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Number	List of articles	Pages
1	Psychotoxic survey effect of cinnamic acid in cinnamon extract and eugenol in clove extract on <i>Trichomonas gallinae</i> in poultry	4
2	Histometric and histopathological study of the healing effects of the alcoholic extract of cloud pomegranate seeds and zinc oxide nanoparticles on skin wound healing in rats.	11
3	Bacterial pigments and its significance	32
4	Tment ofvarious An overview of the use of nanoparticles in the trea urinary infections	46
5	Extraction of steroidal compounds by carbon dioxide supercritical fluid method from fishery wastes and investigation of its sunscreen properties	55
6	Use of artificial intelligence AI Financial Management	61
7	of artificial intelligence in pricing the competition of technology companies with market orientation	67
8	Evaluating the competitiveness of companies with mathematical models and its relationship with equity	80
9	Simultaneous movement in the markets Digital currency : evidence from wavelet analysis	89
10	The role of urban management in the development of urban tourism Case example Creative City of Isfahan	105
11	Analysis of the effects of climatic factors on the worn-out urban fabric ( Case (study : the central context of Mashhad city	117
12	Evaluating the culture of health,safety and environment In one of the country's gas companies using the cultural ladder	138
13	Comparison of self-esteem and irrational beliefs in women candidates and non-candidates for hair mesotherapy	147
14	Investigating strategies for detecting wind power generation system sensor problems	158
15	Review of several methods based on wavelet transform for data steganography	162
16	Improving energy efficiency in communication networks	182

Number	List of articles	Pages
17	Investigating the effect of magnetic cellulose containing silver nanoparticles on reducing the growth of gram-positive bacteria <i>Staphylococcus aureus</i>	188
18	Application of silver nanoparticles in wound treatment	196
19	The concept of a man's stability at home from the point of view of Rishi and Sunni interpretation sources	211
20	Economic development during the advent period from the perspective of verses and traditions	222
21	A Novel Federated Earliest Deadline First Real-time Task Scheduler for Multiprocessors	232
22	Explanation of the comprehensive and balanced model of education Proportion of Alevi worship and justice	242
23	Understanding Recommender Algorithms: Exploring The Role Of Data Mining And User Behavior Analysis	243
24	Explanation of the comprehensive and balanced model in the ratiometric measurement of Alevi worship and justice	251

## Psychotoxic survey effect of cinnamic acid in cinnamon extract and eugenol in clove extract on *Trichomonas gallinae* in poultry

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### ABSTRACT

*Trichomonas gallinae* is the common cause of trichomoniasis in birds and poultry, especially among pigeons, but infections have also been observed in turkeys, ducks, and geese. Recent research and clinical studies have shown that the contamination rate in local ducks is 67%. Metronidazole is the most common effective drug in trichomonas infections, but the drug resistances created in recent studies show that effective treatment methods should be used in addition to metronidazole to clear the infection. The use of medicinal plants is one of the ways of treatment. Cloves have important plant sources of phenolic compounds such as flavonoids, hydroxybenzoic acids, hydroxycinnamic acid and propene hydroxyphenyl. In addition, cloves have anti-mutagenic and anti-inflammatory properties, and their anticoagulant and anti-parasitic effects are noteworthy. Cinnamon has important sources of chemical compounds such as cinnamic aldehyde, safrole, cinnamic acid, cadinene, caryophyllene, tannins, phenols, diterpenes, different carbohydrate and mucilage compounds and a small amount of coumarin. According to many studies, cinnamic acid present in cinnamon has antimicrobial, antifungal and anti-mutagenic effects. In this study, the antimicrobial effects of cinnamon cinnamic acid and clove eugenol on *Trichomonas gallinae* in local ducks were investigated.

**Procedure:** after preparing clove leaves and cinnamon sticks, extraction was done by soaking with 72% ethanol solvent. Then the extract was concentrated and dried. Then stock concentrations were prepared from it. From 22 ducks, positive samples of *Trichomonas gallinae* parasite were detected and cultured in Diamond medium. Metronidazole was used as a positive control. Then the diffusion method in the well was used to check the anti-parasitic effect of cloves and cinnamon and the appropriate concentration was determined.

**Findings:** The greatest antiparasitic effect was observed in the concentration of 100 µg/ml of the hydroalcoholic extract of cinnamon and cloves.

**Conclusion:** The results of this research show the acceptable effects of cinnamic acid from cinnamon extract and eugenol from clove extract on the protozoa of *Trichomonas gallinae*. It is expected to use these extracts as an anti-parasitic drug.



**Keywords:** cinnamic acid, eugenol, cinnamon, clove, *Trichomonas gallinae*.

## 1. INTRODUCTION

*Trichomonas* is a protozoan of the *Trichomonadidae* family that has a four-flagellated trophozoite. All species of this genus are parasites and all of them do not have cysts, and different species have been seen in humans, birds, rodents, arthropods, and molluscs. The genus *Trichomonas gallinae* is the common cause of trichomoniasis in birds and poultry, especially among pigeons, but infections have also been observed in chickens, turkeys, ducks, and geese (Cover and Harmon 1994).

Although the percentage of contamination is more abundant in pigeons, recent research and clinical studies have shown that the contamination rate in local ducks is 67%. Infection occurs through mouth to mouth and mostly through the sap of the layer tree. Ducklings and immunosuppressed ducks are more sensitive to pollution. Weak ducks acquire the disease by eating food in the same dish and water. The most concentrated wounds are in the mouth and esophagus, the trauma created prevents the affected bird from getting enough nutrition, and the continuation of this situation causes weight loss, weakness and lethargy. The trauma resulting from the disease causes a decrease in the tonus of the stratum corneum, and if not diagnosed and treated, it leads to the death of the animal. The clinical diagnosis of this disease is through the observation of live trophozoite and the stimulus of the parasite from the samples of oral and stratum corneum injuries (Britain and Pattison 2002).

Treatment is done through nitroimidazole drugs, especially metronidazole. Although metronidazole is the most common effective drug in *trichomonas* infections, the drug resistance created in recent studies shows that effective treatment methods should be used in addition to metronidazole to clear the infection (Galask 1990).

Metronidazole drug has clinical side effects such as dizziness, inflammation of the tongue and pharynx, nausea and vomiting, dry mouth, eosinophil reduction and leukocytopenia. (Seddiek et al 2014) for this purpose, to reduce drug side effects and effective and complementary treatment, nowadays extract extracts It is a plant that contains useful substances found in the plant such as essential oils, flavonoids, alkaloids, mucilages, tannins, saponins, vitamins, salts and other substances that, in addition to antioxidant properties, have antifungal, antibacterial and anti-parasitic effects. And many of them are used as an effective or complementary treatment along with other drugs, and for this reason, they have been considered as a new anti-parasitic source with high efficiency, toxicity and low cost.

Clove, with the English name clove and the scientific name *Syzygium aromaticum*, is a plant with evergreen leaves and a tree with an average size of 7 to 11 meters from the native *Mirtaceae* family that grows on Malka Island in eastern Indonesia. Cloves have important plant sources of phenolic compounds such as flavonoids, hydroxybenzoic acids, hydroxycinnamic acid and propene hydroxyphenyl. Quercetin, catechin, and kaempferol are the most abundant flavonoids, and eugenol, carvacrol, thymol, and menthol compounds are also abundantly found in cloves (Wenqiang et al. 2007). Cloves have a high protective power to stabilize free radicals, and for this reason, its psychotoxic properties have been proven in microorganisms. In addition, cloves have antimutagenic and anti-inflammatory properties, and their anticoagulant and antiparasitic effects are noteworthy (Sangwan et al. 1990).

According to the research conducted, 16 chemical compounds have been detected in clove extract, whose main components include 85.5% eugenol, 3.2% eugenol acetate, and 1.8% heptacosane.

Cinnamon with the English name Cinnamon and the scientific name *Cinnamomum zeylanicum* is a medicinal plant that is one of the oldest medicinal plants in traditional medicine. Cinnamon has important sources of chemical compounds such as cinnamic aldehyde,

safrole, cinnamic acid, cadinene, caryophyllene, tannins, phenols, diterpenes, different carbohydrate and mucilage compounds and a small amount of coumarin.

According to many studies, cinnamic acid in cinnamon has antimicrobial, antifungal and anti-mutagenic effects (Misharina & Samusenko 2008).

Considering the positive therapeutic effects as well as the antimicrobial effects of cinnamic acid and clove eugenol, this study investigated its anti-trichomonas effects in the laboratory environment.

## 2, Methods of work

First, 100 grams of cinnamon bark and 100 grams of clove buds were obtained from the herbal market. In order to obtain cinnamon powder, cinnamon shells were first sieved with a powder grinder and then to obtain a uniform powder.

In order to obtain clove powder, first the buds were placed under vacuum in the oven at a temperature of 35 degrees for 3 hours, and then the dried buds were ground and sieved like cinnamon.

Then clove and cinnamon powders were mixed separately at a ratio of 1:10 with 72% ethanol in a sterile Erlenmeyer flask with a screw cap at a temperature of 27 degrees Celsius. The samples were placed on a shaker at 150 rpm for 48 hours, and then their ethanol extract was obtained by passing the mixture through Whatman paper number 4. The extracts were concentrated under vacuum with a rotary device at a temperature of 65°C. After the solvent was separated, the extracts were dried with the help of an oven under a vacuum at a temperature of 48°C and a pressure of 15 ml of mercury.

In order to quality control the absence of microbes, the extracts were filtered through a sterile 0.45 micron membrane filter and kept in sterile vials and closed, away from light, in a refrigerator at 5 degrees Celsius until use.

In this study, metronidazole 98% was used as a positive control and for *Trichomonas gallinae* protozoa from the modified diamond culture medium (QUELAB, Canada).

Samples were taken from 40 local ducks reared in rural areas that had symptoms of oral lesions by sterile swab and were taken to the laboratory for microscopic examination to confirm the presence of protozoa.

After investigation, 22 positive samples were identified and sampling was done from their pharyngeal area using needle gavage, and then after sterilization of the culture medium and tools, the samples taken for growth in the logarithmic phase were transferred to Diamond culture medium containing 10% fetal bovine serum and 1% streptomycin were transferred in the presence of flame. The parasites were kept in an incubator for 48 hours at 37°C.

About 100 microliters of Diamond culture medium containing  $1 \times 10^3$  parasites was added to 96-well microplates with a capacity of 300 microliters each. Then cinnamon and clove extracts and metronidazole were dissolved in 100 microliters of Diamond medium with pre-prepared stock concentrations. The final concentrations in the wells reached 25, 50, 75 and 100 µg/ml. In the negative control well, 100 microliters of pure culture medium was poured. The final volume of all wells reached 200 microliters.

The treatments were repeated fifteen times and then the microplates were transferred to an incubator at 37-38 degrees Celsius to evaluate the density and mortality rate of parasites in a period of 24 hours. To distinguish the mortality of parasites from trypan blue dye and for statistical analysis, spss version 21 software was considered significant with values of  $P \leq 0.05$ .

## 3, Result

(in Figure No. 1) the effectiveness of the positive control and different concentrations of cinnamon and cloves are shown.

The number of parasites in the treatment groups with metronidazole, which is the drug of choice, with concentrations of 25, 50, 75, and 100 µg/ml after 24 hours is zero, which is  $1.2 \times 10^3$  compared to the control group. It is significant  $P < 0.01$ .

The number of parasites in the concentration of 25 µg/ml of cinnamon extract is  $0.68 \times 10^3$  and 25 µg/ml of clove extract is  $0.89 \times 10^3$ .

The number of parasites in the concentration of 50 µg/ml of cinnamon extract is  $0.201 \times 10^3$  and 50 µg/ml of clove extract is  $0.238 \times 10^3$ .

The number of parasites in the concentration of 75 µg/ml of cinnamon extract is  $0.112 \times 10^3$  and 75 µg/ml of clove extract is  $0.168 \times 10^3$ .

The number of parasites in 25 concentrations of cinnamon and clove extract is not significant compared to 50 concentration of cinnamon and clove extract  $P > 0.05$ , but it is significant compared to 100 concentration.  $P < 0.05$ .

Also, the number of parasites in 50 concentrations of cinnamon extract is not significant compared to 75 concentrations of cinnamon and clove extracts,  $P > 0.05$ , but it is significant compared to 100 concentrations.  $P < 0.05$ .

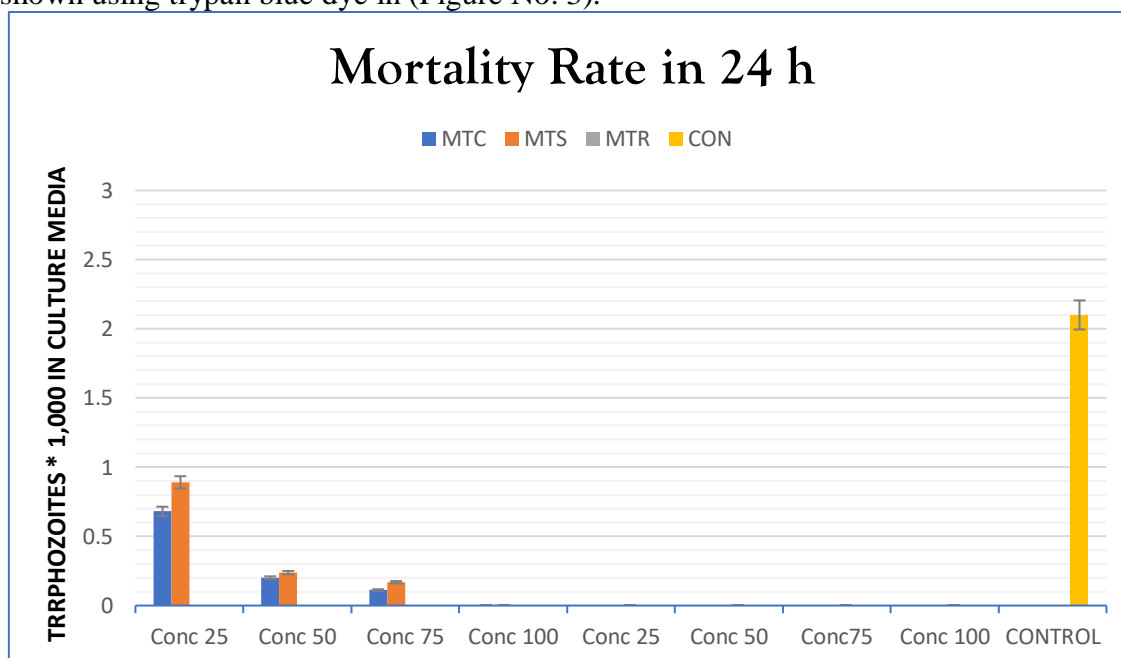
The difference between 75 µg/ml of cinnamon and clove extract with a concentration of 100 is not significant.  $P > 0.05$ .

#### Percentage of growth inhibition

In the control group, there was no significant difference between the percentage of growth inhibition in 25, 50, 75 and 100 microg/ml metronidazole gels in a 24-hour period.  $P > 0.05$ .

Also, no significant difference was observed in the concentration difference between 25 and 50, 50 and 75, and 75 and 100 of cinnamon sticks and cloves.  $P > 0.05$  (Figure No. 2)

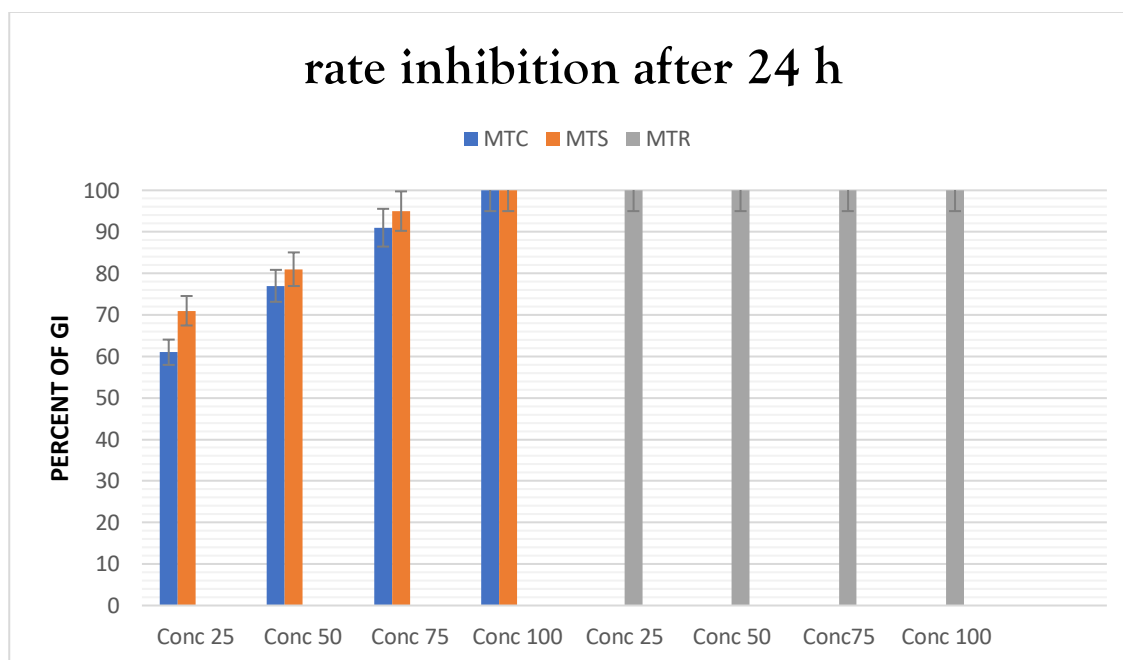
The task of mortality of parasites in a concentration of 100 µg/ml of cinnamon and clove extract is shown using trypan blue dye in (Figure No. 3).



**Figure 1. Specifications of trypomastigotes in subsequent treatments after 24 h**

**MTC: Cinnamon MTS: Syzygium MTR: Metronidazole CON: Control**

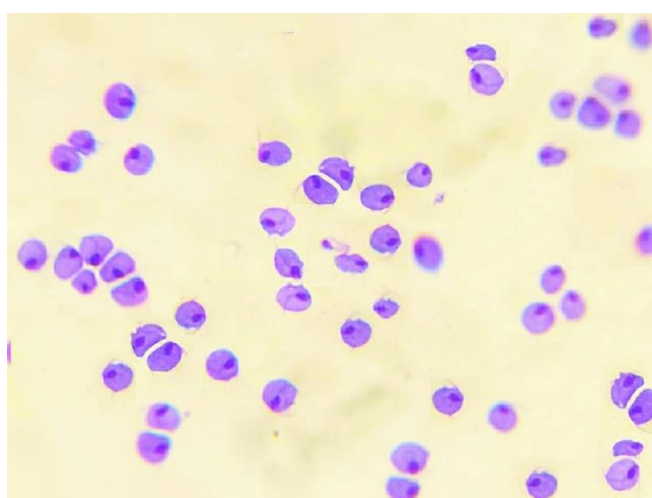
Data are shown as average  $\pm$  standard error. Averages have significant differences with non-identical letters.



**Figure 2. Comparison of growth inhibition percentage in different treatments after 24 h**

**MTC: Cinnamaldehyde MTS: Syzygium MTR: Metronidazole CON: Control**

Data are shown as average  $\pm$  standard error. Averages have significant differences with non-identical letters.



**Figure 3. Mortality status of *Trichomonas gallinae* in the presence of 100  $\mu\text{g/ml}$  of cinnamon and clove extracts.**

#### 4, Discussion

In this study, the psychotoxic effect of clove extract, like cinnamon, was investigated in different concentrations, and the concentration of 100 µg/ml of clove extract resulted in the death of 100% of parasites after 24 hours.

Clove extract and essential oil have been used in dentistry for many years as a mouth and teeth disinfectant. Previous studies indicate that this combination has caused a decrease in anti-fungal and anti-parasitic activities, especially *Trichomonas tenax* in the mouth of patients.

Since the largest compound in clove extract is eugenol, the present study showed that eugenol, like cinnamic acid in cinnamon extract, has an anti-parasitic effect.

In the present study, the effectiveness of both cinnamon and clove extracts was acceptable, and the effectiveness of clove was slightly higher than that of cinnamon, which is shown in graph number 1, but there was no significant difference in both.

The results of this research show the acceptable effects of cinnamic acid of cinnamon extract and eugenol of clove extract on the protozoan *Trichomonas gallinae*. It is expected to use these extracts as an anti-parasitic medicine by studying and analyzing statistics in a wide range of studies from different cases. Herbal compounds are cheap and accessible, and the cost of extracting their extracts is low. Therefore, they can be used for anti-trichomonas applied research.

It is suggested to conduct many clinical researches to find the effects of these plants and their components on other microorganisms and protozoa.

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## **Histometric and histopathological study of the healing effects of the alcoholic extract of cloud pomegranate seeds and zinc oxide nanoparticles on skin wound healing in rats.**

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### **Abstract**

The skin is the largest organ in the body in terms of surface area and has various functions. One of the most common injuries to the skin is open wounds caused by cuts and injuries. One of the most important topics for researchers has always been to find a way to repair wounds. Today, herbal treatment is very much studied by researchers in the field of wound healing due to the possibility of less side effects. Cloud pomegranate white seed extract is probably effective in healing wounds due to its antibacterial and anti-inflammatory properties. On the other hand, some studies show the antibacterial properties of zinc oxide nanoparticles in local use and reduce contamination and infection in the wound, and suggest re-epithelialization as the most important mechanism of wound healing in this substance. In this research, an attempt was made to investigate the healing effects of zinc oxide nanoparticles in the form of an ointment, the alcoholic extract of white pomegranate seeds in the form of an ointment, and the combined ointment of the two compared to the effects of the control group and Oserin. In this study, twenty-five mice were selected and randomly assigned to five treatment groups. The first group did not receive any medication, the second group received Oserin ointment, the third group received white pomegranate seed extract as an ointment, and the fourth group received zinc oxide nanoparticles. Ointment face and the fifth group received alcoholic extract of white pomegranate seeds along with zinc oxide nanoparticles. Photographs were taken of the wounds created on days 0, 7, 14, and 21 and the extent of wound healing was calculated. On days 0, 1, 3, 7, 14, and 21, mice were killed painlessly and samples were taken from the wounds. Histopathological examinations were performed on the samples collected from the wound. At the end of the study, the amount of mononuclear cells, multinucleated cells, fibroblast and vascularization in the fifth group was less than other groups. The process of wound contraction in the fifth group was more than other groups. Although, in the fifth and fourth groups, the process of wound contraction was more severe than the other groups. Complete healing of the wound was observed on the 21st day only in the fifth group. In this study, the topical application of white pomegranate seed extract along with zinc oxide nanoparticles extract had a positive effect on the stages of wound healing in mice, and therefore it may have a beneficial role on wound healing.

**Keywords:** histopathology, wound healing, alcoholic extract of white pomegranate seeds, zinc oxide nanoparticles, Syrian mice.

## 1. Introduction

Wound healing is a process that starts immediately after the injury, and during the injury, the tissue is destroyed, blood vessels release blood plaques, and blood cells are released into the wound site. The first sign of wound injury is the release of molecules. It is like ATP and the unfolding of collagen in the wall of blood capillaries. The general processes of wound healing have three major stages that are defined during the wound healing process, which include healing processes, formation of epithelial tissue, and wound healing. Healing processes occur in four stages. During the first stage or hemostasis, the damage caused is limited. The clot provides a suitable initial substrate for the transfer of cells to the wound area. In the second stage, inflammation occurs, in this stage, with the increase of blood flow in the wounded area and the entry of different types of white blood cells, the damaged tissues are removed and the wound is protected against microorganisms. In the cell proliferation stage, a fibrinous tissue is formed in the wound site with the cooperation of fibroblasts, which is actually a germ tissue, and simultaneously, epithelial cells begin to multiply from the edges of the wound. In the final stage of maturity, the wound occurs. The final product of healing processes is scar tissue, which can be in three forms: atrophic, hypertrophic, or keloid [1]. Many advances have been made in the management of surgical wounds and various methods including aseptic techniques, prophylactic antibiotics and laparoscopic surgery have been used. Surgical wound infection and wound damage leave complications caused by surgery [2]. Pomegranate with the scientific name *Punica granatum* L. is one of the members of the dark pomegranate family (Punicaceae) whose origin is believed to be Iran and its neighboring countries[3-4-5]. The number of cultivars of this fruitful plant has been reported to be very numerous and there are more than 1000 cultivars [6-7-8]; While this number is more than 760 based on the latest reports in the country [3-7-8-9]. The edible fruit of this plant is a type of seta called Balosta[3-8-9]. The skin of the fruit of this plant is leathery and thick, which contains a large number of fleshy seeds called aril [10]. The fruit consists of three parts: the seeds, which make up about 3% of the fruit's weight and contain 20% of oil; Fruit juice, which makes up about 30% of the weight of the fruit, and the skin of the fruit, which is attached to the seeds with fleshy parts, is called skin. Pomegranate fruit is consumed in different ways in the world, such as fresh or processed, such as fruit juice, paste, kernel oil, vinegar, pomegranate seeds, etc. [10-3]. Pomegranates, olives, figs and grapes were the first plants cultivated by humans. Pomegranate is one of the oldest edible fruits that is mentioned in the Quran, Bible and Torah [11]. Pomegranate is considered as a manifestation of life, longevity, health, elegance, fertility, knowledge, ethics, immortality and spirituality. 12]. In ancient Egyptian culture, pomegranate fruit was known as a manifestation of success and ambition [10].

[10]. In traditional medicine, the different components of this plant have many therapeutic effects. Since ancient times in our country, the root of this plant has been used as an anthelmintic [3]. In traditional Indian medicine, they knew about pomegranate and used its skin and roots to get rid of worms. Its fruit skin is a strong astringent and is used to treat diarrhea, and its juice is used as a febrifuge and tonic [13]. Some authors [14-15-16]. They believe that the decoction of dried pomegranate skin in water is useful for internal and external use for

many injuries that required astringent or antimicrobial properties, especially for pestilence, diarrhea and blindness. The products obtained from a mixture of seeds, fruit juice and skin not only prevent miscarriage., but it causes pregnancy [17]. In traditional Greek medicine, pomegranate flowers are used to treat diabetes [18]. The new uses of pomegranate-derived products today are for the treatment of AIDS [19] It works; Also for beautifying and increasing beauty [19], hormone replacement therapy [20], diagnosis of allergy symptoms [21], cardiovascular protection [22-23], oral and dental hygiene [24], eye ointments [25] and Weight loss soap [26] is used.

Over the past few decades, there has been considerable research interest in drug transformation using particle delivery systems as carriers of small and large molecules. Particulate systems such as nanoparticles have been used as a physical approach to change and improve the pharmacokinetic and pharmacodynamic properties of different types of drug molecules [27]. Nanotechnology is the science of controlling the unique chemical, physical and biological properties of materials at the nano scale and using them in fundamental and new ways. Nanotechnology can be very important in many fields such as imaging, drug production and tissue engineering. The application of nanotechnology in veterinary medicine and animal reproduction and in other fields has been reported [28]. Nanotechnology in veterinary medicine with emphasis It has been used mostly on biosensors, drug making, chemotherapy devices and also nano material mechanisms for diagnosis, treatment and tracking of diseases. Nanotechnology is the understanding and application of new properties of materials and particles in dimensions of 1 to 100 nanometers, which show new physical effects mainly influenced by the dominance of quantum properties over classical properties. Considering the various characteristics and substances effective on wound healing that are present in white pomegranate seed, the aim of this study is to investigate the healing effect of white pomegranate seed extract along with zinc oxide nanoparticles on the healing of experimental wounds of all thickness in Syrian mice.

## **2. Materials and work methods**

White pomegranate seeds were separated from the fruit and dried in the shade at room temperature (24°C). The dried seeds were ground and turned into powder by an electric grinder. Next, the alcoholic extract (ethyl alcohol) was obtained by the usual method [29]. To carry out this study, 25 Syrian mice were prepared and kept in individual cages. Then the mice were divided into 5 groups including the first group did not receive any medicine, the second group was Oserin ointment, the third group was the sieved extract of white pomegranate seeds in the form of an ointment, the fourth group was zinc oxide nanoparticles in the form of an ointment, and the fifth group was the alcoholic extract of pomegranate white seeds along with zinc oxide nanoparticles. They were divided. In the saline control group, after weighing each mouse (average weight 25 grams), according to the anesthetic dose for Syrian mice, ketamine 50 mg/kg + xylazine 5 mg/kg [30] intraperitoneally and using an insulin syringe. The injection was done. After anesthetization, the area between the two shoulder blades of the animal was weighed and prepared by betadine scrub and a circular piece of skin with a diameter of 2 cm was removed. After removing the skin with all its thickness (epidermis and dermis), the operation site was treated with sterile physiological serum. This treatment process was done

for all 12 mice after surgery (12 mice in each group were divided into three subgroups 7, 14 and 21 days after surgery). After the end of each treatment period in each group, the mice were anesthetized using ether and removed from the wound site along with 0.5 cm of the surrounding skin and preserved in 10% formalin and sent to the histopathology laboratory. In the Eserin control and experimental groups, all operations were performed and the duration of treatment was the same as in the saline control group, with the difference that the treatment was performed with Eserin and Eserin ointment base containing white pomegranate seed extract, respectively. Consumption volume of physiological serum In such a way as to clean the wound from possible contamination. Also, the same amount of eserin and eserin containing white pomegranate seeds were used and covered the entire wound area in a thin layer. Sampling was done in the same way as the previous two groups. The samples sent to the pathology laboratory, after staining with hematoxylin-eosin method, were evaluated qualitatively and quantitatively. In histopathology grading, parameters affecting wound healing [31] were used, and the amount of epithelium formation, vascularization, formation of collagen fibers, and the presence or absence of inflammatory cells were investigated. The mentioned criteria were scored as - (absence), +1 (very little), +2 (low), +3 (moderate) and +4 (high). Also, the wound surface was measured on the 7th, 14th and 21st days after the wound was created using Image J software with the unit of  $[\text{mm}]^2$ . The percentage of wound healing is calculated according to the following formula:

(1)

$$\text{Recovery percentage} = \frac{\text{first day on the surface wound} - \text{The wound surface on the desired day}}{\text{Wound surface on the first day}} \times 100$$

### 3. Quantitative evaluation

In the microscopic observation of the skin wound healing site on the 7th day of the control group, most of the wound surface was covered by a scab consisting of a blood clot containing fibrin and blood cells, edematous cells and remnants of necrotic tissues. The presence of a large amount of microbial cells on the surface of the scab on the wound was quite clear. The space under the scab was occupied by loose connective tissue. The presence of acute type edematous cells was also evident under the scab as well as the connective tissue itself located in the wound space. The covering tissue of the pavement, which had started to regenerate with the formation of covering lichen, was expanding from the surface under the scab towards the surface of the wound (Figure 1). In the microscopic observation of the skin wound healing site on day 7 of the Oserin treatment group, most of the wound surface was covered by a scab consisting of a blood clot containing coagulated fibrin, edematous cells and necrotic tissue remnants, as in the control group. The wound space was completely occupied by young and newly formed granulation tissue. Acute edematous cells were also seen mainly in the superficial parts of the wound and under the scab, although they were also abundantly visible in the deeper tissues of the wound. The covering tissue of the pavement also started to regenerate with the formation of a covering bud and was expanding from the surface under the scab to the surface of the

wound (Figure 2). Microscopic observation of the healing site of the skin wound on the 7th day of the treatment group with zinc oxide nanoparticles showed that the majority of the wound surface was covered with a scab containing a blood clot consisting of fibrin and blood cells, as in the previous groups (control and treatment with Oserin). It is also covered with edematous cells and necrotic tissues. The wound space was completely occupied by the young fleshy bud, rich in vascularity and pericellular. The intensity of the presence of tumor cells was reduced compared to the group treated with Oserin. The covering bud was thicker and more developed compared to the group treated with Oserin, and it was expanding from the surface under the scab to the surface of the wound (Figure 3). In the microscopic observation of the healing site of the skin wound on the 7th day of the treatment group with white pomegranate seed extract, a large part of the wound surface was covered by a scab containing a blood clot consisting of fibrin and blood cells, as well as edematous cells and necrotic tissues. The wound space was completely filled by pericellular and young fleshy buds and was more developed than the previous groups (control, Oserin and zinc oxide nanoparticles). Certain hyperemia was observed in the new blood vessels inside the flesh bud. The presence of tumor cells was also reduced compared to the group treated with zinc oxide nanoparticles. Compared to the treatment group with zinc oxide nanoparticles, the coating texture of the pavement has grown more and it is growing from the bottom surface of the scab. The extension was toward the surface of the wound (Figure 4).

In the microscopic observation of the healing site of the skin wound on the 7th day of the treatment group with white pomegranate seed extract + zinc oxide nanoparticles, many parts of the scab were separated from the wound surface and the wound surface was mainly covered by the remains of necrotic tissues and edematous cells. The wound space was completely filled by vascular fleshy bud and young pericell, and it was more developed than the previous groups. Certain hyperemia was also observed in the new blood vessels inside the flesh bud. The presence of tumor cells was also reduced compared to the group treated with white pomegranate seed extract. Epithelial tissue continued to expand on the wound surface and grew more than the group treated with white pomegranate seed extract (Figure 5).

Microscopic studies of the healing site of the skin wound on the 14th day of the control group showed that a large part of the wound surface was still covered by a scab containing blood clots consisting of fibrin and blood cells, as well as a large number of edematous cells and necrotic tissues. The wound space was completely occupied by vascularized fleshy bud and young pericell. Many edematous cells were visible on the surface under the scab as well as the tissue of the flesh bud itself. The cobblestone covering tissue was also spreading from the surface under the scab towards the surface of the wound (Figure 6).

In the microscopic evaluation of the healing site of the skin wound on the 14th day of the Oserin treatment group, a significant part of the wound surface was still covered by a scab containing a blood clot consisting of fibrin and blood cells, as well as a large number of edematous cells and necrotic tissues. The wound space was completely occupied by vascularized fleshy bud and young pericell, and marked hyperemia was observed in the new blood vessels present in it. The amount of edematous cells on the surface under the scab and the tissue of the fleshy bud itself was reduced compared to the control group. The cobblestone tissue was still expanding



towards the surface of the wound (Figure 7). The amount of edematous cells on the surface under the scab and the tissue of the fleshy bud itself was reduced compared to the control and Oserin treated groups. The squamous covering tissue was also expanding towards the wound surface and it grew more than the previous two groups and covered more than half of the wound surface (Figure 8). Microscopic studies of the healing site of the skin wound on the 14th day of the treatment group with white pomegranate seed extract showed that parts of the wound surface were covered by scabs containing blood clots consisting of fibrin and blood cells, as well as a large number of edematous cells and necrotic tissues. The wound space, which is occupied by young granulation tissue, was more orderly than the group treated with zinc oxide nanoparticles. The amount of edematous cells on the surface under the scab and the tissue of the fleshy bud itself was significantly reduced compared to the group treated with zinc oxide nanoparticles. The squamous covering tissue was also expanding from under the scab towards the surface of the wound and covered more of the surface of the wound than the group treated with zinc oxide nanoparticles (Figure 9). Microscopic observation of the healing site of the skin wound on day 14 of the treatment group with white pomegranate seed extract + zinc oxide nanoparticles showed that the scab was separated from the wound surface and the wound space was covered by granulation tissue, which was more orderly and organized than the group treated with white pomegranate seed extract. It was occupied. The amount of tumor cells was also reduced well compared to the group treated with white seed extract. The cobblestone covering tissue that was expanding towards the wound surface had covered more of the wound surface, but it was not much different compared to the group treated with white pomegranate seed extract (Figure 10).

Microscopic examination of the healing site of the skin wound on the 21st day of the control group showed that the squamous epithelial tissue, spreading from both sides of the wound surface, covered most of it, and the remaining part was partially covered by a scab consisting of blood clots, remnants of necrotic tissues, and a small number of The cells are covered. The wound space was completely occupied by the young granulation tissue with vascularity and pericellularity, and there was a definite blood pool in its vessels. Edema cells were also visible diffusely in the granulation tissue (Figure 11). Microscopic observation of the healing site of the skin wound on day 21 of the oserin treatment group revealed that the squamous epithelium has covered more than half of the wound surface by spreading from both sides of the wound surface. The wound space is completely occupied by young granulation tissue with vascularity and pericellularity, and the collagen strands in it were thicker and more regular compared to the control group. Edema cells were also visible diffusely in the granulation tissue, but their intensity was reduced compared to the control group during this period. The neoplastic vessels of the granulation tissue had relative hyperemia in the deeper parts (Figure 12).

Microscopic evaluation of skin wound repair site on day 21 of zinc oxide nanoparticles treatment group. The cobblestone covering extends from both sides of the wound surface and covers most of it (more than three-fourths) and a small part of it has no covering. The wound space was completely occupied by young granulation tissue with vascularity and pericells, and the collagen fibers in it were thicker and more organized than the group treated with Oserin and had more maturity. As in the group treated with Oserin, the presence of edematous cells



was well reduced. The new vessels of the granulation tissue in the deeper parts were still relatively hyperemic as in the group treated with Oserin (Figure 13). Microscopic examination of the healing site of the skin wound on day 21 of the group treated with white pomegranate seed extract showed that the covering tissue of the relatively regular paving of the new foundation completely covered the wound surface. The wound space was completely occupied by relatively mature granulation tissue and fibrous strands. The presence of edematous cells was also greatly reduced and they were rarely visible, and mild to moderate hyperemia was observed in the vessels of the areas around the repair area (Figure 14). Microscopic observation of the healing site of the skin wound on day 21 of the treatment group with white pomegranate seed extract + zinc oxide nanoparticles showed that the covering tissue of the new foundation pavement completely covered the wound surface. Compared to the group treated with white pomegranate seed extract, it is thicker and has more order and organization. The wound space is completely occupied by mature granulation tissue with specific fibrotic fibers and the collagen fibers in it are thicker and more organized compared to the group treated with white pomegranate seed extract. Hyperemia was not visible and edematous cells were not noticeable (Figure 15). The rank comparison of the tissue changes of repair between the studied groups during the test period is given in Tables 1 to 3.

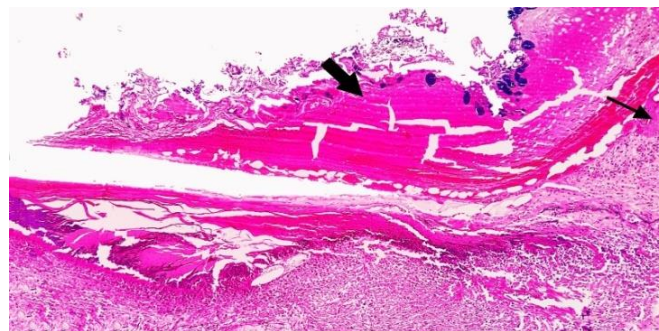


Figure 1. Microscopic view of the healing site of the skin wound on day 7 of the control group. The surface of the wound is covered by a scab (thick arrow) consisting of a blood clot containing fibrin and blood cells, edematous cells and the remains of necrotic tissues. The presence of microbial cells on the surface of the scab on the wound is obvious. The space under the scab is occupied by loose connective tissue. The presence of acute type edematous cells is also evident under the scab as well as the connective tissue itself. The squamous covering tissue that has started to regenerate with the formation of covering mucus (thin arrow) and is visible from the surface under the scab to the surface of the wound (hematoxylin-eosin, 100x magnification).

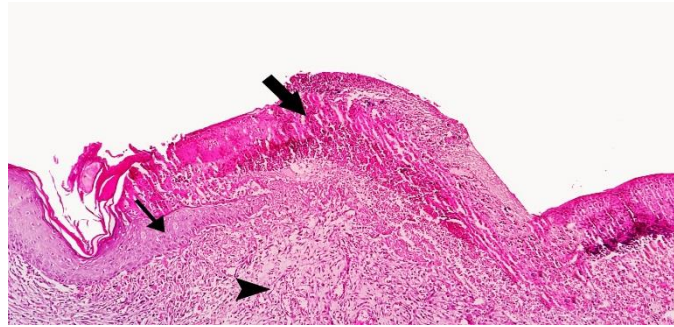


Figure 2. Microscopic view of the healing site of the skin wound on day 7 of the Oserin treatment group. The surface of the wound is covered by a scab (thick arrow) consisting of a blood clot containing coagulated fibrin, edematous cells and the remains of necrotic tissues. The wound space is completely filled by young granulation tissue (arrowhead). The presence of acute swelling cells is mainly limited to the superficial parts of the wound and under the scab. However, they can be seen in deeper tissues. The squamous covering tissue that has started to regenerate with the formation of covering mucus (thin arrow) and is expanding from the surface below the scab towards the surface of the wound (hematoxylin-eosin, 100x magnification).

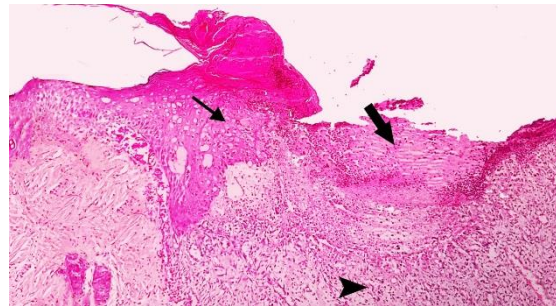


Figure 3. Microscopic view of the healing site of the skin wound on day 7 of the group treated with zinc oxide nanoparticles. The wound surface is covered by a scab (thick arrow) containing a blood clot consisting of fibrin and blood cells, as well as edematous cells and necrotic tissues. The wound space is completely filled by pericellular and young fleshy bud (arrowhead). The presence of tumor cells has decreased compared to the group treated with Oserin. The squamous epithelial tissue that has started to regenerate with the formation of a covering bud (thin arrow) is thicker and more developed compared to the group treated with Oserin, and it is expanding from the surface under the scab towards the surface of the wound (hematoxylin-eosin, 100x magnification)

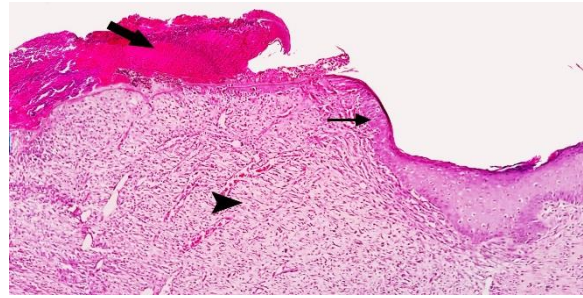


Figure 4. Microscopic view of the healing site of the skin wound on day 7 of the group treated with white pomegranate seed extract. The wound surface is covered by a scab (thick arrow) containing a blood clot consisting of fibrin and blood cells, as well as edematous cells and necrotic tissues. The wound space is completely filled by the pericellular and young fleshy bud (arrowhead) and marked hyperemia is observed in the newly formed vessels inside the fleshy bud. The presence of tumor cells has decreased compared to the group treated with zinc oxide nanoparticles. The squamous covering tissue (thin arrow) has grown more than the group treated with zinc oxide nanoparticles and is expanding from the surface below the scab towards the surface of the wound (hematoxylin-eosin, 100x magnification).

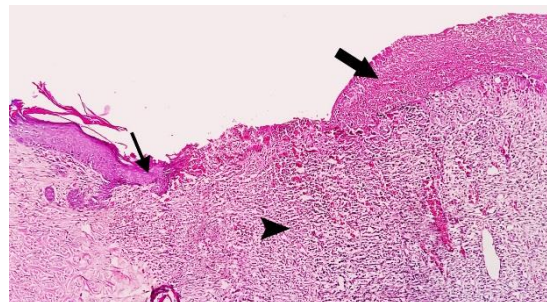


Figure 5. Microscopic view of the healing site of the skin wound on day 7 of the treatment group with white pomegranate seed extract + zinc oxide nanoparticles. The scab is separated from the surface of the wound and the surface of the wound is mainly covered by the remains of necrotic tissues and edematous cells. The wound space is completely filled by vascular fleshy bud and young pericell, and a specific hyperemia is observed in newly formed vessels inside the fleshy bud. The intensity of the presence of edematous cells has decreased compared to the group treated with white pomegranate seed extract. The squamous covering tissue (arrow) is also expanding on the surface of the wound (hematoxylin-eosin, 100x magnification).

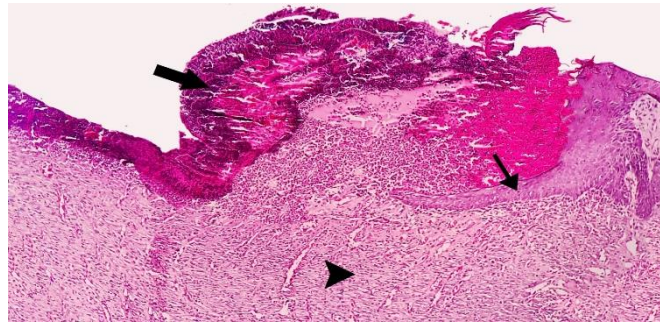


Figure 6. Microscopic view of the healing site of the skin wound on day 14 of the control group. The surface of the wound by a scab (thick arrow) contains a blood clot consisting of fibrin and blood cells, as well as a large number of edematous cells and necrotic tissues. It is covered. The wound space is completely occupied by vascular fleshy bud and young pericell (arrowhead). Many edematous cells can be seen on the surface under the scab as well as the tissue of the fleshy bud itself. The squamous covering tissue (thin arrow) is expanding from the surface below the scab towards the surface of the wound (hematoxylin-eosin, 100x magnification).

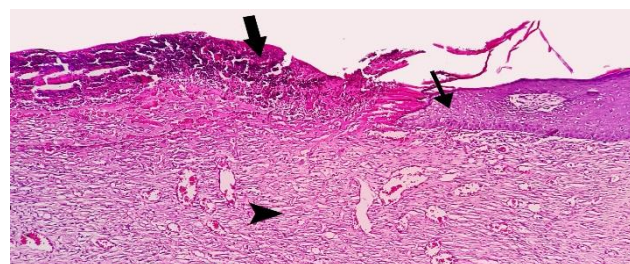


Figure 7. Microscopic view of the healing site of the skin wound on day 14 of the Oserin treatment group. The surface of the wound is covered by a scab (thick arrow) containing a blood clot consisting of fibrin and blood cells, as well as a large number of edematous cells and necrotic tissues. The wound space is completely occupied by vascular fleshy bud and young pericell (arrowhead). A specific hyperemia is observed in the neovascular vessels of the



flesh bud. The amount of edematous cells on the surface under the scab and the tissue of the fleshy bud itself has decreased compared to the control group. The squamous covering tissue (thin arrow) is also expanding towards the surface of the wound (hematoxylin-eosin, 100x magnification).

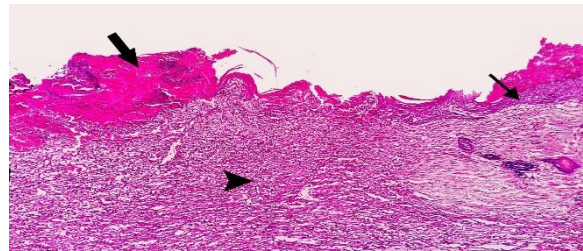


Figure 8. Microscopic view of the healing site of the skin wound on day 14 of the group treated with zinc oxide nanoparticles. Parts of the scab (thick arrow) are separated from the wound surface, but a large part of the wound surface is covered by a scab containing a blood clot consisting of fibrin and blood cells, as well as a large number of edematous cells and necrotic tissues. The wound space is completely occupied by vascular fleshy bud and young pericell (arrowhead). The amount of edematous cells on the surface under the scab and the tissue of the fleshy bud itself has decreased compared to the control group. The squamous covering tissue (thin arrow) is also expanding towards the surface of the wound (hematoxylin-eosin, 100x magnification).

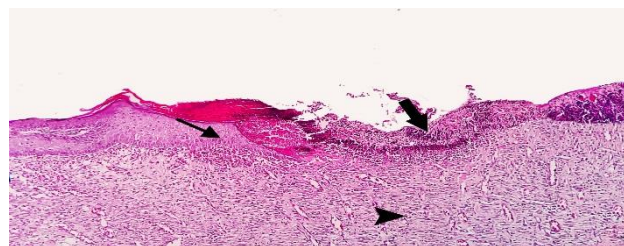


Figure 9. Microscopic view of the healing site of the skin wound on day 14 of the group treated with white pomegranate seed extract. The surface of the wound is covered by a scab (thick arrow) containing a blood clot consisting of fibrin and blood cells, as well as a large number

of edematous cells and necrotic tissues. Wound space occupied by young granulation tissue (arrowhead). Compared to the group treated with zinc oxide nanoparticles, it has more order. The amount of edematous cells on the surface under the scab and the tissue of the fleshy bud itself has been significantly reduced compared to the group treated with zinc oxide nanoparticles. The squamous covering tissue (thin arrow) is also expanding from under the scab towards the surface of the wound (hematoxylin-eosin, 100x magnification).

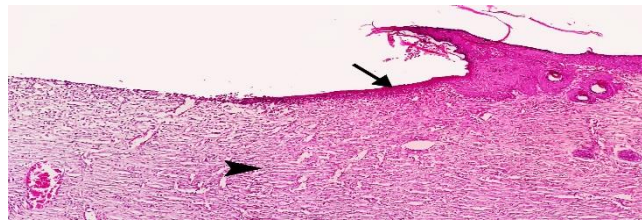


Figure 10. Microscopic view of the healing site of the skin wound on day 14 of the treatment group with white pomegranate seed extract + zinc oxide nanoparticles. The scab is separated from the wound surface and the wound space is occupied by granulation tissue (arrowhead), which is more orderly and organized than the group treated with white pomegranate seed extract. The amount of tumor cells has been reduced well compared to the group treated with white seed extract. The squamous covering tissue (arrow) is also expanding towards the surface of the wound (hematoxylin-eosin, 100x magnification).

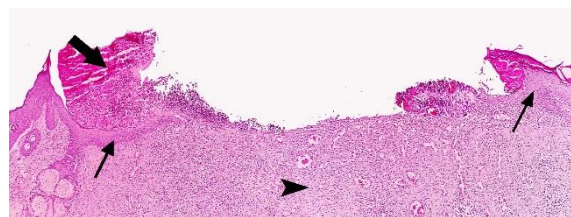


Figure 11. Microscopic view of the healing site of the skin wound on day 21 of the control group. The squamous covering tissue (thin arrows) has covered most of it by spreading from both sides of the wound surface, and the remaining part is partially covered by a scab (thick arrow) composed of blood clots, remnants of necrotic tissues and a small number of cells. The wound space is completely occupied by young granulation tissue with vascularity and pericells



(arrowhead) and a certain amount of blood is observed in its vessels. Edema cells can be seen diffusely in the granulation tissue. (Hematoxylin-eosin, 100x magnification).

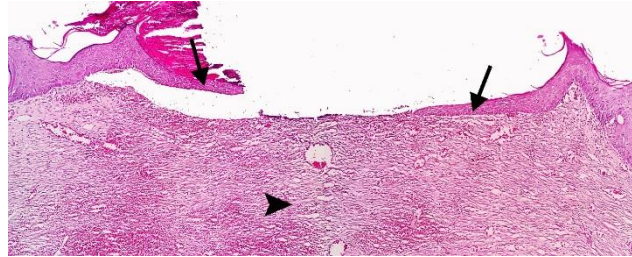


Figure 12. Microscopic view of the healing site of the skin wound on day 21 of the Oserin treatment group. The cobblestone covering tissue (thin arrows) has covered most of the wound surface by spreading from both sides. The wound space is completely occupied by young granulation tissue with vascularity and pericells (arrowhead) and the collagen strands in it are thicker and more regular compared to the control group. Edema cells can be seen diffusely in the granulation tissue. The new blood vessels of the granulation tissue in the deeper parts have relative hyperemia (hematoxylin-eosin, 100x magnification).

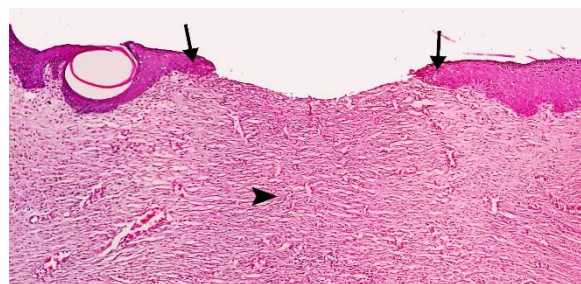


Figure 13. Microscopic view of the healing site of the skin wound on day 21 of the group treated with zinc oxide nanoparticles. The cobblestone covering tissue (thin arrows) by spreading from both sides of the wound surface, covers most of it and a small part of it has no covering tissue. The wound space is completely occupied by young granulation tissue with vascularity and pericells (arrowhead), and the collagen fibers in it are thicker and more organized than in the group treated with Oserin and have more maturity. The presence of edematous cells has also been greatly reduced. The new blood vessels of the granulation tissue in the deeper parts still have relative hyperemia (hematoxylin-eosin, 100x magnification).

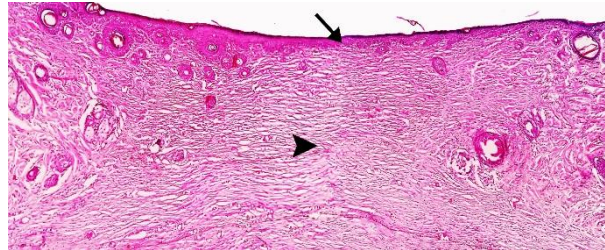


Figure 14. Microscopic view of the healing site of the skin wound on day 21 of the group treated with white pomegranate seed extract. Relatively regular cobblestone covering tissue (thin arrow) has completely covered the surface of the wound. The wound space is completely occupied by relatively mature granulation tissue (arrowhead) and fibrous strands. The presence of edematous cells is greatly reduced and rarely visible, and mild to moderate hyperemia is observed in the vessels around the repair area (hematoxylin-eosin, 100x magnification).

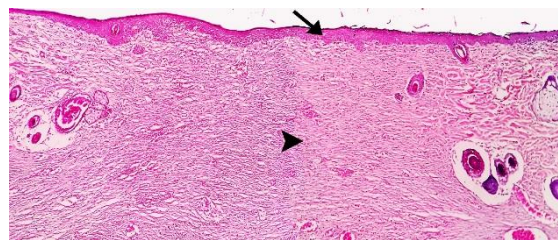


Figure 15. Microscopic view of the healing site of the skin wound on day 21 of the treatment group with white pomegranate seed extract + zinc oxide nanoparticles. The covering tissue of the new foundation pavement (thin arrow) which has completely covered the wound surface is thicker and has more order and organization than the group treated with white pomegranate seed extract. The wound space is completely occupied by mature granulation tissue (arrowhead) with distinct fibrotic fibers, and the collagen fibers in it are thicker and more organized than the group treated with white pomegranate seed extract. Hyperemia was not visible and edematous cells were not seen either (hematoxylin-eosin, 100x magnification).

**Table 1- Comparison of changes in restoration parameters between the studied groups on day 7**

Epidermal tissue caress	Fibroplasia process	Amas reduction	The degree of homeostasis	Repair parameters group
+	+	+	+	the witness
+	+	+	+	Treatment with Oserin
+	+/++	+/++	+/++	Treatment with zinc oxide nanoparticles
++	++	++/+++	++/+++	Treatment with white pomegranate seed extract
+++	+++	+++	+++	Treatment with white pomegranate seed extract + zinc oxide nanoparticles

Epidermal tissue caress	Fibropasia process	Amas reduction	The degree of homeostasis	Repair parameters group
++	++	+/++	+/++	the witness
++	++	++	++	Treatment with Oserin
++/+++	++	++/+++	++/+++	Treatment with zinc oxide nanoparticles

+++	+++	+++	+++	Treatment with white pomegranate seed extract
+++	++++	++++	++++	Treatment with white pomegranate seed extract Zinc oxide nanoparticles

**Table 3- Comparison of the changes in restoration parameters between the studied groups on the 21st day**

Epidermal tissue caress	Fibroplasia process	Amas reduction	The degree of homeostasis	Repair parameters group
++/+++	++/+++	++	+++	the witness
+++	+++	++/+++	++/+++	Treatment with Oserin
++++	+++	++/+++	+++ /++++	Treatment with zinc oxide nanoparticles
+++++	+++ /++++	+++ /++++	++++	Treatment with white pomegranate seed extract
+++++	++++	++++	++++	Treatment with white pomegranate seed extract Zinc oxide nanoparticles

### 3. Conclusion

The differences of these cells counted in this study can indicate the acceleration of the healing process due to the effect of the fourth group and the fifth group, because the higher the number of inflammatory cells, the faster the healing process of the wound [32]. Also, the healing process has an inverse relationship with the number of multinucleated cells[32], which is consistent with the findings of this study and indicates the effectiveness of the extract used. After 14 days of treatment with white pomegranate seed extract and zinc oxide nanoparticles extract, The effects of wound healing were observed with a decrease in the wound surface and

an increase in contraction of 99 percent on the 14th day and 100 percent on the 21st day compared to the 7th day, which may be the response to the partial effect of tannins and polyphenols such as ellagic acid, Gallic and coumaric acid are present in the extract of white pomegranate seed [33]. In the macroscopic examination of the treated wounds of the fourth and fifth groups, the production of granule tissue and the contraction of the outer edge of the wound were evident. In the contracted wound, myofibroblast cells play an important role in closing the wound and bringing the edges of the wound closer [34]. The results show that wound treatment with white pomegranate seed extract and zinc oxide nanoparticle extract causes the arrangement of myofibroblast cells in the treated wound areas. These cells are highly active in matrix synthesis and show little organization at the edge of the wound [35-36]. Wound repair is a series of regular events that lead to the formation of the integrity of the injured tissue. Wound repair causes the damaged tissues to be protected from the invasion of pathogenic substances and causes for the restoration of the damaged tissue to be provided. Different phases are involved in wound healing, including inflammatory phases, tissue budding, fibroblastic tissue formation and proliferation, new blood vessel formation, wound consolidation, and epithelial tissue formation [37]. The wound healing process takes place through the use of plants and substances found in nature that contain compounds such as flavonoids, alkaloids, tannins, and other biomolecules. These factors often affect one or more phases of the repair process. Peel, pulp and seed, pomegranate peel has the highest antioxidant activity. There are many polyphenols in pomegranate peel, for example ellagic tannins, ellagic acid and gallic acid. They have been used in the preparation of recipes for food, cosmetics, tinctures and therapeutic drugs. The effectiveness of dried fruit skin in the treatment of respiratory and urinary tract infections and diarrhea has been reported. Cytotoxic activity, hepatoprotective activity and hypoglycemic activity have also been reported. Ethanol extract of pomegranate peel has an ameliorating effect against oxidative stress caused by chlorpyrifos-ethyl in rats. It also has a strong hepatoprotective action and suppresses oxidative kidney damage caused by iron nitrilotriacetate. Reactive oxygen species (ROS) damage cells and tissues, hence are detrimental to wound healing. ROS peroxidize lipids, inactivate enzymes and degrade DNA. Studies have shown that vitamin C and E are effective antioxidants to eliminate free radicals. The antioxidant and anti-inflammatory properties of pomegranate fruit, which can accelerate the wound healing process, can be attributed to some extent to these vitamins. In addition, tannins and polyphenols such as ellagic acid, gallic acid and coumaric acid are found in pomegranate fruit [20]. In addition, it should be said that this effect was identified as a significant increase in the rate of wound contraction and aggregation, an increase in the formation of epithelial tissue, and an increase in hydroxyproline [37]. In the present study, as it was mentioned, it was seen that the number of blood vessel intersections decreased in the experimental group, which is an ideal stage from the point of view of the process of reconstruction and organization of collagen in the wound site, which is probably due to the presence of flavin in the extract of pollen [37]. Free radicals produced in the damaged area cause damage in the repair process through damage to the cell membrane, nucleotides, proteins and lipids. Antioxidants such as yellow wood pigment, vitamin E, etc. have been mentioned, whose antioxidant properties have been proven in damaged tissues [39-38]. The subject of the use of antioxidants in wound healing and improvement The wound healing process has been proven [40-41]. Many plant extracts have antioxidant power. Flavonoids are the main

components of many plant extracts. Flavonoids are strong neutralizers against free radicals [42]. It has been proven that the antioxidant capacity of plant extracts is related to the presence of vitamins C and E, carotenoids and flavonoids [43]. Considering the effect of carotenoids in increasing the power of wound healing, it may be possible to know the wound healing activity of this seed in relation to carotenoids [44]. Wounds treated with flavones show an increase in glutathione, which is an oxidant, and ascorbic acid. It has been observed that the increase in the amount of these two in the site roughly improves the repair process [43]. Ascorbic acid has a confirmed role in collagen metabolism. In addition, ascorbic acid is a stimulus for collagen gene transcription, collagen mRNA levels and collagen production in cultured human fibroblasts [45]. Considering the absorption of mineral materials from the soil by plants such as manganese, iron, copper and zinc, their use in wound healing may be through the provision of necessary elements for the formation of enzymes. In fact, these elements are the catalysts for the synthesis of enzymes that are involved in the wound healing process[46].

In conclusion, the topical application of white pomegranate seed extract along with zinc oxide nanoparticles has a positive effect on the different stages of wound healing, so it may play a beneficial role in wound healing.

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## Bacterial pigments and its significance

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### ABSTRACT

Synthetic pigments have been widely used in various applications since the 1980s. However, the hyperallergenicity or carcinogenicity effects of synthetic dyes have led to the increased research on natural pigments. Among the natural resources, bacterial pigments are a good alternative to synthetic pigments because of their significant properties. Nontoxic nature of pigment produced by a number of microorganisms make them environmentally friendly for utilization in dye, foodstuff, pharmacy, cosmetics and other industrial purposes. Aims: Bacterial pigments are promising compounds in the prevention and treatment of various cancers. In the current study, the antioxidant, cytotoxic and antimicrobial effects of a red pigment obtained from a marine bacterial strain were investigated. Methods and Results: Optimization of the pigment production by the marine strain was conducted using the one-factor-at-a-time approach. Chemical identification of the pigment was achieved by UV-visible, FTIR and HPLC analyses. The biological activities of the pigment were evaluated by DPPH, MTT and microbroth dilution assays. The strain was identified as *Arthrobacter*, and its pigment was related to carotenoids. The EC<sub>50</sub> antioxidant activity of the pigment was evaluated as 4/5 mg ml<sup>-1</sup>. It showed moderate anticancer effects on an oesophageal cancer cell line, KYSE30, while no inhibition was observed on normal HDF (human dermal fibroblasts) cells. The pigment had no antibacterial effects on the four tested strains. Conclusion: The antitumour activity of a carotenoid-related pigment from *Arthrobacter* sp. was reported for the first time. Significance and Impact of the Study: Marine environments are interesting sources for the identification of novel bioproducts. The identification of carotenoid pigments from marine bacteria with remarkable antioxidant and anticancer activities would result in better insights into the potential pharmaceutical applications of carotenoids and marine environments.

**Keywords:** Bacterial pigments, microorganism, antimicrobial activities, biocolorants.

## 2. INTRODUCTION

The new found awareness in human safety and environmental conservation has kindled fresh enthusiasm for natural sources of colors. Natural colorants or dyes derived from flora and fauna are believed to be safe because of non-toxic, non-carcinogenic and biodegradable in nature [1]. Traditional sources of colorants include natural products such as flavonoids and anthraquinones produced by plants and animals. For example, carminic acid, a deep red anthraquinone produced by scale insects is now used as a pigment in paints, crimson ink, cosmetics and food colors [2]. As the present trend throughout the world is shifting towards the use of eco friendly and biodegradable commodities, the demand for natural colorants is

increasing day by day. Natural pigments are sourced from ores, insects, plants and microbes. Among microbes, bacteria have immense potential to produce diverse bioproducts and one such bioproduct is pigments. The production and application of bacterial pigments as natural colorants has been investigated by various researchers [3–5]. Bacterial pigment production is now one of the emerging fields of research to demonstrate its potential for various industrial applications [4]. Most of the bacterial pigment production is still at the R&D stage. Hence, work on the bacterial pigments should be intensified especially in finding cheap and suitable growth medium which can reduce the cost and increase its applicability for industrial production [5]. There are many studies in the literature on bacterial pigments which focus production and application of specified pigment in each case. A comprehensive material of such studies on bacterial pigments is rare in literature. So, based on accumulated data in the literature and with an intention to encourage researchers and stake holders alike to explore and exploit this overflowing source of bacterial pigments.

### 1.1 history of pigments

Dyeing was known as early as in the Indus Valley period (2600–1900 BC); this knowledge has been substantiated by findings of colored garments of cloth and traces of madder dye in the ruins of the Indus Valley Civilization at Mohenjodaro and Harappa. So, natural dyes, dyestuff and dyeing are as old as textiles themselves. Man has always been interested in colors; the art of dyeing has a long past and many of the dyes go back into prehistory. It was practiced during the Bronze Age in Europe. The earliest written record of the use of natural dyes was found in China dated 2600 BC [6]. Primitive dyeing techniques included sticking plants to fabric or rubbing crushed pigments into cloth. The methods became more sophisticated with time and techniques using natural dyes from crushed fruits, berries and other plants, which were boiled into the fabric and which gave light and water fastness (resistance), were developed. The cochineal dye was used by the people of Aztec and Maya culture period of Central and North America. By the 4th century AD, dyes such as woad, madder, weld, Brazil wood, indigo and a dark reddish-purple were known [7]. Henna was used even before 2500 BC, while saffron is mentioned in the Bible [8]. Use of natural pigments in food is known from Japan in the shosoin text of the Nara period (8th century) which contains references to colored soybean and adzuki-bean cakes, so it appears that colored processed foods had been taken at least by people of some sections. Thus, studies on natural pigments are greatly impelled by their multiple functions [9]. The art of coloring spread widely with the advancement of civilization [10]. Before the advent of synthetic pigments, natural pigments were the only source of color available and were widely used and traded, providing a major source of wealth creation around the globe. It has been used for many purposes such as the coloring of natural fibers (wool, cotton, silk), fur and leather. They were also used to color cosmetic products and to produce inks, watercolors and artist's paints [1]. Since the introduction of synthetic dyes by Perkin in 1856, many convenient and cheap synthetic pigments have appeared, and the use of natural dyes has decreased due to the relatively cheaper synthetic pigments [11]. Over the course of the 20th century, naturally occurring organic pigments have been almost completely displaced by synthetic molecules such as phthalocyanines that range from blue to green, arylides that are yellow to greenish or reddish-yellow and quinacridones ranging from orange to violet [12]. Advances in organic chemistry enabled mass production of these compounds relatively cheaper thereby allowing them to displace natural product pigments, whose procurement is often more challenging. Current applications of synthetic pigments are in the



textile industry, leather tanning industry, paper production, food technology, agricultural research, light-harvesting arrays, photo electrochemical cells and in hair colorings.

### 3. Biopigments types, classification and properties

Colors are present in the nature. Microorganisms such as fungi, yeasts and bacteria produce a vast variety of biopigments such as carotenoids, melanins, flavins, quinones, monascins, violacein or indigo [13]. According to Delgado-Vargas et al. (2000), natural pigments can be classified as follows based on their structural characteristics:

- Tetrapyrrole derivatives: chlorophylls and heme colors.
- Isoprenoid derivatives: carotenoids and iridoids.
- N-heterocyclic compounds different from tetrapyrroles: pterins, purines, flavins, phenoxazines, phenazines and betalains.
- Benzopyran derivatives (oxygenated heterocyclic substances): anthocyanins and alternative flavonoid pigments.
- Quinones: benzoquinone, naphthoquinone, anthraquinone.
- Melanins.

Tetrapyrrole derivatives have pyrrole rings in linear or cyclic arrays. Pyrrole is a colorless liquid substance, soluble in alcohol, ether, diluted acids and also in most organic chemicals (National Center for Biotechnology Information, 2018a). Chlorophyll structure contains a hydrocarbon tail connected to chlorin, an aromatic ring with tetrapyrrole. The magnesium ion in the center is bound to four pyrrole rings.

Chlorophyll is a green pigment found in most algae, plants and cyanobacteria. Chen et al. (2012) reported that chlorophyll a, d and f are present in cyanobacteria. It is a flammable liquid with antitumor properties, antioxidant activities [14] and its derivatives have been found effective against dengue vectors [15].

In general, carotenoids have eight isoprenoid units whose order is inverted at the molecule center. All carotenoids can be considered as lycopene (C<sub>40</sub>H<sub>56</sub>) derivatives by reactions adding or removing hydrogen, inserting oxygen, of cyclization, of double bond or methyl migration, of chain elongation and shortening [16]. Lycopene is a solid red bright pigment, used to add color in food and to stabilize flavor formulation (NCBI, 2018c), with antioxidant, anti-inflammatory, and neuroprotective properties [17]. *b*-Carotene can be a red, brownish-red or purple-violet crystal or powder, depending on the solvent used for extraction and conditions of crystallization. Carotenoids are soluble in benzene, chloroform, carbon disulfide and moderately soluble in ether, petroleum ether and oils. *B* Carotene is approved by U.S. Food and Drug Association to be used as a nutrient supplement and as a source of vitamin A. Direct exposure of carotenoids can cause eye and skin irritation and harmful to aquatic life with long lasting effects (NCBI, 2018d). In flavins, a pteridine and a benzene ring are condensed. Riboflavin, or vitamin B<sub>2</sub>, is the main molecule of this group, produced by all live cells of microorganisms and plants shortening [18]. It is a solid orange-yellow pigment, soluble in water, sodium chloride solution and dilute alkali solution [19]. Based on the structure, they can be divided into the yellow betaxanthins (480 nm) and red-purple betacyanins (540 nm) and their color is due to the resonating double bonds (NCBI, 2018f). Betalains present

antioxidant, antiradical, antimicrobial and neuroprotective properties [17]. Among the flavonoids, the anthocyanins are the most relevant pigments. Chemically, they have 15 carbons with a chrome ring bearing a second aromatic ring B in position 2 (C6-C3-C6) and with sugar molecules bonded at different hydroxylated positions of the primary structure, which gives to them several possibilities of combinations and production of colors. They possess antimicrobial and antioxidant activities and can reduce the risk of cancer and heart disease shortening [15].

Melanins are nitrogenous polymeric compounds with the indole ring as monomer. In general, melanins are a mixture of macromolecules, characterized by molecular irregularity, photoconductivity and insolubility at most used solvents [18]. Allomelanins have been described in spores and fungi shortening.

#### 4. Types of bacterial pigment

**Carotenoids:** Carotenoids are one of the main natural pigments found widely in plant and microorganisms. These pigments are lipid soluble, occurs in yellow-orange-red color and belongs to the isoprenoid polyenes [19]. In bacteria, carotenoid may play a role in the modulation of membrane fluidity to survive under low temperature conditions. Carotenoid also provides protection to bacterial cells by absorbing or screening UV radiation [3]. Canthaxanthin is a carotenoid with orange-pink color and was first isolated from *Micrococcus roseus* [1] while echinenone, an orange carotenoid also obtained from the same bacteria was later identified in 1970 [2]. Besides that, an extremely halophilic bacteria, *Haloferax alexandrinus* and a photosynthetic bacterium, *Bradyrhizobium* sp. also can produce dark-red canthaxanthin. Astaxanthin, a red or oxygenated carotenoid [13], is one of the most abundant marine pigment and cannot be synthesized by animals. It is a naturally lipid-soluble pigment that is mostly found in marine water bacteria such as *Halobacterium* sp., *Brevundimonas* sp. Strain SD212, *Paracoccus* species, *Micrococcus* sp. strain PAH83, *Altererythrobacter ishigakiensis*, and *Sphingomicrobium astaxanthinifaciens*. However, astaxanthin was also obtained in non-marine bacteria such as *Sphingomonas* sp. from cold storage. Staphyloxanthin, an orange membrane-bound carotenoid found in *Staphylococcus aureus* gives gold color to cells and acts as a virulence factor for the bacteria itself [34]. *Xanthomonas oryzae* pv. *Oryzae* is a causal agent of a rice plant disease called bacterial leaf blight, and produces yellow membrane bound and brominated aryl-polyene pigments [15]. However, the presence of a unique class of carotenoids known as xanthomonadins has led them to be used as diagnostics. Flexirubin, first isolated in 1974 from an aerobic Gram-negative gliding bacterium, *Chitinophaga filiformis* (previously known as *Flexibacter elegans*) is a unique type of bacterial pigment with terminal alkyl substitution consisting of  $\omega$ - phenyl octaenic acid chromophore esterified with resorcinol [16]. Flexirubin has a restricted distribution among bacteria and has been used as chemotaxonomic markers for the Bacteroidetes phylum, previously called the Cytophaga-Flavobacterium-Bacteroides group [17].

**Prodigiosin:** Prodigiosin is a linear tripyrrole and a red pigment secondary metabolite. It was first extracted from *Serratia marcescens* [18]. It is sensitive to light and insoluble in water, but soluble in alcohol and ether such as methanol, chloroform and acetonitrile [19]. In nature, prodigiosin is produced only in the later stages of bacterial growth [20]. Prodigiosin is produced in Gram negative bacteria such as *Pseudomonas magnesorubra*, *Serratia rubidaea*, *Alteromonas rubra*, *Vibrio gazogenes*, *Zooshikella rubidus*, and *Hahella chejuensis*. Some actinobacteria producing prodigiosin include *Streptomyces griseoviridi*, *Streptomyces* sp.

JS520, and *Streptovorticillium rubrircetuli*. Prodigiosin has no defined role in the physiology of producing strains [21] but have been reported to have different in vitro bioactivities.

**Melanin:** Melanin are dark colored natural pigments, formed due to polymerized phenolic and/or indolic compounds [11]. Melanin can be classified into three classes based on color and structure (i) eumelanins (black brown), (ii) pheomelanins (red or yellow) and (iii) allomelanins (dark brown to black). This pigment is found widely dispersed in animals, plants and microorganisms. Research on melanin producing bacteria has been reported and some examples include *Vibrio cholerae* and *Shewanella colwelliana*, where they produce pyomelanin due to the catabolism of tyrosine via the tyrosine degradation pathway. Marine bacteria such as *Aeromonas salmonicida* and *Alteromonas nigrifaciens* produces melanin in vivo with the help of the tyrosine precursor [22]. Moreover, Proteobacteria such as *Marinomonas mediterranea* and Actinobacteria such as *Streptomyces kathirae* and *Streptomyces lusitanus* DMZ-3 were also able to produce melanin. In *V. cholera*, melanin is induced in response to environmental conditions [23]. Naturally, melanin is not considered essential for growth and development of some microorganisms but are required to enhance their ability to compete and survive in unfavorable environmental conditions [21]. Melanin acts as a protective agent against thermal, desiccation, hyperosmotic shock, chemicals (oxidizing agents and heavy metals), and cell damage by solar UV radiation [19]. Moreover, in some pathogenic bacteria, melanisation becomes a virulence factor since melanin protects bacterial cells from defense mechanism in the infected host [18].

**Violacein:** Violacein is a water-insoluble violet or purple pigment found in *Chromobacterium violaceum*, first isolated from the Amazon River in Brazil [24]. Various studies have shown that violacein possesses different bio-activities such as antimicrobial, anticancer, antiviral and anti-ulcerogenic activities. It has also become a useful indicator of quorum sensing due to its ease of visualization [21]. In nature, violacein might be responsible for protection against UV radiation [22]. **Pyocyanin:** In nature, the human pathogen *Pseudomonas aeruginosa* can be found in terrestrial and aquatic environments, and it can cause serious infection. The most characteristic feature of *P. aeruginosa* is the production of the soluble pigment known as pyocyanin [20]. Pyocyanin is a blue green pigment and is composed of two subunits of N-methyl-1-hydroxyphenazine [21]. Studies have revealed that phenazines contributes to the virulence of *P. aeruginosa* and pyocyanin is the main phenazine produced by *P. aeruginosa* and has been shown to contribute to the unusual persistence of *P. aeruginosa* infections [22]. Even though *P. aeruginosa* is well known for its association with chronic infections in cystic fibrosis and wound infections due to burns, *P. aeruginosa* also can produce pigments with useful bio-activities. As mentioned earlier, besides as coloring agents, pigments have also been reported to possess various biological properties. Therefore, the following sections will focus on the studies and research done on therapeutic applications of bacterial pigments.

## 5. Materials and methods

### Isolation and identification of pigmented bacterium

Samples were obtained from 15 m depth of the Caspian Sea (36.46°N 51.02°E). They were aseptically pooled and diluted up to  $10^{-5}$ , and inoculated on the artificial sea water (ASW) agar medium containing (g l<sup>-1</sup>): NaCl 10, MgSO<sub>4</sub> 0.52, FeSO<sub>4</sub> 0.01, MgCl<sub>2</sub>.6H<sub>2</sub>O 0.19, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> 0.98, CaCl<sub>2</sub>.2H<sub>2</sub>O

0.19, KCl, 0.15, peptone 10, yeast extract 5, glucose 2 and agar 15 (Stafsnes et al. 2010). The pH was adjusted to 8, and the plates were kept at 20°C for at least 1 month. A red-pigmented bacterium designated as strain G20 was obtained in the isolation procedure. The extraction of genomic DNA, PCR amplification of 16S rRNA and phylogenetic analysis were carried out as described later (Makhdoumi et al. 2015).

## 6. Preparation of the pigment extract

The bacterial cells were grown in the ASW broth medium in a 1000-ml Erlenmeyer flask and kept in a shaker incubator (150 rpm and 20°C) until the culture medium turned red. The bacterial cells were harvested following centrifugation at 4000 rpm for 20 min. The cell pellets were extracted with 95% (v/v) methanol until the pellets became colourless. The methanolic extract was collected and evaporated under reduced pressure below 40°C in a rotary evaporator (Heidolph, Germany), and then it was freeze-dried (Freeze dryer, Christ Alpha 1.2 LD Plus, Germany). Thin layer chromatography (TLC) was developed using silica plates (Merck, Darmstadt, Germany). The concentrated pigment was dissolved in a methanol solution, spotted on a silica gel sheet and developed with a mobile phase of ethanol: Diethyl ether (1:4 v/v) at room temperature in the dark. For preliminary chemical characterization, the UV-visible spectrum of the pigment was recorded between 200 and 800 nm, using methanol as a blank. High-performance liquid chromatography (HPLC) system (Waters, Milford, MA, USA) consisting of a 1525 binary pump and a 2489 UV/vis detector set at 440 nm, was used. Separation was conducted on an InertSustainSwift C18 column (150 mm length, 46-mm internal diameter and 5-  $\mu$ m particle size) and the data were analysed with the Breeze 2 software (Waters). Linear gradient elution chromatography was done using solvent systems A (methanol) and B (water) at ambient temperature. The gradient program used was as follows: initial, A–B (20:80, v/v), and 0– 60 min, linear change to A–B (80:20, v/v) at 1% methanol/min gradient speed. The flow rate was kept constant at 1 ml min<sup>-1</sup>, and 20  $\mu$ l of the methanol-water (50%, v/v) extract of pure pigment was applied. Crocin—a wellknown plant carotenoid—was used as the reference pigment. Fourier transform infrared spectroscopy (FTIR) was measured in cuvettes with windows of calcium florid. The transformed spectres were background-corrected for the solvent (Aust et al. 2003).

## 7. Enhancing pigment production

To increase the pigment production, amounts of different factors including the carbon source (1% w/v of glucose, fructose, maltose and starch), temperature (10–40°C), pH (6–9) and incubation time (0–120 h) were varied one at a time in an ASW basal broth medium (20°C, pH 8). Each subsequent factor was examined after taking into account the previously optimized factor(s). In each experiment, the absorbance of methanolic extract was measured at 490 nm, and the bacterial growth was determined by the measurement of the absorbance at 600 nm (Shimadzu, Japan).

## 8. Antioxidant activity

The antioxidant capacity of the pigment was studied following a method described by Blois (1958). Briefly, twofold serial dilutions of the pigment prepared in dimethyl sulfoxide were added to a 0.1 mM DPPH (1,1-diphenyl2-picrylhydrazyl) (Sigma, USA) methanolic solution, and then left in darkness at 30°C for 30 min. The absorbance of the resulting solutions was measured colorimetrically at 517 nm. A sample containing only the solvent and the DPPH without the pigment was used as a control. The scavenging effect on the DPPH was determined as follows:

$$\text{DPPH scavenging effect (\%)} = [(A_0 - A_1) / A_0] \times 100$$

where  $A_0$  was the absorbance of the control reaction and  $A_1$  was the absorbance in the presence of the pigment extract.

## 9. Cytotoxic activity

### Cell lines and cell culture

KYSE-30 (a human oesophageal squamous carcinoma cell line) cells were obtained from the Pasteur Institute (Tehran, Iran) and cultured in the Roswell Park Memorial Institute medium (RPMI 1640, Gibco, Scotland) with 10% fetal bovine serum (FBS, Gibco, Scotland). Human dermal fibroblasts cells as a gift from the Royan Institute (Tehran, Iran) were maintained in Dulbecco's modified Eagle's medium (DMEM, Gibco, Scotland) and enriched with fetal bovine serum (FBS, Gibco, Scotland). Both cell lines were grown at 37°C in a humidified atmosphere of 5% CO<sub>2</sub> in the air. Cell viability assay Cell viability was determined by the MTT [3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] assay (Mosmann 1983). For this, 4000 KYSE30 cells and 8000 HDF cells were incubated in 96-well plates, in the absence (control) or presence (test) of various concentrations of the pigment in a final volume of 200  $\mu$ l for 24, 48 and 72 h. A total of 20  $\mu$ l of MTT (diluted in PBS) was added to each well, and after 4 h of incubation, the precipitated purple MTT formazan crystals were dissolved in 150  $\mu$ l DMSO, and the absorbance was recorded at 540 nm (Stat Fax, America). The cell viability was measured by the following formula (Maheswarappa et al. 2013):

$$\text{Viability} = [(A_T/A_C) \times 100]$$

where AC was the absorbance of the control reaction and AT was the absorbance in the presence of the pigment extract. Treated and control cells were observed under a light inverted microscope (Olympus, Japan) for monitoring the morphological changes after 24, 48 and 72 h.

## 10. Antibacterial activity

The effects of the pigment on the growth of the selected microbial strains were evaluated in a liquid Mueller Hinton medium using the microbroth serial dilution approach (Kim et al. 2007). *Staphylococcus aureus* (PTCC1431), *Bacillus subtilis* (PTCC1023), *Pseudomonas aeruginosa* (PTCC1074) and *Escherichia coli* (PTCC 1330) were selected as reference strains. Microbial growth was determined by measuring the turbidity at 600 nm.

## 11. Data analysis

All quantitative experiments were repeated at least three times. The data analysis was conducted using GraphPad Prism version 6.0 and the IC<sub>50</sub> and EC<sub>50</sub> values were obtained from nonlinear regression (Mosaddik et al. 2004; Deng et al. 2013).

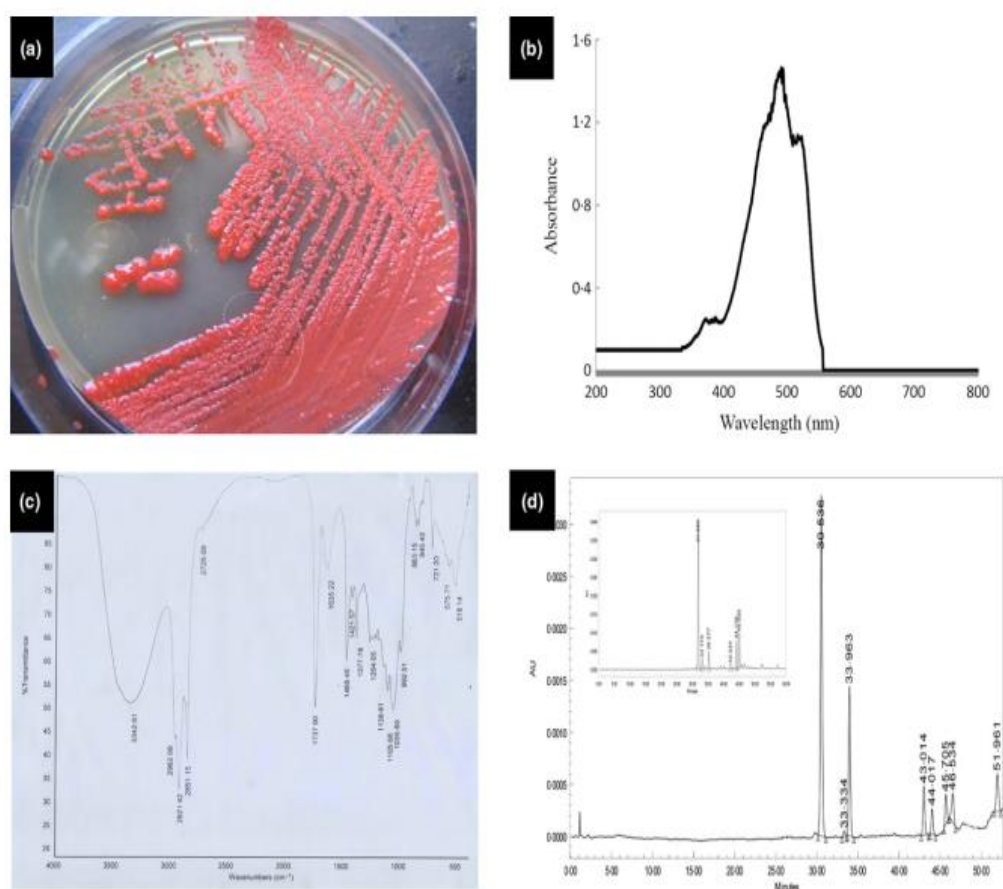
## 12. Results

### 11.1 Isolation and identification of pigmented bacterium

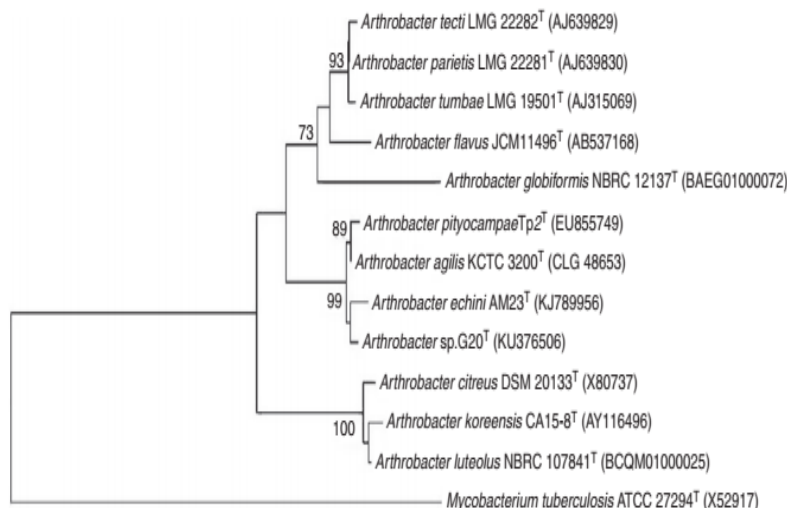
Strain G20 was obtained from 15 m depth of Caspian Sea coastal water. The novel strain was Gram-negative, nonmotile and rod shaped. The cells of strain G20 formed convex and round colonies with an entire edge on the solid ASW medium after 2 days (Fig. 1a). The preliminary chemical characterization of the pigment extract is presented in Fig. 1b–d. As seen in Fig. 1b, the UV–Vis spectrum of pigment showed the maximum absorption at 491 nm, which is in the range of reports for various carotenoids (Sutthiwong et al. 2014). The FTIR spectrum for pigment (Fig. 1c) showed characteristic absorption frequencies of the carbonyl group at



1737  $\text{cm}^{-1}$ , alkene group at 1635  $\text{cm}^{-1}$ , aromatic ether group at 1264  $\text{cm}^{-1}$ ,  $\text{CH}_2$  (bending) at 1466  $\text{cm}^{-1}$ , mono-substituted benzene group at 721  $\text{cm}^{-1}$  and the hydroxyl group at 3000  $\text{cm}^{-1}$ . Further signals were identified as  $\text{CH}_3/\text{CH}_2$  stretch vibrations at 2962  $\text{cm}^{-1}$  and 2851  $\text{cm}^{-1}$ . The IR spectrum of the pigment extract is similar to the spectrum of purified lycopene (Aghel et al. 2007). Comparing the HPLC chromatogram of the novel pigment solution with the chromatogram of the crocin solution (Fig. 1d) showed the major peak at the retention time of 30.536 min, followed three minutes later by a smaller but marked peak, which is comparable with crocin, a plant carotenoid that is found in the flowers of *Crocus* and *Gardenia*. Phylogenetic analysis based on the 16S rRNA gene sequence revealed that strain G20 is a member of the genus *Arthrobacter* (Fig. 2). The closest relatives of strain G20 were *Arthrobacter echini* AM23<sup>T</sup>, *Arthrobacter agilis* KCTC 3200<sup>T</sup> and *Arthrobacter pityocampae* Tp2<sup>T</sup> with a gene sequence similarities of 99.4%.



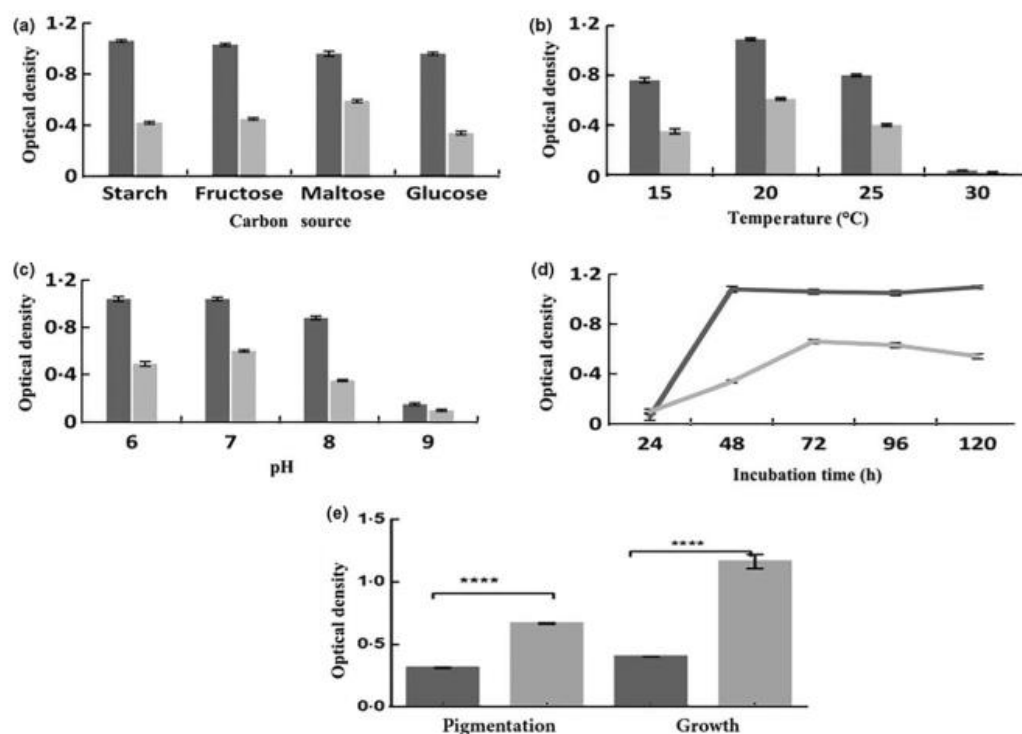
**Fig 1.** Some characteristics of the novel pigment. (a) Pure culture of pigment producing *Arthrobacter* sp. G20 grown on ASW medium. (b) UV/vis spectrum of pigment. (c) FTIR spectrum of methanolic extract. (d) HPLC analysis of novel pigment in comparison to crocin (top-left corner). [Colour figure can be viewed at [wileyonlinelibrary.com/](http://wileyonlinelibrary.com/)]



**Fig 2.** Neighbour-joining phylogenetic tree based on 16S rRNA gene sequences, showing of the novel strain and other identified *Arthrobacter*.

### 11.2 Enhancing pigment production by one-factor-at-a-time approach

The effects of various levels of selected factors including a carbon source, temperature, pH and incubation time on the bacterial growth and pigmentation are presented in Fig. 3a–d. The bacterial growth was not affected ( $P < 0.05$ ) by a range of carbon source (mono-, di- and polysaccharides). However, most of the pigment production was observed in the media supplemented by maltose. As observed in Fig. 2d, the pigment production does not coincide with the bacterial growth, and the highest concentration of the pigment was obtained at the stationary phase. The alkaline condition strongly reduced the bacterial growth and pigmentation, and the highest amount of pigment production was observed at a pH around 7. The strain was psychrophile, and it could not grow over 30°C. The maximum amounts of bacterial growth and pigmentation were achieved at 20°C. Optimization procedure (carbon source, maltose; temperature, 20°C; pH, 7; and incubation time, 72 h) resulted in 2.7 and 2.1 times increased bacterial growth and pigmentation (Fig. 3e) and yielded 0.84 g l<sup>-1</sup> of pigment production.



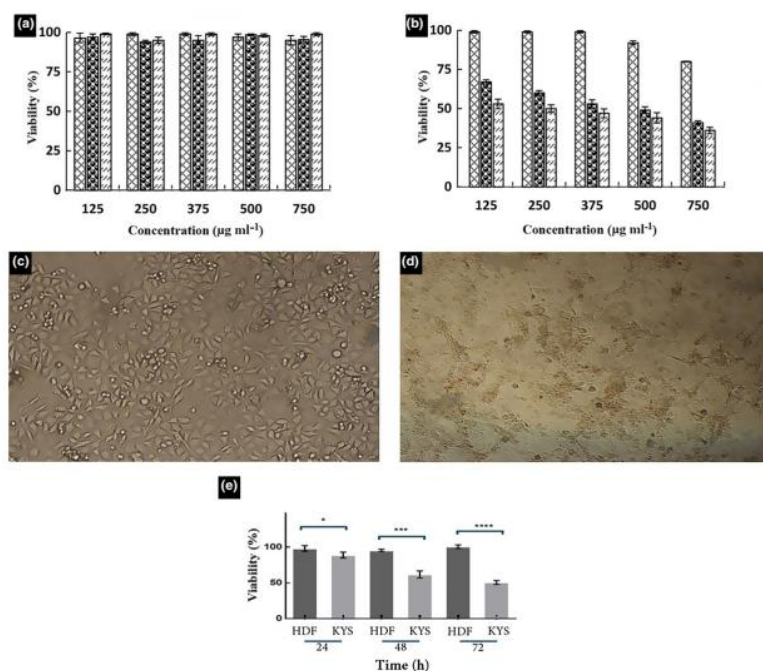
**Fig 3.** Effects of different factors on the growth (dark grey) and pigment production (light grey) by *Arthrobacter* sp. G20. (a) Carbon source (20°C, pH = 8); (b) temperature (pH = 8); (c) initial pH and (d) incubation time. (e) Comparison of pigment production and bacterial growth before (dark grey) and after (light grey) optimization. \*\*\*\*P < 0.0001 (un-pair ANOVA with Tukey post hoc test).

### 11.3 Antioxidant activity

The novel carotenoid pigment has the ability to act as an antioxidant, and its EC<sub>50</sub> scavenging activity of DPPH was equal to 4.5 mg ml<sup>-1</sup>. This amount is comparable to well-known antioxidants like  $\beta$ -carotene and  $\alpha$ -tocopherol, for which the EC<sub>50</sub> scavenging capacities are reported as 3.5 and 1.5 mg ml<sup>-1</sup> respectively (CorreaLlant.en et al. 2012).

### 11.4 Cytotoxic activity

As revealed by the MTT assay, the pigment extract had no detectable effects on the viability of the normal HDF cells (Fig. 4a,e) while it showed a moderate antitumour effect on the oesophageal cancer cells (Fig. 4b,e). The IC<sub>50</sub> values of the pigment on the KYSE30 cells were calculated as ( $\mu$ g ml<sup>-1</sup>) 1321, 668 and 366 after 24, 48 and 72 h respectively. Microscopic observation revealed that after treatment with the pigment, cells turned to round shapes in comparison with control cells (Fig. 4c,d).



**Fig 4.** Effect of red pigment on cell viability and morphology. (a) Effect on normal HDF cell viability after 24 (diamond), 48 (sphere) and 72 (diagonal) h. (b) Effect on cancerous KYSE30 cell viability after 24 (diamond), 48 (sphere) and 72 (diagonal) h. (c) Light microscopic images of nontreated KYSE30 cells. (d) Light microscopic images of treated KYSE30 cells with pigment (750 µg/ml) after 72 h. (e) Comparison the viability of HDF (dark grey) and KYS30 (light grey) cells after treatment by pigment extract. \*P < 0.05, \*\*\*P < 0.001, \*\*\*\*P < 0.0001 (unpaired t-test). [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

### 11.5 Antibacterial effects

The novel carotenoid-related pigment obtained in the current study did not display significant antibacterial activity. Only a weak activity against *E. coli* was observed at a high pigment concentration (MIC<sub>50</sub> equal to 25 mg ml<sup>-1</sup>) (Data not shown).

## 13. Discussion

In this study, the biological activities of a novel pigment obtained from the marine *Arthrobacter* sp. were investigated. Based on the chemical characterization and compared to other known pigments, it was suggested as a member of carotenoids. The genus *Arthrobacter*, which was first introduced by Conn and Dimmick (Conn and Dimmick 1947) is phenotypically heterogeneous, and its 89 species (Parte 2013) have been isolated from various sources such as soil, fresh water, fermented food, clinical specimens, paintings, air, ocean sediment, etc. Except for some species like *A. scleromae*, *A. histidinolovorans* and *A. albus*, the bacteria of this genus produce pigments with a great variety of hues and structures (Huang et al. 2005). Riboflavin (yellow), indigoidine (blue), indochrome (blue) and porphyrins (red) are examples of various structures observed in this genus (Sutthiwong et al. 2014). *A. roseus* and *A. agilis* are two *Arthrobacter* species isolated from cold environments, which contain red carotenoid pigments (Reddy et al. 2000, 2002). It was stated that pigmentation is responsible for the cold adaptation

of these psychrotrophic bacteria through cell membrane stabilization and radiation protection (Chattopadhyay and Jagannadham 2001). Although carotenoid production is demonstrated in this genus, there are no reports so far about the biological activities of carotenoids obtained from *Arthrobacter* spp. As regards the enhancement of the pigment production by optimization of the culture condition, maltose was the most suitable carbon source in comparison to glucose and starch. As reported previously psychrophilic *Arthrobacter*, unlike mesophilic ones, could not hydrolase starch (Reddy et al. 2000), which explains why starch is not a suitable carbon source for pigment production by this psychrophilic strain. Our results indicated that more complex carbon sources (like maltose) are more desirable than simple monosaccharide (glucose and fructose) for the production of this secondary metabolite. As Fong et al. (2001) stated, carotenoid production is an adaptation strategy of psychrophilic bacteria to decreasing growth temperatures. We also observed the best bacterial growth at 20°C and the best pigment production yield (ratio of pigment production to biomass) at 15°C. Free radicals—which contain a single unpaired electron in their molecular structures—are generated in the human body for various endo/exogenous reasons. These molecules adversely alter cellular lipids, proteins and DNA, and trigger a number of human diseases like cancers. Antioxidants like carotenoids are compounds that donate an electron to rampaging free radicals and neutralize them. Therefore, they are well-known as preventing agents for cancers and other diseases in the pharmaceutical and food industries. The antioxidant capacity of our novel pigment is comparable to well-known antioxidants like  $\beta$ -carotene and  $\alpha$ -tocopherol. These data suggest that *Arthrobacter* spp. are interesting sources for the bacterial-based antioxidant production. There are remarkable reports about the role of antioxidants in lowering the risk of a variety of cancers. However, some scientists have argued about their role in cancer treatment. This is because of the fact that tumour development is accompanied by decreasing the intracellular reactive oxygen species (ROS). In cancerous cells, ROS acts as an apoptosis-promoting agent and the excess of antioxidants can block these cancer-preventive mechanisms and develop cancer (Salganik 2001). Recently Schoenfeld et al. (2017), demonstrated that the alterations of redox-active iron metabolisms in cancer cells in comparison to normal cells are responsible for the specific activity of ascorbic acid (antioxidant agent) against nonsmall-cell lung cancer (NSCLC) and glioblastoma (GBM) cells. It is understood from this example that an excess of antioxidants can also kill cancer cells but by using a different mechanism. There are some other reports that indicated that carotenoids harbour both anticancer and antioxidant activity, and could promote the apoptosis cascade and kill the tumour cells (Chen et al. 2015). For instance, Lycopene suppresses the development of gastric cancer (Velmurugan et al. 2005) and induces apoptosis in smoke-induced lung cancer (Seren et al. 2008). In the current study, we observed that the treated cancerous cells were rounded, which is a morphological characteristic of apoptotic cells. However, the exact mechanism of its action remains to be clarified. The tested pigment did not show remarkable antibacterial activity. There are no uniform reports about the antibacterial activity of carotenoids. The differences in their activities may be attributed to the various pigment formulas, as well as different bacterial cell structures. Some pigments could inhibit the growth of bacteria like *Bacillus cereus* (Al-Abd et al. 2015), but others did not affect *B. subtilis* (Keceli et al. 2013) and *Salmonella typhimurium* (Al-Abd et al. 2015). While the pigment did not have a direct antibacterial effect, the possibility that a carotenoid such as this could enhance immune responses of a host organism is entirely consistent with the work of Pechinskii and Kuregyan (2014). In conclusion, a novel marine and cold adaptive *Arthrobacter* sp. was isolated from the Caspian Sea. This strain produced a nonwater-soluble red pigment.



The chemical characterization of the pigment suggested that it belongs to carotenoids. The pigment showed remarkable antioxidant activity. The specific antiproliferating effect against a KYSE30 cancerous cell line in comparison with normal HDF cells was observed. This is the first report on the pharmaceutical potential of carotenoid pigments from *Arthrobacter* spp. However, further studies are required to determine the structure and the exact mechanisms involved in the function of this pigment.

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## Tment ofvaroius An overview of the use of nanoparticles in the trea urinary infections

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### **Abstract**

Nanoparticles have many advantages based on which these particles can be used to design and develop different drug delivery systems . Examples of these systems are the management Urinary tract infections are one of the most common Common . of urinary tract infections infections in patients More in sections different It is a hospital . Many of these infections have Various metal, silica, composite, organic and green . become resistant to antibiotics nanoparticles have been investigated in various studies to control urinary infections and have shown significant effects . The current research is a review article written based on authentic articles published from1999 to 2023 in the field of using nanoparticles to control and treat urinary tract infections . The database for this article is Sciencedirect ,PubMed andGoogle scholar .

**Keywords:** nanoparticles, urinary infection, silica

### **1.Introduction**

Nano technology can be defined as a term for all advanced technologies in the field of working with nano scales , which are increasingly used worldwide . Nanoparticles have many special chemical and physical properties in terms of size , shape and high surface - to - volume ratio , which are the characteristics of its use . made them suitable in many medical and biological cases Is. In some cases , their size is smaller or at the level of cellular and protein structures . It is a gene that has the ability to make a suitable replacement be for antibiotics[ 1 ] Nano technology to a great extent in treating wounds and reducing microbial infections And . also to prevent the accumulation of bacteria on the surface of various tools such as prostheses . has been used[ 2 ] .

Gram - negative intestinal bacilli are the most common bacteria that cause urinary tract . infections , followed by gram - positive cocci] 3 [ Considering the prevalence of various . types of urinary tract infections in society and the continuous and occasional consumption antibiotics for treatment , it seems that the occurrence of antibiotic resistance of urinary pathogens It is a bad thing in every society] 4 [ Therefore, it is necessary to use new treatment . methods for such infections . Nanoparticles can be a solution to this problem

## Urinary tract infection<sup>2</sup>.

Patients with non-infectious diseases such as cancer, heart disease and other chronic diseases who have to stay in the hospital for a long time are at a high risk of contracting nosocomial infections [5]. According to reports, 10% of hospital patients get this infection during hospitalization [6].

One of the infections common and important in the world is urinary tract infection. The age of urinary tract infection is 150 million every year. People like this in the whole world are sick. They will also. This infection is one of the most common. There are infections. Mr. Aj'an b Patients and patients. More in sections different. It is a hospital. One of the people of the nation. Bacteria. It is important to create bacterial urinary tract infection in humans. *Ashreeshia Klay* is which is observed in all ages. It will be [7]. This bacillus bacterium. Voluntary anesthesia and the fluorine component. Intestinal abnormalities. Humans and it is an animal. Most of the infections. The result of bacteria *Ashishya Klay* in humans as per Opportunistic happens [8]. The main cause of infection. Urine of uropathogenic strains of *Escherichia coli* are. Who About 80 percent of them. They create infections [9]. This is one of the challenges important in prevention, in us and control of infectious diseases (such as urinary tract infection) as well as a threat to the general health of people. It is resistant to antibiotics [10].

Normally in our country. Urinary tract infections. The basis of using Anti Biotics. It is different that. Among them are penicillins, Cephalosporins, He mentioned fluoroquinolones and the work of panems. Its increase. Magha and Matanati. Biotics and organization. Buildings biofilm. Payed Ar. Causing neutralization in anti-mans biotic. Common in our country. D-stagah infection. Urine is caused by bacteria such as *Pseudomonas aeruginosa* [11]. Accordingly, studies. On A to find Awa Maal against Meeker and B new Besiya R. It is important. One of the most important things. Matar H E. An anti substitute. Biotics. Peptides against. They are micro and B and nanoparticles [12].

## 3 .UNanoparticles and urinary infection treatment

Many scientists have ignored it that the age of nanotechnology. It is different from science and is a combination of engineering, biology, chemistry, medicine and chemical physics [13]. Studies show that with the smaller size of nanoparticles, new and more different properties and activities can be seen in it [14]. Nanoparticles have been discussed in the past in two sections, metallic and non-metallic [15]. Metal nanoparticles have been used in insecticides and bactericides for many years [16]. Some other nanoparticles that are considered as an emerging method in the pursuit of modern pharmaceutical science and because of the high potential to carry out specific treatment processes in biomedical studies. Science and pharmacy are very practical [17].

In recent years, nanotechnology has had an important impact on drug discovery and the development of more effective and stronger drugs. Nanoparticles. They are complex three-dimensional structures with a diameter of up to 100nm that are designed to induce multiple effects. The properties of nanoparticles are related to their size reduction and the interaction between their components and the environment [18]. In nanomedicine, components. Nanoparticles have a variety of functions, because not only the active substance induces therapeutic effects, but the auxiliary substances may also show various beneficial properties. For example, they can deliver drugs to specific sites (for example: tissues or target cells) through: increasing drug solubility, improving drug penetration through biological barriers; and control the release of the drug, thereby greatly improving bioavailability [19]. So, based on the benefits. Nanoparticles can be used to design and develop different drug delivery systems. Examples of these systems for urinary tract infection management include organic

and inorganic nanoparticles (and their combinations) . The design of these nanoparticles is a combination of a matrix with antimicrobial properties and the addition of active molecules .(such as antibiotics or proteins), to improve the antibacterial effect of the new systems] 20 [ Therefore, the aim of this review is to introduce and discuss the recent nanotechnological . advances to improve the treatment of UTI and on the various systems and materials used for .design and synthesis Nanoparticles and the results that these nanoparticles have shown against .urinary pathogenic microorganisms are focused

#### 4 . Silver nanoparticles

have been widely studied due to their application in many fields such as biotechnology , .microelectronics , optics and biomedicine] 23 [ It is well known that silver is a very effective . antibacterial agent and also has strong activity against bacteria, fungi and viruses, although the mechanism and how Function it yet still To are you well known not done Is] 24 [ Several . studies reported that silver and silver nanoparticles may adhere to the cell membrane surface .and disrupt cell permeability and respiratory functions] 25 [ It is also possible that silver and . silver nanoparticles not only interact with the surface of the membrane, but can also penetrate into the bacteria] 26 [ Many researchers also suggested that . Silver ions interact with the thiol .groups in the proteins of bacteria and increase their proliferationDNA affect[ 27 ] Silver . ions have also been reported to dissociate the respiratory chain from oxidative phosphorylation .or disrupt the proton motive force across the cytoplasmic membrane] 28 [ .

#### 5 . Zinc nanoparticles

Antifungal effects of treatments Zinc nanoparticles , such as ZnO and ZnO nanocomposites , have recently been identified[ 29 ] It has also been reported that Zn . nanoparticles It shows inhibitory effects on bacterial biofilm formation and Candida biofilm formation] 30 [ Previous studies have shown the fungicidal effects of these two agents . relative to MICs ) Zn nanoparticles 5-50 µg/ml ) were detected against both isolates ] 31 [ . about Zn nanoparticles , it has been reported that the interaction of nanoparticles with .microorganisms present in biofilms causes particle accumulation] 32 [ In a study, it was . ,reported that biofilm characteristics, such as oxygen concentration, biofilm substrate pH And the composition of the biofilm, may be on the accumulation Zn nanoparticles and as a result spread and affect the biofilm cells . Such findings may be due to similar activity These nanoparticles are of significant importance against biofilms in these studies] 33 [ .

#### 6 . Copper nanoparticles

Activity anti-bacterial copper nanoparticles by their close interaction with membranes microbial and the release of metal ions in the solution is created] 34 Shalom et . al coated silicone urinary catheters with CuO nanoparticles fused with zinc . Then , their antibiofilm activity against Escherichia coli , Staphylococcus aureus and Proteus mirabilis .bacteria By observing the durability of biofilm, they evaluated 9, 8 and 0.5 respectively . Finally, the authors performed experiments using rabbits as an in vivo model in which coated and uncoated catheters were applied. Rabbits that were catheterized with uncoated urinary catheters got infected on the fourth day of the experiment . In contrast, no infection was detected in rabbits catheterized with coated catheters during the experimental period 7 .(days 35.



## 7 . Silica nanoparticles

Another mineral molecule used to promote UTI treatment is silica, which is generally used in combination with other substances. For example, in a review, synthesized silica-titanium Si-Ti-Sv nanostructures were used as nanocarriers for isohydrofural, a new antibacterial agent Izo3-Si-Ti-Sv to obtain d. The antibacterial activity of these nanocarriers, was evaluated against different strains of nosocomial UTI pathogens ( *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Morganella morganii* and *Enterococcus faecalis*) The results showed that Izo3-Si-Ti-Sv has more antibacterial potential than Si-Ti-Sv and .nitrofurantoin] 36 [ The antibacterial effect of silica nanoparticles has been attributed to the activation of autophagy and apoptosis mechanisms in the cell[ 38] .

## 8 . Organic nanoparticles

Organic nanoparticles are stable particles composed of organic compounds such as polymers or lipids, which have found significant applications in drug delivery] 38[ . Therefore, according to their active ingredients, they are more suitable for biological applications and have become more important in the nanomedicine and pharmaceutical industry every day] 39 [ In the search for new treatment strategies for urinary tract infections, these particles are mainly considered as nanocarriers. Nanocarriers are especially important due to their inhibitory activity on the formation of biofilm of pathogens. In this context, it has been observed that the functionalization of standard urinary catheter materials (for example: polydimethylsiloxane) with antibacterial aminocellulose nanospheres ACNSs, (80% growth inhibitory activity in equal to formation Biofilm By *Escherichia coli* Compared to the silicon surface provides. In addition, the effect of functionalized urinary catheters ACNS and hyaluronic acid polyanion HA ( Against biofilm *Pseudomonas aeruginosa* has been evaluated The results showed that a 5-layer structure reduces the number of bacterial colonies. In addition, the structure of 10 layers has anti-biofilm activity [ 41] .

N. Envalmas Carbon-based nanoparticles have been studied as promising agents for drug delivery. In general, carbon nanomaterials exert their antibacterial activity by direct interaction between their surface chemical groups and the bacterial wall, thereby causing physical damage and inhibition of metabolism. It is interesting to note that Nanodiamonds due to their physical and chemical properties such as small size, diverse and adjustable surface performance and the ability to enter mammalian cells increase these antibacterial properties] 42 [ .

) In a study, the ability of two different sizes of nanodiamonds (6 and 25nm) to be endocytosed into human bladder cells and kill intracellular UPEC was used. Experiments were performed using T24 bladder cells infected with invasive UPEC strain. Then infected cells for two hours with nanoparticles at a concentration of 200µg/ml were treated. The results showed that 6 nm nanoparticles have better antibacterial effects against UPEC than showed 25nm nanoparticles. Measuring the entry of nanoparticles into cells using a transmission electron microscope Done. Microscopic images showed that 6 and 25nm nanoparticles have entered the bladder cells, which indicates the possibility of their use against UPEC. ] 43 [ These nanoparticles have been specifically used for the treatment of CAUTI caused by the catheter in hospitalized patients[ 44,45 ] . In addition, the use of intravaginal injection of nanoemulsions based on natural compounds is one of the most promising alternatives to improve the actual treatment against urinary tract infections] 46 .

## 9. Combined nanoparticles

Due to the high resistance of urinary tract pathogens to antibiotics, the development of effective and strong antimicrobial agents is urgently needed. In this context, composite materials have been designed as new strategies for the treatment of urinary tract infections. Organometallic frameworks are hybrid organic-inorganic porous nanostructures that have been developed for the treatment of infections because of their ability to act as antimicrobial agents as well as drug carriers [47]. Potential. These nanoparticles are used to fight pathogens MDR. It is based on the possibility of penetration of their metallic component and their ability to cause physical damage to microbial cells [48].

## 10. Green nanoparticles

Inorganic nanoparticles can be engineered by physicochemical and biological routes. In physicochemical methods for the synthesis of nanoparticles, strong reducing agents and organic solvents are used [49]. The use of these chemical reagents causes poisoning and environmental problems. For this reason, biological synthesis methods are preferred [50]. On the other hand, biological synthesis methods include the use of plants, bacteria, fungi or algae to reduce the use of metal ions in the production of nanoparticles. Therefore, nanoparticles produced by biological synthesis are free of toxic chemicals and biocompatible. It has also been shown that the synthesis of these nanoparticles is simple and economical [51].

In the research of silver nanoparticles through Egyptian henna leaf extracts were produced. The components of plant extracts were identified using gas chromatography mass spectrometry (GC-mass). Silver nanocrystals had an average size of (28 to 60 nanometers). The antibacterial activities of silver nanoparticles were investigated and it was observed that all microorganisms were highly sensitive to biologically synthesized silver nanoparticles [52]. In another research, nanoparticles CuO Green using leaf extract *Camilla japonica* it was prepared. The results of disc diffusion experiments showed that nanoparticles CuO. At a concentration of 100 µg/ml, they prevent the growth of tested Gram-positive and Gram-negative uropathogenic bacteria. Furthermore, reduced cell viability and loss of cell membrane integrity were observed in bacteria by laser scanning microscopy, supporting the effect of copper nanoparticles as potential antibacterial agents [53]. Researchers engineered ZnO nanosheets for use in the treatment of UTIs. They are from actinomycete *Nocardiopsis* sp. GRG1 (KT235640) for the synthesis of (ZnO green, used to inhibit MDR uropathogenic bacteria. Antibacterial activity was determined by Kirby-Bauer disc diffusion method. The results showed that the maximum concentration of 25 micrograms/ml of nanoparticles. The diameter of the growth halo against *Proteus mirabilis* and the maximum concentration of 24 micrograms. The halo diameter causes non-growth against *Escherichia coli*, which is more than the age of ) extract and nanoparticle alone. In addition, antibiofilm properties 92 and 90% against % *Proteus mirabilis* and *Escherichia coli*, respectively ) were observed using a concentration of 20 µg/ml of green extract [54].

## 11. Conclusion

It is noteworthy that in most studies, nanoparticles have inhibited the growth of bacteria that cause urinary tract infections. The topical route of administration for the treatment of UTIs

with nanoparticles, either through the intravaginal or intravesical route, is preferred for both inpatients and outpatients. In addition, the use of nanosystems capable of inactivating or eliminating urinary tract pathogens as catheter coatings is well suited to these infections. Prevents and reduces the formation of biofilms. As a result, the use of subcutaneous vaccines has been suggested to reduce the increasing number of bacteria causing urinary tract infections and to overcome their antibiotic resistance.

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## Extraction of steroidal compounds by carbon dioxide supercritical fluid method from fishery wastes and investigation of its sunscreen properties

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### Abstract

fish is obtained as waste , which of In fish processing processes , generally more th includes head , skin , fins , intestines , entrails and eggs . . While the egg of the month , It is a very valuable product that is used as food in many parts of the world . But in Iran , the eggs of some fish such as white fish and trout are only used in a limited way and are not processed . In most cases , these wastes are considered as low - value products , while fish wastes contain high amounts of nutrients .Active ingredients like steroids have the potential to produce products with high added value and use in the industry of supplements and cosmetic products .

In the current research, with the supercritical method of carbon dioxide, which is a green and the potential extraction method, the oil phase of the compounds in salmon eggs, extraction of using the resulting residue as Protection against solar radiation will be examined in cosmetic . creams.

**Keywords** :fishing waste , steroid compounds UV -radiation , antiUV , propertyCO2 supercritical fluid extraction

### 1.Introduction

In the fish processing industry , more than60%products and waste such as head, - of by skin, fins, intestines and viscera , gonad , etc. are produced , only40 %of the products are . produced . It is usable for humans These high amounts of monthly waste lead to pollution in some areas and their disposal causes serious problems . Studies show that these materials contain optimal amounts of rich substances such as proteins , fatty acids and vitamins , which are usually required for the production of products . They can be used with high added value. Fish eggs are also often consumed as food in many parts of the world . However , in Iran, fish eggs are used only for food consumption , and most of the gonads of these fish (such as carp , mackerel, and tuna ) are discarded . be finished{1}.

Iran It is one of the biggest producers of salmon and its consumption in families is very common . In the sale of live and processed salmon , the eggs are usually thrown away as waste . and have a very low price if purchased for breeding purposes

Fish oil is one of the products that can be extracted from fish waste . This oil contains polyunsaturated fatty acidsPUFA ) . such as docosaheaxaenoic acid (DHA and ( cosapentaenoic acid ( EPA) and it also includes types and supplies . These botanical compounds can be used in the production of supplements and creams to improve some skin problems such as aging , skin cancer , allergies , dermatitis , skin wounds and melanogens . Guy Rand2 .

Different creams are designed and produced to reduce the harmful effects of free radicals

that are produced from metabolic processes inside the cells . Unfortunately, most sunscreens contain UV filters . They are like zinc and titanium and rarely contain natural bioactive molecules . These are physical filters It is soluble in fat and penetrates deeply into the skin and accumulates in the body , which leads to various side effects such as endocrine disorders {3} .

### 1.1 Steroid wastes and compounds

Due to the lack of resources, people today are forced to use resources that were previously considered to be of little value . Every day, a large number of valuable resources leave the life cycle and become waste . They are known as low-value materials . One of these sources is salmon eggs . These eggs contain proteins , minerals , vitamins , and carotenoids , and in addition , it has very valuable oil . Fish oil contains squalene , and tom oilA and Tom Y. N , D is cholesterol, monoglycerides , diglycerides , triglycerides , free fatty acids , phospholipids and sterols .. Fatty acids in fish oil exist in two forms : neutral lipids and free acids . The main , saturated fatty acids in fish oil include myristic acid , palmitic acid , stearic acid and behenic acid .which monounsaturated fatty acids include myristoleic acid , palmitoleic acid , oleic acid cosenoic acid ,They are the Catholic Church , the Russian Catholic Church , and the Catholic , , Church .In addition , the main fatty acids in fish oil include oleic acid $\alpha$  Li Nolen 's KSD , - areDHA andEPA [4] .

### 1.2 Skin and environmental oxidative stress

Human skin , which acts as an interface between the body and the environment , is highly sensitive to oxidative and environmental stresses . Ultraviolet(UV radiation is the strongest ( factor that can affect the skin surface as oxygen stress . This radiation leads to the destruction of lipids on the surface of the skin , which causes the destruction of the biological membrane inflammation , cancer and aging of the skin . . Skin aging is divided into two categories : , temporal aging and light aging . Photoaging is caused by skin damage due to frequent contact withUV . rays In recent years , an increase in the number of cancers associated with exposure toUV rays - has been observed . In the past , UVB was known as one of the carcinogenic factors , but recent research shows thatUV A may also have severe carcinogenic effects . - apoptez , A place is a protective toxin that is induced to remove malignant cells after intense contact with UVrays , However.if exposure toUV is chronic resistance to apoptosis and , carcinogenic effects may occur in skin cells . Therefore , the skin has substances that prevent ] [ 6 ] [ 5 [ lipid peroxidation7.

### 1.3 Extraction by means of supercritical fluid .(SFE)

Green technology is used as a sustainable approach in material processing, using environmentally friendly techniques to extract high quality materials. In this regard , techniques such as supercritical fluid extraction, ultrasound extraction , pulsed electric fields , and extraction using spherical They are known as green alternatives for high quality material separation. These techniques are used with advantages such as high speed, minimal solvent consumption, use of environmentally friendly solvents, recovery of superior compounds and .higher selectivity

SFE is a method of separating matter from liquid or solid matrix, which is of interest in the food industry due to its many advantages, such as the use of non-toxic solvents, non-pollution of the environment and reduction of energy consumption. In this method, solutes are separated

from the matrix by using solvents at or near the critical temperature and pressure. In these conditions, solvents have intermediary properties between gases and liquids, which cause the ) recovery of the target compounds. Non-toxic organic solvents, such as carbon dioxide CO<sub>2</sub> . which is known as a safe solvent, are used in this method , (CO<sub>2</sub> has characteristics such as cheapness, high purity, non-toxicity and flammability. This method helps to dissolve solutes . due to its higher diffusion coefficient and lower viscosity SFE efficiency is mostly influenced , by pressure, extraction temperature, extraction time CO<sub>2</sub> density, CO<sub>2</sub> flow rate and solvent concentration. By changing the temperature and pressure, the selectivity of SFE is adjusted. Ethanol is one of the common solvents in this method that meets the requirements of green . technology

### Advantages

This green extraction technique is performed without the use of an organic solvent, and for 1- this reason, the obtained extract is very pure. Also, lipids can be used immediately after . extraction

) The use of low temperature (40-80°C) in this method preserves the quality of the final ° 2- . product and results in obtaining high quality products

The products obtained by this method do not contain heavy metals and mineral salts 3-

Due to features such as low viscosity and high diffusivity, this extraction method is very 4- . efficient with fast performance and high yield

:Disadvantages

Equipment item Need To this Method, To the reason Function At Pressures Top And 1- Complexity technical, costs upper have

This Method Ability Extraction Materials polar particle for direct object does not have 2- . meaning That materials That property polar have able Extraction By this Method are not

3- Consumption Electricity this Method relatively high [8]

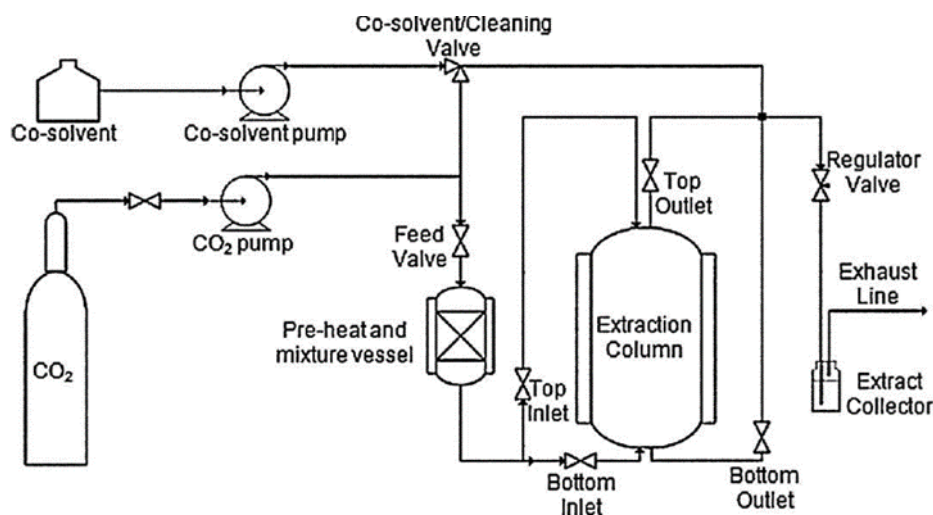
## 3. Methodology

### 1.3 Sample preparation

24 kg of fresh salmon roe will be purchased from fish sales centers and kept in the freezer . of the dry industry until extraction

### 3.2 method

Extraction of fatty acids and squalene using supercritical fluid system Helix SFE System provided by Applied Separations Inc. . It is done as shown schematically in the figure below



Briefly, freeze-dried samples will be first ground into powder and then poured into a 50 kg steel cylinder at the rate of 30 kg. The filled cylinder is placed inside the steel extraction column with a crane and the opening of the column is tightly closed. The extraction process starts with the injection of carbon dioxide into the cylinder. By creating a certain pressure and temperature, a critical point is created and the extraction process is carried out using carbon dioxide. The mobile phase is exposed to temperature and pressure near the critical point of the solvent to increase the solubility power of the mobile phase and then separates the solutes by precipitation method in separation columns.

In order to determine the effective factors on the extraction process and the relationships between them, by involving the factors: temperature ( $T$ ), pressure and  $\text{CO}_2$  flow rate ( $Q$ ) will be used with the Santos method.

### Check for UV protection 3.3

To check the protective properties of the extracts against UVB and UVC rays using a UV meter (UVP UVX Digital Radiometer) and adding to sunscreen cream was done. For this purpose, first, the amount of UV was measured alone. Sunscreen cream was applied on a substrate and then it was measured after exposure to the UV source.

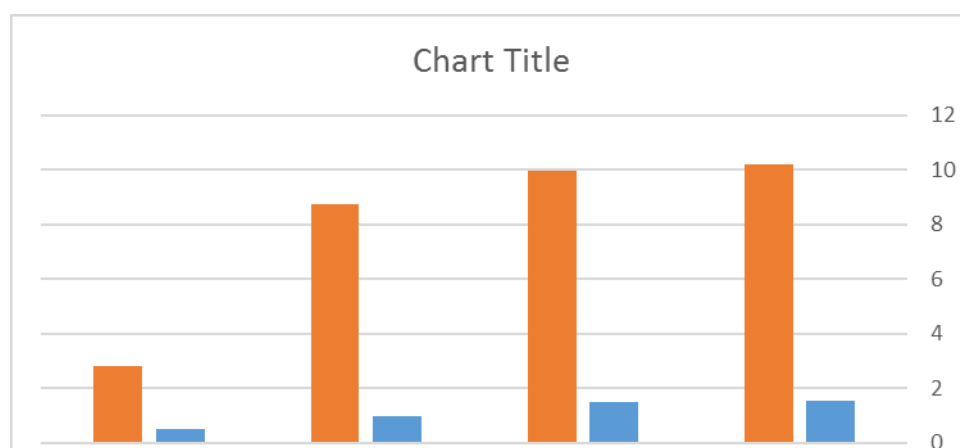
$$\text{Inhibition percentage} = \frac{\text{Recruitment of control samples} - \text{Sample absorption}}{\text{Recruitment of control samples}} \times 100$$



#### 4. research findings

Absorption of slide + cream + extract	Absorption of slide + cream	absorption slide	) Sunlight w/cm <sup>2</sup> ( μ	Type of radiation
0.53	1	1.48	1.56	UVA
2.8	8.75	9.98	10.20	UVB

1- Absorption of the radiometer **Table**



**figure1- Comparison chart of UVA and UVB**

#### 5. Conclusion

In addition to the threat of environmental theft, monthly losses also have significant economic losses. For this reason, the management of monthly expenses is necessary to deal with these critical issues. In fact, today, the development of a sustainable monthly waste management system plays a significant role in this end of the world. This management system is closely related to the guidelines related to waste management, which aims to prevent the production of waste and use instead of waste. It is used as a source of reuse, their drop game and water game. This method allows us to avoid monthly losses. We use it as a significant source for the production of value-added products such as peptides, proteins, oil and enzymes. By using extraction and purification techniques based on methods such as supercritical fluid extraction, it is possible to comprehensively and efficiently extract useful compounds from fish waste and in order to Production of value-added products. In this process, choosing the best extraction method to maintain the nutritional value and quality of the desired product, especially if we consider that it is possible. If the products are used for human consumption, it is very important.

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## Use of artificial intelligence AI Financial Management

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### Abstract

Artificial intelligence is a pervasive technology that can be used in financial management and financial services. The combination results from the combination of artificial intelligence and intelligent financial system management, which consists of the cooperation of experts and artificial intelligence tools. The intelligent financial system can quickly data mine big data and make it available to the organization's decision makers. The features of this system can be fraud detection ( fraud detection ) , cost reduction forecast , The plan of the stock seller , the market risk manager , the operational risk manager , the financial risk , and the investment mentioned

**Keywords:** artificial intelligence, financial management, intelligent financial management, alfinanci services

### Introduction

AI provides a significant foundation for technological innovation . The financial sector will be transformed by artificial intelligence and will provide an opportunity for better and more appropriate services , reducing costs and developing new business models2019, Paolo Giudici Artificial intelligence , Internet and other technologies have produced intelligent financial .( management . It is possible to increase the space and take a more creative approach to improve and improve the financial management of companies with their growth . When it comes to big data , simple financial accounting to adapt to your needs . Management of modern company decision - making is difficult2022 Cai ,Chen

### Artificial intelligence

artificial intelligence is to have the ability to think independently like humans, understand the surrounding environment and create feedback . Currently, at the micro level , it is used in translation , speech recognition , image recognition and other fields . At the macro level , the artificial intelligence system replaces a large amount of human repetitive work , improves the efficiency of using social resources , and allocates It has effectively strengthened social resources . Artificial intelligence can simulate human behavior and thinking . According to ability Learning and independent judgment, the development of artificial intelligence can be divided into three levels : the first level of weak artificial intelligence , the second level of strong artificial intelligence and the third level of super artificial intelligence . Is. At present,

the research level of artificial intelligence in the world is still at the first level Xiangping Zhu , 2021

Artificial intelligence has overtaken the modern diffusion process of perceived markets . Currently , artificial intelligence is practically used in various sectors . The industry of financial organizations is dealing with artificial intelligence in real advanced ways . The great invention of artificial intelligence will lead the financial industry with a legendary storm of instructions In many of the day -to-day aspects of the financial industry , artificial intelligence is used to . gain time-saving benefits , cut costs , and add value with the help of rapid more is used Eletter.2010 , Yaseen , Elrefae

### **Artificial intelligence works**

The use of AI in financial services has many benefits . This can increase efficiency and productivity through automation . Minimizing errors caused by psychological factors emotional and strengthening the accuracy and brevity of management information by identifying patterns and long -term developments that are not easily identified by existing . monitoring methods ( Buchanan2019 ). Such requirements are especially valid in cases . where laws , such as financial instrument directivesII ) for the European Union MarketsMiFID II expands the obligations of senior management to analyze and take into account more data , from the business . Maggie Redd Ho.2010 , Ip , Wu , Tse

In the financial services industry , artificial intelligence is still in its early days . In banking AI is everywhere and there are more barriers including legal , regulatory , economic and social , barriers . The global financial ecosystem is also exposed to new complications Giudici2018

### **Smart financial system**

There is no valid and comprehensive definition in the university . This article defines the method of smart financial management based on the concept of smart financial management . With the help of financial experts and intelligent information technology , through human and computer interaction , the whole process of organizational business activities , financial accounting activities and activities Management accounting is analyzed and judged , forming strategic decisions and then financial planning activities .It complements the companies . Smart finance has created a change in the field of accounting , reducing the distortion of accounting information , improving accounting efficiency , and reconstructing the accounting process ., has reduced the cost and effectively promoted the financial transformationof ) companiesXiangping Zhu ,2021

### **Smart financial information technology**

Smart finance requires collaboration with financial experts with smart information technology. Intelligent identification system, data warehouse and data mining system, cloud computing system and intelligent engine system are necessary. The intelligent recognition system uses OCR scanning image recognition, intelligent language seedlings and other information technologies to intelligently understand enterprise data and identify the enterprise environment. Data warehousing and data mining systems integrate, sort and summarize data sources and facilitate the extraction and analysis of big data. In the face of the rapid development of intelligent financial information technology, some data show that among the intelligent information technologies used by Chinese companies, OCR scanning image

.recognition and RPA operation automation account for the largest proportion 2021) , Xiangping Zhu

### **Financial smart internet platform**

The intelligent Internet financial platform extends financial management to the front end of the business and participates in the front - end service center of the financial cost control system . The ten thousand one smart financial connection platform includes foreign suppliers customers , retailers , industrial and commercial taxes , etc. The remaining ,10.000operating systems are centrally managed with resources from various departments, head offices and branches of the company . Operating systems are built between external data and internal data to realize data connectivity and directly collect business data . and slow processing. This type of end - to - end connection enables companies to integrate capital flow and management flow into a single transaction clinic ., which integrates the two main processes of organizational . operations and greatly improves work efficiency2021) ,Xiangping Zhu

### **Advantages of using artificial intelligence**

1.commerce Fraud detection With the emergence of e - commerce fraud Onlinebefore and it is impossible to avoid it . Recently , the United States reported fraud detection at 15 times the actual fraud rate . Artificial intelligence is available today. By supporting gambling fact - checking , home appliance methods can now deliver fraudulent contracts deprived of some information to humanoid experts with a high level of accuracy . Real course permits and reduction of misidentification failures ( Eletter.2010 , Yaseen , Elrefae ) . Multinational companies are currently using artificial intelligence for identification and background checks .Unreliable banks explore the financial sector .One of the best applications of artificial intelligence that we can see is the use of MasterCard . If fraudsters try to use another MasterCard by stealing information and data , artificial intelligence technology analyzes and analyzes real data .and instant notifications in email It sends real owners smart phones and all communication media related to personal wallets Buchanan. 2019)

### **Cost configuration prediction**

costs, which is used by many companies and financial services sectors. When the cars are Artificial intelligence is useful for detecting buyestolen or the account is hacked, in order to .prevent fraud or theft from the store will be obliged Giudici. 2018 (

### **Stock Dealer Plan**

A computer system trained to predict when to buy or sell stocks in1.order to maximize profits while minimizing losses during uncertainty and meltdowns. Client-side user authentication: This can re-authenticate or identify the user and proceed allow the transaction to. 2009 ) Fethi & Pasiouras (



## Stock Market Risk Manager

Market risk is related to changes in **the value of** financial instruments . or contracts due to unpredictable fluctuations in asset prices , i.e. commodity prices , interest rates , foreign exchange rates , and other market indicators Refers. In other words market risk is the risk of portfolio value fluctuations due to changes in the price , ) level . It is the market price fluctuationsBogojevic Arsic.2009 This shows that .( every participant in the financial market directly A direct investment is exposed to market risk . Depending on the financial power and the size of the position exposed to this risk , the participants should manage this risk . In this regard , financial institutions try to actively manage internal risk and determine the type of market risk they want based on their knowledge of market volatility . Markets are exposed to it and choose . On the other hand , non - financial companies seek to reduce , if possible , eliminate this risk along with other types of risk ( to reduce market risk , eliminate it along with There are other types of risk . Artificial intelligence techniques can be useful and their implementation in market risk management may lead to significant advances .Machine learning as the main techniqueAI can help rket risk management better

## Operational Risk Manager

**Financial risk** : Today , the management **of financial risk is**1. changing due to the influence of fintech , which led to disruption in the financial sector . Financial risk management is the practice of optimizing the way financial institutions Companies can accept financial risk . More broadly , AI is part of fintech and has already changed the way financial risk is managed . In addition , artificial intelligence has helped financial risk managers by increasing decision - making efficiency . As mentioned before, artificial intelligence is aimed at using different techniques based on human intelligence . These techniques use past experience (for example, different data sets ) in efficient and intelligent ways (imitating human behavior ) . A key technique of artificial intelligence Machine learning is a machine that enables the preparation of data and predictions that can be used to make decisions about risk . be valuable Types of car parts There is supervised education and unsupervised education .Supervised learning is based on the collected data and tries to get the result using partial least squares , principal component analysis , minimum absolute shrinkage and selection operator , minimum angle regression , Ridge line , decision making , support vector machine , artificial neural networks and techniques It . predicts deep change ( van Liebergen2017 .

**Investment** AI was used to identify dozens of platforms . It is used2. to create effective investment strategies . Another application of artificial intelligence in finance is algorithmic trading , systems that acquire knowledge about changing market conditions and price levels using specialized algorithms . They leave the bank very quickly to do automatic transactions . Studying how to process text, news and meanings is a significant use of artificial intelligence . Artificial intelligence is used to intelligently read and interpret data , including articles, papers , social media and materials . This is very important if the systemAI can read in seconds what it would take hours to do and still not be able to capture all the details that may affect the specific performance of the product . , Offer. Development of profitable investment services is important . Data mining facilitates the study of market data , predictive behavior and price levels . he does . It also cannot provide forecasts and

performance of the legal and structural development model El & Belushi Nobanee.2018)

## Result

Artificial intelligence, as one of the new technologies, provides many tools for financial management. This technology helps to improve the financial decisions of companies. According to these mistakes, artificial intelligence minimizes, leads to more accurate calculations, and also a high speed in performing these calculations and can provide financial reports with the highest speed and accuracy to the decision makers of the organization. The use of artificial intelligence in financial management requires the infrastructure of image identification, OCR scanning and automation of operations. It is RPA but it is not enough and experts should be used along with this technology. The combination of artificial intelligence and management can be called a smart financial system. The intelligent financial system provides services in investment and calculation of financial, market and operational risks as well as in the identification of demand

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## of artificial intelligence in pricing the competition of technology companies with market orientation

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### Abstract

Today, artificial intelligence plays an important role in the development of activities related to businesses. Artificial intelligence has been effective in various aspects including pricing. The main goal of this research was to identify the functions of artificial intelligence in competitive pricing in technology companies with a market-oriented approach. For this purpose, the method of this research was applied, survey and correlation. In this research, the statistical population was 850 managers and marketing experts of technology companies in the science and technology park of Tehran province. The random sampling method was simple and the sample size was determined by using Morgan's table of 256 people. A researcher-made questionnaire was used to measure the research variables. The validity of this tool has been confirmed through construct validity and reliability using Cronbach's alpha coefficient. Finally, in order to explain the functions, the structural equation modeling method was used in the form of Imus software. The results of this research led to the identification of the functions of artificial intelligence in the form of data - oriented pricing , prediction in competitive pricing , pricing adaptability , pricing personalization , demand management in . pricing , value - based pricing

**Keywords** :artificial intelligence, competitive pricing, technology companies, market .orientati

### 1. Introduction

The assessment of competition in the technology industry is influenced by various factors These factors include production cost , product value , competitors ' prices , target market , . Abi 's market strategy , customers ' sensitivity to price , and Abi 's market policies . They are ] Ghats1According to these factors , companies should choose an appropriate pricing . [ ] strategy and coordinate it with market changes2 [

Assessing the competition in the technology industry is important because of the intense competition , the rapid changes in technology , and the need to adapt to the preferences of the customers , this strategy It helps companies to be present in the dynamic market . This approach helps to manage the budget , influence on the brand and market , and determine the ] return on investment3. [

In the meantime, competitive pricing with a market orientation focuses on setting prices ] based on market conditions and interaction with competitors4In this way , companies . [ determine their prices according to the current information by analyzing the competitors and

] the market situation<sup>5</sup>This approach provides the possibility that the companies are . [ ] coordinated with the rest of the competitors and are present on the path of competition<sup>6</sup> . [ Also , according to market analysis and customer feedback , this approach allows companies to adjust prices in a way that matches customer preferences . be coordinated and adjust their competition strategy immediately . This approach , considering the dynamics of the technology market , allows companies to quickly react to changes in the behavior of competitors and ] market developments and to position themselves in front of Competitors keep<sup>7</sup>. [

The coordination of market orientation and valuation in the technology industry may face some challenges . The rapid changes in the market and the complexity of the products make a more accurate coordination between pricing and market orientation necessary [ 8 ] . Extensive competition in the technology industry can lead to a decrease in pricing power and an increase in competitive pressure . Customers ' sensitivity to price , continuous innovation , and global influence are also other challenges . To deal with these challenges , companies need accurate market analysis , market oriented strategy , and use of technology . Also , creating appropriate ] organizational structures and accurate market forecasts are of high importance<sup>2</sup>. [

In this context, various tools have been created and developed in order to develop ] businesses in recent years. One of these tools is artificial intelligence<sup>9</sup> Artificial intelligence . [ )AI plays a vital role in businesses . This technology , with the ability to accurately analyze ( data , predict market changes , and improve decision - making , helps to improve the efficiency . and performance of processesAI also serves customers through chatbots and voice systems process optimization , automated manufacturing , intelligent marketing , and AI . Jad services , ] based on role automation<sup>10</sup>This technology allows businesses to keep up with rapidly . [ changing markets , reduce costs , and vastly improve their macro performance . Artificial ) intelligenceAI ] plays an important role in valuing companies ( <sup>11</sup>This technology allows . [ for the accurate analysis of large volumes of data , predicting market changes , recognizing customer patterns , determining dynamic prices , and optimizingIt provides evaluation and quick response to changes .By usingAI companies can pay more attention to brand valuation , and customer feedback , leading to improved performance and increased decision - making ] efficiency .It is valued<sup>12</sup>. [

In this article, the main goal is focused on understanding the functions of artificial intelligence in dynamic pricing of companies active in technology industries with a market-oriented approach. Therefore, the main question that we seek to answer in this article is, what are the functions of artificial intelligence in the competitive pricing of market - oriented technology companies

## 2 Theoretical foundations

### 1.2 Functions of artificial intelligence in technology industries

) Artificial intelligenceAI plays a very important role in the technology industry . This ( technology is used in various fields from data analysis and automation to quality improvement preventive maintenance and repair , robotics , product design improvement , customer service , ] and Security is used<sup>13</sup>By using artificial intelligence , technology industries are able to . [ improve performance , increase production , improve product quality , and create hand - made ] . intelligent production processes<sup>14</sup>[



In this field , artificial intelligence plays an important role in the market of companies . From analyzing data and predicting customer behavior to improving customer experience , smart advertising , communication with customers through chatbots , SEO optimization , and market research . , artificial intelligence can help companies to improve strategies and ] performance of the water market<sup>15</sup>. [

Artificial intelligence plays a fundamental role in the design and development of products of technology companies . From accurate data analysis and data - driven product design to test and quality automation , AI is helping companies improve processes and deliver more . innovative and quality products<sup>16</sup>

## 2.2 Competitive pricing

Pricing Competition is a method that determines prices based on immediate changes in the ] market using artificial intelligence algorithms<sup>17</sup>This approach allows businesses to . [ change prices accurately and according to market conditions . This process is done by analyzing accurate market data , forecasting demand and supply , and using artificial ] intelligence algorithms<sup>18</sup>. [

Competitive pricing has advantages as an important strategy for technology businesses . This method can help to attract new customers , increase market share , create customer loyalty and facilitate entry into new markets . Offering attractive and competitive prices makes , ] . businesses appear stronger and more flexible in front of the competition<sup>17</sup>[

Competitive pricing theories refer to a large number of concepts and models related to determining prices in a competitive market . Here are some basic ideas in the field of : competitive assessment

The idea of complete competition

In perfectly competitive markets , it is assumed that no business has a role in price determination and all information is fully available. This theory is based on the ideality of ] arkets and free interaction between buyers and sellers<sup>18</sup> [

The opinion of supply and demand

This theory is based on the balance between demand and supply in the market . A determining price is created from supply and demand , which makes the number of available ] goods and customer demand match<sup>17</sup> [

: Finished price comment

This theory believes that in a competitive market , the price is quickly based on the amount ] that all the important information and changes in the market are properly interacted<sup>19</sup>. [

: My opinion in Latvia

According to this theory , every person in the market makes their decisions based on the added value of demand and supply . In fact , this theory has empowered people to act ] strategically on their economic information<sup>20</sup>. [

Commentary on the price recommendation

This theory believes that pricing is based on market information and customer suggestions ] In this way , the customers have a direct role in determining the prices .19 [

: The idea of fixed returns

This theory uses fixed returns to explain the role of the market and pricing in competitive ] conditions . Although the prices may change , but in the long periods , the returns are fixed 18

Paying attention to these theories will help businesses to better understand the place of valuable products in competitive markets . In practice , many markets operate in a combination of these theories and various variables such as technology , demand , supply , and customer . behaviors play a role . They have a role in determining prices

### 3.2 Market approach in competitive pricing

Market orientation in competitive pricing means setting prices according to the competitive conditions in the market . This approach is based on knowing competitors , determining pricing strategies to maintain and increase market share , attract customers , and improve the competitive position . . In this approach , pricing is recognized as one of the main tools influencing the market and competitive decision . Below are some of the

important elements of market orientation in competitive pricing

) Determining the price according to competitors Competitor-based Pricing (

In this way , companies determine their prices based on the prices of competitors . This may be done directly by copying competitors ' prices . Or with the reduction of f The ] increase should be responded to the competitors ' prices21. [

) Determining the price according to the amount of demand and supply Supply and Demand-based Pricing (

the demand is higher than the supply, the prices will increase forever , and if the demand decreases forever , the prices will decrease forever . This approach takes into account the ] change of the market such as the change of demand and supply22. [

- Determining the price according to the amount of value ( Valuebased Pricing (

In this way , prices are based on experiential value The added value of the product is determined for the customer . This is possible by providing features Do additional services ] bring value to customers and increase their willingness to pay more23. [

) Determining the price according to the cost drivers Cost-based Pricing (

In this way , the costs and expenses related to the production of the product are considered as the main factor in determining the price of the product . As the prices increase , the prices ] may increase forever to ensure the inevitable profit of the company24. [

Each of these methods has its own advantages and limitations , and the choice of the method is based on market conditions , product characteristics , and company goals . . Also , it is probably necessary to pay attention to the developments of the market and closely monitor the . competitors and their customers

## 4.2 Artificial intelligence in competitive pricing

) Artificial intelligence AI plays an important role in evaluating the competition . This ( technology helps companies to make significant improvements in the process of pricing and pricing . Below are some key points regarding the use of artificial intelligence in competition : evaluation

: data analysis

Artificial intelligence is able to analyze a huge amount of data . This possibility helps companies to consider market information , customer behavior , and competitive conditions ] more carefully<sup>25</sup>. [

: Price prediction

Using predictive algorithms , artificial intelligence can predict changes in demand and supply - ] accurately and more appropriately<sup>26</sup>. [

: Adapting to the speed of the market

Artificial intelligence allows companies to quickly respond to changes in the market and - competitors . This speed and better adaptation can help companies to operate in the ] environment of more dynamic competition and faster changes<sup>27</sup>. [

: Price customization

Artificial intelligence allows companies to personalize prices based on the specific - characteristics and needs of their customers . This helps companies attract their customers and ] increase their satisfaction<sup>28</sup>. [

: Demand management

Artificial intelligence plays a big role in demand management . By analyzing demand and - forecasting it , companies can better manage their inventory , suppliers , and production policies ]<sup>29</sup>. [

: Competing on value

Artificial intelligence allows companies to compete based on value to their customers instead - of competing based on price . This allows companies to cover continuous improvements in ] their products and services under pricing<sup>30</sup>. [

In general , the use of artificial intelligence in pricing helps companies to manage their prices and competitive strategies more accurately , faster , and more intelligently . The following table shows the functions of artificial intelligence in competitive pricing based on : research literature

**Table1 Functions of artificial intelligence in dynamic pricing based on research - literature**

Source	The function of artificial intelligence	Row
]25] ,]31[	Data driven pricing	1
]26[	Anticipation in competitive pricing	2
]32] ,]27[	Pricing flexibility	3
]28] ,]33[	Personalization of pricing	4
]29[	Demand management in pricing	5
]30] ,]34[	Value-based pricing	6

### 3. Research methodology

This research has been investigated in two ways from the point of view of the purpose of application and the collection of descriptive and correlational information , and it is specifically based on the structural equation model . In this research , according to its purpose and scope , a measurement model has been developed . This model shows how to change hidden are measured on the basis of the open variable . For this purpose , the factor load of each index on the target is estimated and its significance level using the value of the analysis critical ratio . can be The measurement model is used to test the fit of the model, determine the validity of the structure of the research tool , and check the relationships.between the independent variables

The statistical population of this research includes all managers and experts of the water market and market research of technology companies in Tehran province , located in science and technology parks . Considering the total number of 850 people in the research community the sample size is limited to ,256 people using Morgan's table. The sampling .method was done by simple random sampling

In the research tool section , using previous studies and required indicators and components Table )1a questionnaire was designed by the researcher. This questionnaire is composed of ,( two parts , demographic information and users' opinions about the components as the main units of information collection , and it is presented in the form of a five - point , one - to - one . questionnaire

In checking the reliability of the questionnaire , first by distributing30questionnaires for the purpose of the pre - test and calculating the Cronbach's alpha coefficient of0.72the , reliability of the research tool has been confirmed and in the stages of research implementation By using Cronbach's alpha test , the level of coefficient B has been increased to79.0in the sample size of256people . Also , the validity of the research tool was confirmed using the confirmatory factor analysis method , which according to Table2the construct validity of , . the research tool was confirmed

**Table2Model fit indices -**

RMR	RMSEA	GFI	$\chi^2/df$	CFI	IFI	NFI	TLI	Indicator
$\geq 0.08$	$\geq 0.08$	$\leq 0.9$	$3 \leq$	$\leq 0.9$	$\leq 0.9$	$\leq 0.9$	$\leq 0.9$	Suggested criteria
042/0	058/0	92/0	59/2	923/0	978/0	921/0	912/0	Reported value
confirmation	confirmation	confirmation	confirmation	confirmation	confirmation	confirmation	confirmation	Approve/reject index

Amos software was used to check the fit of the model and use the confirmatory factor analysis method. Also, the composite reliability and average variance extracted are presented in the form of Table

**Table3Composite reliability and average variance extracted -**

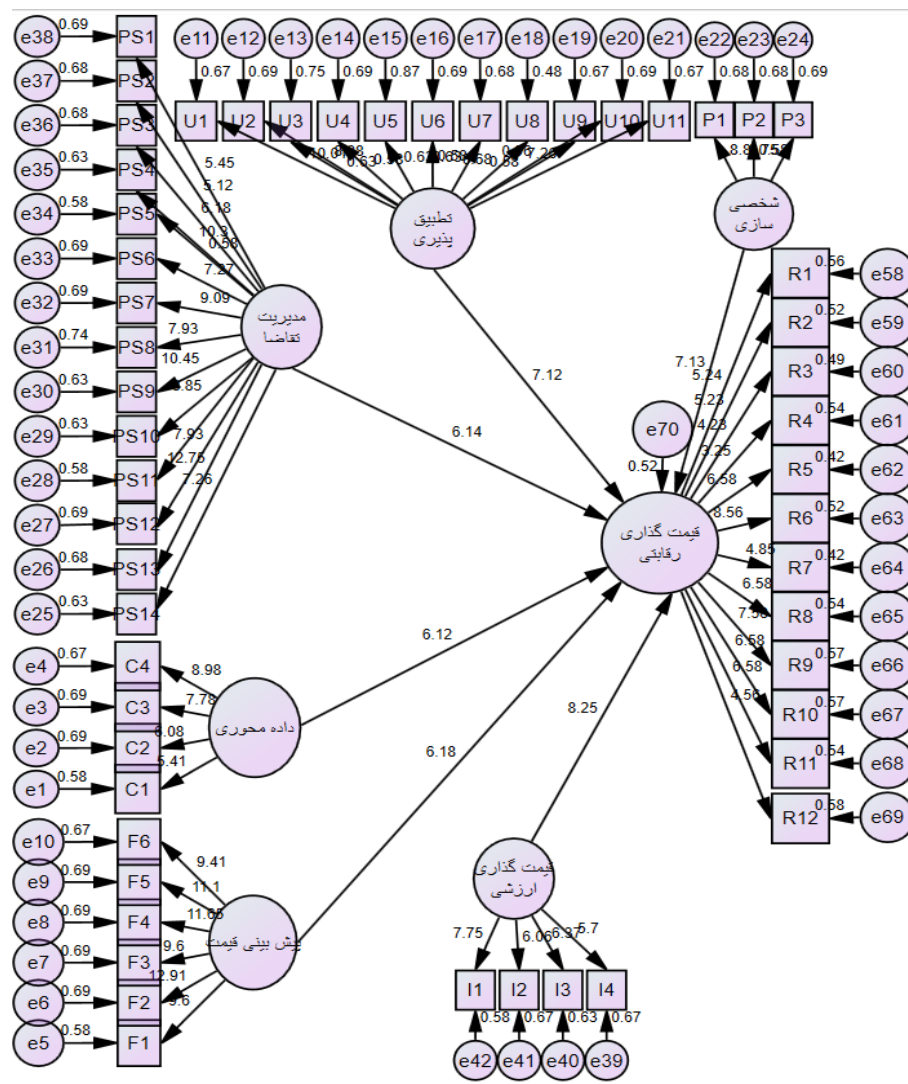
Mean variance extracted	Composite reliability	Questions	Components
0.65	0.82	C1-C4	Data driven pricing
0.56	0.84	F1-F6	Anticipation in competitive pricing
0.56	0.81	U1-U11	Pricing flexibility
0.65	0.74	P1-P3	Personalization of pricing
0.63	0.85	PS1-PS14	Demand management in pricing
0.57	0.74	I1-I4	Value-based pricing
0.68	0.86	R1-R12	Competitive pricing



#### 4. Research results

Based on the findings of the research, it was found that 43 were men and 57% were women. In terms of education 74 had a bachelor's degree and 26% had a master's degree or higher. Also 13 have work experience between 5 and 10 years, 19 have work experience between 10 and 15 years, and 68 have work experience over 15 years.

In the continuation of this section, in order to analyze the relationships between the research variables and identify the functions of artificial intelligence in competitive pricing, the structural modeling method has been used. In this section, the model is drawn in the mode of significant coefficient



**Figure- 1 Conceptual model based on critical ratio**

As can be seen in the figure, the final conceptual model of the research, which is inspired by the background and theoretical foundations of the research, is drawn in the form of the mouse software. The principal components are circled, and the numbers on the lines indicate the critical ratio. This model has been evaluated by users to check its final fit. Also, according to Table No1 all the fit indices of the evaluated model have been placed at the desired level.

For example, the chi-square index with the degree of freedom is reported as the standard level. Also, the amount of horn pRMSEA It is also calculated at the level of 0.058 which is at the standard level of the prediction. In the following, the status of the relationship between the components of the artificial intelligence function and the assessment of competition in technology companies has been investigated

**e Tabl4Analysis Relationships between artificial intelligence functions in competitive - pricing**

Condition	The significance level	Critical ratio	factor load	Components	symbol
confirmation	001/0	12/6	52/0	Data driven pricing	c
confirmation	001/0	18/6	57/0	Anticipation in competitive pricing	F
confirmation	001/0	12/7	63/0	Pricing flexibility	U
confirmation	001/0	13/7	64/0	Personalization of pricing	P
confirmation	001/0	14/6	53/0	Demand management in pricing	P.S
confirmation	002/0	25/8	67/0	Value-based pricing	I

As shown in the above table, in examining the relationship between all the main components and indicators, factor loading values are presented. These values, if they are above 0.3, indicate the existence of a relationship between the immediate and visible components. As it is evident in this table, all the relationships between latent and visible variables have been confirmed. Also, the results of checking the fit of the investigated model are presented in the form of the following table

**Table5Fit indices -**

RMR	RMSEA	GFI	$\chi^2/df$	CFI	IFI	NFI	TLI	Indicator
$\geq 0.08$	$\geq 0.08$	$\leq 0.9$	$3 \leq$	$\leq 0.9$	$\leq 0.9$	$\leq 0.9$	$\leq 0.9$	Suggested criteria
0 / 000	042/0	92/0	54/2	95/0	93/0	91/0	95/0	Reported value

As it is clear in the above table, all the examined indicators are at a suitable level of fit, so it can be said that the fit of the final model is also statistically confirmed. According to the

table above, two RMSEA index values. It is calculated at the level of 0.042 and the chi-square index on the degree of freedom is 2.45 both of which are presented in their standard range. All other fit indices have been calculated at a high level of 0.9 and this standard indicates the fit of the studied model. Therefore, it can be stated that the model identified in the qualitative section has been approved by managers and experts

## 5 . Discussion and conclusion

As stated in this research, artificial intelligence can play an effective role as a tool in today's businesses. In this research, the main goal was to explain the functions of artificial intelligence in dynamic pricing in technology companies. For this purpose, the research literature related to this issue was first reviewed. Finally, functions such as data-oriented pricing, prediction in competitive pricing, pricing adaptability, pricing customization, demand management in pricing, value - based pricing were proposed as important functions in this field from the perspective of research literature. In the next step, by converting these components into questionnaire items, the opinions of managers and experts of the technology department were examined in relation to these functions. The results of the research, while confirming the validity of the model, led to the confirmation of the impact of these approaches on competitive pricing in current technology companies. Therefore, we can pay more attention to these functions of artificial intelligence in dynamic pricing in technology companies. Each of these functions is explained below

) Artificial intelligence AI plays an important role in various areas of business, including valuation. Below, we will examine the role of artificial intelligence in several basic functions of evaluation

: Data - oriented valuation

models Deep learning and algorithms of artificial intelligence are used in the collection, analysis and analysis of data related to valuation. Also, accurate analysis of market data, customer behavior, competitors, and purchasing environment is done quickly using advanced algorithms

: A preview in competition evaluation

In this context, it can be stated that predictive models based on artificial intelligence are capable of analyzing historical data, market patterns and possible changes in the future. Help Algorithms Machine learning is able to predict changes in prices and behavior of competitors in the market

: Applying the evaluation method

Algorithms of artificial intelligence provide the ability to quickly adapt to changes in the market, customer needs and environmental factors. This allows businesses to Update pricing policies in response to rapid market changes

: Personalization of the assessment

Artificial intelligence models can personalize prices based on individual customer data, past purchasing behavior, and preferences. AI - based recommender systems can also improve personalized pricing

### : Demand management in pricing

Artificial intelligence can provide improved demand management and forecasting of market needs . Algorithms of artificial intelligence can help to improve the matching between production and demand and improve the efficiency of pricing

### : Valuation based on value

Artificial intelligence models can analyze the value and benefits of products and services and determine prices based on this value . This type of valuation is possible based on accurate analysis of information and communication between different variables of the . market

Finally, it can be suggested to the studied technology companies that based on the functions of artificial intelligence mentioned in this research, they can take into account the inflationary conditions and also the problems caused by price changes in order to compete in the market level based on the price of the methods presented in artificial intelligence and the functions mentioned in This research will benefit well

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## Evaluating the competitiveness of companies with mathematical models and its relationship with equity

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### Abstract

At this Article to rank classification power Competitiveness of companies With Use From Technique analysis cover Data I see paid and Relationship it With Cost Rights owners take stock Will review became . Society A statistic research Contains Company Hi accepted done At Exchange papers Bhadar Tehran Is That With Attention To At available to be Pharmaceutical companies using A systematic exclusion sampling method is chosen. Data related To variables Research for 5 years From 2014 to 2018 inclusive \_ Bring became \_ First Company I see With Use From Method data covering analysis On Basis power competitive rank classification became Then Information With Use From Inferential statistics, especially linear regression analysis And analyze appointment taken and the results sign gave That Among Variable Competitive power rating And Cost Rights owners take stock Relation Positive meaningful Existence has it . At Finally, With Attention To results research, Suggestions Presentation will be.

### Keywords:

competitive power, data coverage analysis, cost of equity, Tehran Stock Exchange

## 1. Introduction

Competition as a whole A competition or gathering between two or more organisms , animals , individuals , economic groups \_ or social groups and ... , to obtain territory, position resources, product, status , fame, awards , social position , leadership and profit . Competition , occurs when at least two parties are trying to achieve a goal , which cannot be shared. A place where one wins and others lose ( zero - sum game ) . Competition in economics is done between sellers in an effort to achieve goals such as increasing profit , market share , and sales volume by changing the elements of the marketing mix : price , product, distribution , and Advertise . \_ Adam Smith in The Wealth of Nations attributed the competition to production ] resources It defines their most valuable applications<sup>1</sup> .

according to Definition ,Martz power competitive Equivalent the power Economic One the unit At front side Competitors in the market Is That ,goods ,Services Skills And Ideas To Convenience More From borders Geographical supply may be<sup>[2]</sup> . Berkeley And his <sup>2</sup>colleagues framework particle for direct object Formed From Three elements Function

,competitive Potential competitive And processes managerial under Title Asset approach Process ,Function To measurement Check Competitiveness At One the company Introduction They do[3] But . Some From owner Commentators also power competitive particle for direct object Dependent To Competitiveness the company they know. this Approach particle for direct object Approach based on On References Or Ability Is . they On The role of agents Internal Organization On power competitive it emphasis have[4] From . the side other Porter, Leo And Partners power competitive One the company particle for direct object More under the effect position the company At Market they know . this Approach also Approach based on On Market called done Is. But Schumpeter At Year (1950) And Van Buren At Year (1999) To Size get power competitive From Discuss Hi related To Knowledge Have used . To this Approach also Approach based on On Knowledge They say[5] .

The present study examines and ranks the competitive power of companies admitted to the ) Tehran Stock Exchange by using data coverage analysis. analysis cover DataDEA 3type ( Model Program tiny linear Is That Performance relative a group From units Measure decision ,5 Cooper ,4 making \_\_ \_ slow this Technique particle for direct object the first Bar charnes introduced6 Rhodes[6] Considering that the analysis cover The data is one Method non- . parametric Is That To Help planning \_ Linear determination Border Performance it Category .that have similar outputs and inputs) 7 From units Decision ( DMU

Therefore, in this research, we are looking for an answer to the question of how to calculate the competitive power of companies listed on the Tehran Stock Exchange using data coverage analysis models and how it is related to the cost of equity. will be

## 2-Research background

Competitiveness includes a set of factors or capabilities that always enable the company to perform better than its competitors . The power of competition occurs when a company in the indicators combination of indicators leads to advancements , developments , and capabilities that appear superior to competitors . such as access to medical resources , Yani is a very expert person , industrial technologies \_ Informatio and ... competitive power is the attractiveness of the company 's in the eyes of its customers pared to its Competitiveness , differentiation in characteristics It is the dimensions that enable it to provide better services than its competitors to its customers . Overall, competitiveness is the value that the organization offers to its customers , as in At that time, this value is not offered by potential and actual competitors

A company for those who have competitive , it should have the following4 characteristics (7) ] :

lack of water

It is not against imitation

Not against his successor

Performance Conceptual Is That Cost References spent done At Process acquisition Target particle for direct object Assessment he does . give the face That Comparison of outputs got came With entries Consumption done Level Performance particle for direct object Specified he does . To test Performance Supply cost References human, Cost of use From Equipment, Maintenance Facilities And rate coming back Fund And etc it item consideration appointment Takes

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. Data Envelopment Analysis <sup>3</sup>

. Charns <sup>4</sup>

. Cooper <sup>5</sup>

. Rhodes <sup>6</sup>

. decision making units <sup>7</sup>

.research , Benyeh Mahd et al2014studied the relationship between product competitiveness and cost of equity . The data used includes a composite sample of123 companies listed on the Tehran Stock Exchange. The research method is of the correlation type and is used for data analysis and the hypothesis test of a multivariate regression model based on cross - sectional data was used . The results of this research show that competitiveness and cost of equity have a meaningful and inverse relationship with each other . In other words, increasing the competitiveness , the cost of equity decreases . Also , the debt ratio has a significant positive relationship and the size of the company has an inverse significant relationship with the cost of equity[8] .

Soltanyi and his colleagues2014conducted a study titled investigating the effect of working capital and financial flexibility on the competitiveness of companies admitted to the Tehran Stock Exchange. In this research, a sample of257companies admitted to the Tehran Stock Exchange during a period of11 years 1381-1391was selected and examined to select a statistical population using the systematic elimination method . In order to analyze the data, the generalized torque method was used. According to the obtained results, it was found that the current assets turnover period has a positive and significant relationship with competitive power , and the accounts receivable collection cycle period, accounts payable payment cycle period, and cash conversion cycle period have a negative and significant relationship with competitive power. has it. Also, there is no significant relationship between the period of inventory turnover, current ratio and current ratio with the competitiveness of companies . The results of this research show that working capital management has a wide impact on market competitiveness and operational efficiency. The ability of working capital has a positive effect on the competitiveness in the product market. But with the reduction of the ability of circulating capital to a certain level, this effect will be weakened[9] .

.Rahnamai Roudpashti et al2015in a research titled " Tehran Stock Exchange industries ranking based on risk criteria from the perspective of institutional investors with data ) envelopment analysisDEA compared risk criteria from the perspective of institutional " ( and non-institutional (micro) investors. . In this research, whose approach is qualitative-quantitative, hierarchical analysis method is used to rank risk criteria and coverage analysis is used to rank different industries. has been The results of the research indicate that from the perspective of institutional investors, eight risk criteria are taken into account in order to rank stock market industries. The most important risk criteria are, respectively : the fluctuation range of the industry yield, the range of price fluctuation to the industry earnings and the total number of days of stoppage of the symbol in the industry. Among the stock exchange industries, from the perspective of institutions and according to the risk criteria, the most efficient and least risky industries are the infrastructure industry of basic metals and financial ] and intermediary activities10] .

investigated the effects of competition at the industry and company level on the risk of future stock price falls in a research titled industry competition structure, market power and the risk of future stock price falls . For this purpose, two main hypotheses were formulated and a sample consisting of 67 companies was selected from among the companies accepted in the Tehran Stock Exchange by systematic elimination method. Hirfindahl- Hirschman index and the number of active companies in the industry were used to measure the competition index in the industry, and the adjusted Lerner index was used to measure competition at the company level. The risk of stock price fall is calculated using two criteria and with a time horizon of one year. The results of the estimation of the research models showed that the high concentration of the industry increases the risk of future stock price fall for the companies of that industry. Also power Market And Size over From limit From Company, One Effect Interactive On Risk of falling prices Ati is a shareholder; It means that Size over From company limit the effect the power Market On Price drop risk take stock intensifies[11] .

al8 Gani et2011 studied the relationship between competitiveness and financing practices in Chi . They found tha there is a significant lationship between competitiveness and financing methods Likewise, the results of their research indicated that financing is influenced by the type of industry, company size and growth conditions12] .

.et al9 Fuxu Jiang2015in a research to investigate the relationship between product market competition and company investment using a sample of Chinese manufacturing companies during the years1999 to 2010The method used in this research is regression. This is the test . Regression of changes shows consistent evidence . The results obtained are a positive relationship between competition and investment. also \_ It was observed that high investment is under high competition[13].

Tan and Florooz 2018 conducted a research titled "Risk, competition and efficiency in Chinese banks". In this study, the data between2003 and 2013 have been analyzed using Lerner's adjusted index of efficiency and inefficiency-stability as indicators of competition and bankruptcy risk. The results show that Chinese commercial banks with higher efficiency have high credit risk and bankruptcy risk, but they have lower liquidity risk and capital risk. Competition reduces credit risk and bankruptcy risk, but on the other hand it increases liquidity risk. Credit risk and bankruptcy risk are significantly and positively related to efficiency, while they are significantly and negatively related to liquidity risk and capital risk[14] .

.Muzo et al 2019 in a research titled "Measuring the Competitive Power in the Malaysian Poultry Industry" calculated the competitive power of the market in the Malaysian poultry industry. The data used in their research is for the period from1980 to 2017 The results of . their research show that the competitive power is affected by the price of chicken in their statistical population. Quality is another indicator for the competitiveness of these companies [15] .

### 3-Research methodology

This research is a descriptive-survey with an applied nature and cross-sectional in terms of time. In this research, a survey method will be used to collect data, so it can be classified as field research. The statistical population of this research is the companies active in the Tehran Stock Exchange. Information about active companies is collected from stock exchange sites. Indicators for evaluating efficiency and profit distribution are suggested by reading and searching in authoritative books and articles, and some of them are considered by academic experts and the stock exchange, and the rest of the indicators are removed. After collecting information and data, data analysis is done. Society statistics this Research Contains Company Hi Accepted medication done At Exchange papers Bhadar Tehran in the period five Year2014 to2018is. At Here Because From entire Information Company I see use may do Sample get \_ We will not had

Please note that the purpose of this research is to rank companies based on competitive power variables using the efficiency index in data coverage analysis. So, the efficiency index of the dependent variable and the following variables, which are competitive power variables, are dependent variables. Here is the continuation of how to measure the variables

Competitive power

It is the company's share of industry sales, in other words:

$$\text{Competitive power} = \frac{\text{Company sales in the year}}{\text{Total sales of the industry that the company is in}}$$

The competitive power variable is considered as the output of the efficiency model (Mozo et al. , 2019). The input variables of data envelopment analysis model to calculate efficiency are:

Number of Employees

Company size (sum of assets)

The total price of the sold item

Sales and administrative expenses

On the other hand, we want to examine the relationship between efficiency and the cost of equity, the method of calculating the cost of equity through Gordon's growth model (Damodaran, 2002) is as follows

In this model, assuming that  $k$  represents the capital cost of ordinary shares (the expected rate of return of ordinary shareholders) can be obtained from the following equation :

$$\text{Cost of equity} = \frac{D_1}{P_0} + g$$

In the above model

$D_1$  ,cash interest paid at the end of the first year :

$P_0$  The price of each share at the beginning of the year :

$g$  .Dividend profit growth rate obtained from the following equation :

$$g = \left[ \frac{EPS_t}{EPS_0} \right]^{\left( \frac{1}{t} \right)} - 1$$

Finally, the following model is tested to check the research hypotheses (Mozo et 2019).

$$y_t = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + \alpha_5 x_5 + \varepsilon_t$$

where in:

Performance rating of each company in each year	$x_1$
size of the company	$x_2$
The ratio of debt to total assets	$x_3$
Ratio of profit to total assets	$x_4$
Sales growth	$x_5$

#### 4-Research findings

The companies studied in this research include pharmaceutical companies during the years 1394 to 1398 which are active in Tehran Bahadur Stock Exchange, these companies are ,19 companies, the names of the companies are given in table(1).

**Table(1)Sample member companies :**

Company Name	Row	Company Name	Row	Company Name	Row
--------------	-----	--------------	-----	--------------	-----



Daru Luqman	3	elixir medicine	2	Alborz Daru	<b>1</b>
Drug chemistry	6	Daro Amin	5	Iran drug	<b>4</b>
Injectable	9	Daru Jabra bin	8	Pars Daru	<b>7</b>
product		Hayan			
Pharmaceutical	12	Daru Zahrawi	11	Dispensing	<b>10</b>
factories				materials	
Darurozak	15	Daru Farabi	13	Daro Aburihan	<b>13</b>
Sina Daru	18	Kausar	17	drug	<b>16</b>
		Pharmaceuticals			
				Kimidaro	<b>19</b>

Due to the fact that in this research, to calculate the efficiency and companies, the cross-efficiency method is used in data coverage analysis, so to use this model, we need to determine the inputs and outputs, to determine them any index. The decrease of which is considered by the decision maker is called the input index and any index whose increase is considered by the decision maker is called the output index. Based on this, the research variables are divided into the following two categories.

#### Input variable:

Number of employees, company size, cost of goods sold, sales and administrative expenses

#### Output variable:

Competitive power

The results of performance evaluation using the data envelopment analysis model are given in table(2) .below

**Table2 Efficiency of pharmaceutical companies in the stock exchange :**

Cross efficiency score in 2018	Cross efficiency score in 2017	Cross efficiency score in 2016	Cross efficiency score in 2015	Cross efficiency score in 2014	Company
0.52	0.57	0.60	0.88	0.97	1
0.66	0.72	0.93	0.64	0.56	2
0.61	0.71	0.85	0.68	0.68	3
0.57	0.61	0.79	0.65	0.69	4
0.56	0.61	0.76	0.76	0.72	5
0.60	0.70	0.87	0.86	0.80	6
0.30	0.34	0.25	0.73	0.86	7
0.61	0.71	0.86	0.66	0.64	8
0.53	0.58	0.62	0.95	0.80	9
0.52	0.57	0.59	0.96	0.91	10
0.52	0.57	0.59	0.70	0.85	11
0.78	0.88	0.55	0.59	0.53	12
0.79	0.89	0.52	0.57	0.49	13
0.78	0.90	0.52	0.64	0.51	14
0.56	0.62	1	0.70	0.67	15
0.40	0.44	0.38	0.84	0.74	16
0.64	0.69	0.96	0.62	0.62	17

0.48	0.51	0.95	0.63	0.82	18
0.58	0.63	0.80	0.89	0.94	19

In addition, we continue to determine the relationship between the calculated cross-efficiency for pharmaceutical companies and the equity of these companies. Multivariate regression method was used to estimate the model and the results are presented in Table3.

**Table 3 Coefficients of the regression model of the research :**

Possibility	Amare	standard	Coefficients	Variables	
T		deviation			
0.233	1/214-	0.738	0.896	Fixed coefficient	<b>c</b>
0.002	3/369	0.174	0.589	Performance score	<b>x1</b>
0.123	1/581	0.113	0.180	size of the company	<b>x2</b>
0.04	2/139	0.123	0.263	Debt-to-asset ratio	<b>x3</b>
0.001	3/575	0.273	0.978	Profit to asset ratio	<b>x4</b>
0.425	807/0	0.114	0.92/0	Sales growth	<b>x5</b>

The coefficient of determination	of	0.757	The mean of the dependent variable	0.569
Adjusted coefficient of determination	of	0.719	standard deviation of the dependent variable	0.213
Standard deviation of regression	of	0.112	Akaike criterion	1/381
The sum of the remaining squares		0.407	Schwartz criterion	123/1
Log likelihood		32/255	Hanan Quinn criterion	1/289
F statistic		20	Watson camera statistics	2/06
ProbabilityF statistic		0.000		

According to the estimation results of the first hypothesis model in Table3the effect of , the efficiency variable on the cost of equity is0.589 which is statistically significant at the . 95 ) level % $p < 0.05$  ). Therefore, with the increase of one unit of efficiency, the cost of shareholders' rights will increase by0.589.

Also, the influence of control variables debt-to-asset ratio at the rate of0.263and profit-to- .

- asset ratio at the rate of 0.978 on the dependent variable i.e. cost of equity is significant and the effect of company size and sales growth on cost Rights owners take stock It was not ) significant in the studied period  $p > 0.05$  .(

The criteria of coefficient of determination, adjusted coefficient of determination, standard deviation of regression , residual sum of squares , Akaike's criterion , Hanan-Quinn criterion and Schwartz's criterion indicate a good fit so that the larger the coefficient of determination and the adjusted coefficient of determination and other introduced criteria are. If they are less, the fit of the model is better

## 5-Conclusions and suggestions

In this thesis, data coverage analysis method was used to rank pharmaceutical companies that are members of Tehran Stock Exchange. In order to use this model, it was necessary to determine the inputs and outputs. To determine them, any index that the decision maker wants to decrease is called an input index, and any index that the decision maker wants to increase is called an output index. Based on this, the research variables were divided into two categories: input variables and output variables. Then, in order to collect information for the companies in question, the documents and annual reports of the companies were used. Also, to collect additional information related to some criteria, the database of each of the companies was referred to and the data related to the input and output for 5 It was collected from 1394-1398 The ranking of companies was done using the cross efficiency model in two stages. The evaluation results are the unique ranking of companies using this method. Also, after statistical inference, we came to the conclusion that between Score Performance cross And Cost Rights owners Fund At Company Hi accepted done At Exchange papers Bhadar Tehran Relationship meaningful Existence has it . According to the research results, there is a positive relationship between the level of efficiency of the company in competitive power and the cost of equity, in other words, as the level of efficiency of the company in competitive power increases, the cost of equity also increases

Finally, the relationship between Performance Company I see And Rights owners Stocks were determined. Based on the results of model estimation using multivariate regression method, it was determined that the effect of efficiency variable on the cost of equity is 0.589, which is statistically significant at the 95% ) level  $p < 0.05$  ). Therefore, with the increase of one unit of efficiency, the cost of equity will increase by 0.589.

According to the research results, there is a positive relationship between the level of efficiency of the company in competitive power and the cost of equity. In other words, as the level of efficiency of the company increases in terms of competitiveness, the cost of equity also increases

This means that companies that are more efficient in their ability to compete, share more profits. Hence, the cost of capital also increases. From a theoretical point of view, this finding of the current research is consistent with the existing theories about profit sharing and the cost of equity.

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## Simultaneous movement in the markets Digital currency : evidence from wavelet analysis

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### Abstract

wavelet- based methods , we investigate the simultaneous and time - varying movement patterns of the price of cryptocurrencies ; From the daily bilateral exchange rates of the four main cryptocurrencies We use Bitcoin , Ethereum , Lite and Dashcoin First , using wavelet multiple correlation and cross correlation , we identify Bitcoin as a potential market leader . In addition , the multiple correlation of the wavelet location in the price of certain cryptocurrencies is estimated in different time scales . From the results , it was found that this correlation comes from the cyclical nature of the IP period and the price of cryptocurrencies is guided by the movement of the price of Bitcoin be Based on the obtained results , we suggest that A portfolio based on cryptocurrencies can be dangerous at this point in time , because the value of other cryptocurrencies is mainly guided by the price of Bitcoin and further by Any shock will immediately change to the aforementioned price \_ forever

**Keywords:** Bitcoin , simultaneous movement, cryptocurrencies , wavelet

### 1. Introduction

Cryptocurrencies are the latest additions to financial instruments and have attracted more attention in recent times (Urquhart, 2018). Bitcoin was the first such asset to be launched in 2009 immediately after the 2008 financial crisis. In the early days, people were skeptical about this new product. However, over the past two years, demand for Bitcoin has grown exponentially, and the market has seen tremendous growth both in terms of market capitalization and the introduction of new crypto assets. The number of cryptocurrencies has increased from 500 in 2014 (White, 2015) to 1,560 as of April 8, 2018. The increase in market capital as well as the introduction of new property points led to the liquidity of the market and the activation of investors. However, regardless of this upward movement, there are serious concerns about various dimensions of the cryptocurrency markets.

The high volatility of the cryptocurrency market is a serious concern. Cryptocurrency markets are shallow and superficial compared to traditional financial markets ( Bome et al. 2015). In such a market, any shock or fluctuation may be easily transmitted to the market leader and

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cause the market to collapse. In addition, the cryptocurrency market, unlike traditional financial markets, allows for an equal distribution of assets. First generation miners and investors had relative ease to mine and buy crypto assets (Smith and Kumar 2018). Based on this, there is a possibility of price engineering movement. Gundal and colleagues (2018) found evidence of suspicious trading activity on the MetGox exchange in 2013.

Another dimension is the use of cryptocurrencies. In addition to gambling, online games, possible money laundering (Moser et al., 2013) and cross-border transactions, speculation is also considered one of the important incentives related to cryptocurrencies (Smith and Kumar 2018). Glaser et al. (2014), argue that the utility of crypto-assets stems from their attractiveness as an asset class. A similar argument was presented by Baur et al. (2018), which is based on their analysis of the value and frequency of transactions in blockchain.

As cryptocurrencies merge with traditional financial assets (see Toney et al. 2018; Khaled et al. 2018 and Henriques and Sadorsky 2018), investor attention and market liquidity will likely increase. In such a scenario, it is of great importance to investigate the potential of diversification in the cryptocurrency market. However, the available research on this phenomenon is rare. Our article deals with this issue.

The rest of this paper is structured as follows: Section 2 provides the research background of the articles, Section 3 discusses the data and methodology employed. Section 4 presents the estimation results and its explanation, while Section 5 provides concluding remarks.

## 2. Research background

Most of the research in the cryptocurrency market can be categorized into the following: a) Price determination and value formation (Urquhart 2017; Van Alstyne 2014; Yermak 2013; Ali et al. 2014; Glaser et al. 2014; Kristofek 2015; Siyayan et al. 2016; Boyer et al. 2016; Blau 2017; Zhou et al. 2017), b) fluctuations (Katsiampa 2017; Jiang et al. 2017; Dwyer 2015; Boyer and Salmi 2016; Dyberg 2016), c) speculative bubbles (Chia and Fry 2015; Chong et al. 2015; Godsif 2015; Chia and Fry 2015; Urquhart 2016; Nadarajah and Chu 2017) and d) forecasting and foresight of different cryptocurrencies (Hai. Zot 2018; Catania et al. 2019).

There are a number of studies that discuss the simultaneous movement of Bitcoin and other financial instruments. A 2015 study by Chu et al found evidence supporting the convergence of Bitcoin exchange rates with conventional exchange rates. Peters and Vivanco (2017) examine the co-accumulation between They paid different bitcoin exchange rates and found that bitcoin does not obey the law of one price. In a similar review, Dirikan and Kanoz (2017) found evidence supporting long-term co-movements between Bitcoin and major stock indices. Salman and Razzak (2018), using Johansen's cointegration method, investigated the cointegration between Bitcoin price and its determinants and found supporting evidence for cointegration. In a recent review, Siyayan And Rajkaniova (2018), ARDL method (autoregressive distributed delay model) implemented and found that Bitcoin price movement and other cryptocurrency price movements are independent of each other.

It is clear from the literature that, except for a few studies (Bomeh et al. 2015; Narayanan et al. 2016; Smith and Kumar 2018), there is no comprehensive research that deals with the dynamics of the cryptocurrency market alone. Considering that the cryptocurrency market is evolving as an independent market segment, examining the dynamics of the cryptocurrency market separately will be very useful for researchers and investors. Our goal is to fill this gap and we try to address this issue in detail. We examine the simultaneous movement of four major cryptocurrencies over the past 3 years, during which the crypto market began to liquidate. Considering the fact that the cryptocurrency market may be filled by investors with different time horizons (Delfin Vidal and Romero Melendez 2016); We abandon traditional time series methods and adopt a comprehensive wavelet-based method. Wavelets are preferred because of their ability to extract information from different time series without losing their time



dimensions. The reason for choosing the wavelet-based analysis is presented in the methodology section.

First, we identify the potential market leader using multi-wavelet correlation and multi-wavelet cross-correlation. After that, we estimate the evolution of the local dynamics by estimating the local multiple correlation of the wavelet of the four cryptocurrencies under consideration and see if the dynamics of the multiple correlation structure can be explained by the price movement of the potential market leader

### 3. Data and research method

use the daily prices (in USD) of four major cryptocurrencies namely Bitcoin, Ethereum, Lite and Dashcoin from August 7, 2015 to March 24, 2018 for our analysis purposes. We choose these four major cryptocurrencies because they represent a fair share of the market in terms of market cap. In addition, we have six random cryptocurrencies named RedCoin, DigixDow, LuckyCoin, Bitmark, EdgeCoin And That Optinium We choose for comparison purposes. The data was collected from a cryptocurrency data aggregation website, coinmarketcap.com. There were no missing values.

Here, a wavelet-based method is used to investigate the time-varying nature of joint movements in the cryptocurrency market at different scales. We only look at short to medium term dynamics as the cryptocurrency market is still in its infancy. While standard time/frequency domain tests can provide information about the possible presence of co-movement among multivariate time series, these tests have serious limitations. First, while they can detect the presence of long-term co-movement and short-term modulation, these tests cannot provide statistics and quantify the amount of co-movement. Due to the fact that agents with different trading time horizons operate in financial markets (Delfin-Vidal and Romero-Melendez 2016), the nature of the relationship between these markets may be different in different time scales. Traditional time series measurements can only provide measurements at a certain frequency. Wavelet methods have been used to transmit information at different frequencies without losing the time dimension.

Multiple wavelet correlation criterion ( WMC ) proposed by Macho (2012), can overcome these two shortcomings. The wavelet multiple correlation coefficient measure can provide the power of simultaneous movement among a multivariate time series in different time scales, as a result, it is possible to distinguish between short-term, medium-term and long-term relationships. Similarly, Mako Wavelet Multiple Cross Correlation (hereinafter referred to as WMCC in the article) suggests in this article. The WMCC provides a measure to identify a potential leader among the group that can influence other variables in the group.

These measures are better in terms of parsimony compared to the traditional wavelet correlation measures and cross-correlation measures. If we have 5 markets, we should Wavelet correlation diagrams  $n(n-1)/2 = 10$  and Compute the J wavelet cross-correlation (order of - wavelet decomposition), which leads to a tedious process. If we use WMC and WMCC methods, we only need to draw J- correlation diagrams and J- cross-correlation diagrams.

Furthermore, in a multivariate context, the pairwise correlation coefficient can be spurious due to the possible association of one variable with other variables. WMC and WMCC estimate overall correlations in a multivariate framework at different time scales and make the results easier to interpret

Multiple local wavelet correlation (henceforth, referred to in the article as WMLC) by Fernandez-Macho (2018) proposed, development Macho (2012) It is called While WMC and WMCC provide a general measure of the correlation of a multivariate field, WMLC provides the same local measure so that the evolution of multiple wavelet correlation values over time can be investigated. First, we briefly explain the estimation of WMC and WMCC. In the next step, a detailed explanation of the WMLC estimation will be given.

Multiple wavelet correlation is explained as follows

, Suppose  $\{X_t\}$  is a multivariate stochastic process and suppose  $\{W_{jt}\}$  are the corresponding wavelet coefficients of level  $j$  which are obtained by applying the maximum overlap discrete wavelet transform MODWT.  $\phi_x(\lambda_j)$  is obtained. The wavelet multiple correlation (WMC)  $\phi_x(\lambda_j)$  can be expressed as a single set of multiscale correlations calculated from  $X_t$  defined

At each wavelet scale  $\lambda_j$ , The square root of the regression coefficient of the linear combination of variables  $W_{ijt}$ ,  $i=1,2,\dots,n$ , whose coefficient of determination is maximum. can be the coefficient of determination related to the regression of variable  $Z_i$ . In a set of regressions  $\{Z_k, k \neq i\}$  as  $R_i^2 = 1 - 1/\rho^{ii}$  Earned in that  $\rho^{ii}$ , the  $i$ -element th diagonal of the correlation matrix. It is the complete inverse of  $P$ .

WMC  $\phi_x(\lambda_j)$  is obtained as follows

1

$$\phi_x(\lambda_j) = \sqrt{1 - \frac{1}{\max \text{diag } P_j^{-1}}}$$

where  $P$  is the  $N \times N$  correlation matrix of the  $W_{jt}$  and coefficient the  $\max \text{diag}(\cdot)$  operator selects the largest element in the diagonal elements. Since the coefficient  $R_i^2$  can be equal to the square of the correlation between the observed values  $z_i$  of and the fitted values  $\hat{z}_i$  from such a regression showed (see the appendix)  $\phi_x(\lambda_j)$ : It can also be expressed as follows

2

$$\phi_x(\lambda_j) = \frac{\text{Corr}(\omega_{ijt}, \hat{\omega}_{ijt})}{\sqrt{\text{Cov}(\omega_{ijt})} \sqrt{\text{Var}(\hat{\omega}_{ijt})}}$$

:where wavelet variances and covariances are defined as follows

$$\begin{aligned} \text{Var}(\omega_{ijt}) &= \frac{1}{T_{jt}} \sum_{j=1}^{T-1} \omega_{ijt}^2 \\ \text{Var}(\hat{\omega}_{ijt}) &= \frac{1}{T_{jt}} \sum_{j=1}^{T-1} \hat{\omega}_{ijt}^2 \\ \text{Cov}(\omega_{ijt}, \hat{\omega}_{ijt}) &= \frac{1}{T_{jt}} \sum_{j=1}^{T-1} \omega_{ijt} \hat{\omega}_{ijt} \end{aligned}$$

where in  $\omega_{ijt}$  the collection in  $O$  of regression  $s\{w_{kj}, k \neq i\}$  leading to the maximum, The coefficient is determined  $\hat{\omega}_{ijt}$  it shows the fitted values. The number of wavelet coefficients under the influence of the boundary associated with the wavelet filter with length  $L$  and scale  $\lambda_j$  is calculated as follows

$$L_j = (2^j - 1)(L - 1) + 1$$

Then the number of wavelet coefficients under the influence of boundary conditions is  $\tilde{T}_j = T - L_j - 1$ . it will be obtained

By assuming a delay  $\tau$  between the observed and fitted values of the selected variables as the criterion variable in each scale  $\lambda_j$  we can calculate the wavelet multiple cross-correlation, (hereafter referred to as WMCC). Define as follows

$$\phi_{X;\tau}(\lambda_j) = \frac{\text{Corr}(\omega_{ijt}, \hat{\omega}_{ijt} + \tau)}{\sqrt{\text{Cov}(\omega_{ijt})} \sqrt{\text{Var}(\hat{\omega}_{ijt} + \tau)}}$$

$n=2$  in WMC and WMCC is like standard wavelet correlation and cross correlation. However, since WMC and WMCC failed to explain the evolution of potential local nonlinear dynamics, Macho (2018) proposed WMLC (Wavelet Multiple Local Correlation) as an additional part of the WMC method. The method is as follows. Let  $X$  be considered as a multivariate time series and be  $W_{\lambda_j}(t) = (w_{1j}(t), w_{2j}(t), \dots, w_{nj}(t))$  the wavelet coefficients  $\lambda_j$  obtained by applying a MODWT to all  $x \in X$  it will be obtained. Following Macho's study (2012), in each wavelet scale  $\lambda_j$ , we calculate the square root of the regression coefficient in the linear combination of variables  $w_{ij}(t)$ ,  $i=1, 2, \dots, n$ , where the coefficient of determination is maximum. The coefficient of determination related to the regression of the variable  $Z_i$  on a set of regressions  $\{Z_k, k \neq i\}$  as  $R_i^2 = 1 - 1/\rho^{ii}$  and in which  $\rho^{ii}$ ,  $i$  is the diagonal element of the complete inverse correlation matrix  $P$ .  $\Phi_{XS}(\lambda_j)$  It is obtained as follows

3

$$\Phi_{XS}(\lambda_j) = \sqrt{1 - \frac{1}{\max \text{diag } P_{j;s}^{-1}}}$$

where the  $P_{j;s}$  is  $n \times n$  weighted correlation matrix in  $W_{j,t}$  with weights  $\theta(t-s)$  and the  $\max \text{diag}(\cdot)$  operator selects the largest factor in the diagonal argument. Since the coefficient  $R_i^2$  can be equal to the square of the correlation between the observed values  $z_i$  of and the fitted values  $\hat{z}_i$ , from such a regression showed  $\Phi_{X,S}(\lambda_j)$ : It can also be expressed as follows

(4)

$$\begin{aligned} \Phi_{X,S}(\lambda_j) &= \frac{\text{Corr}(\theta(t-s)^{1/2} \omega_{ijt}, (\widehat{\theta(t-s)^{1/2} \omega_{ijt}})^{1/2} \hat{\omega}_{ijt})}{\text{Cov}(\theta(t-s)^{1/2} \omega_{ijt}, (\widehat{\theta(t-s)^{1/2} \omega_{ijt}})^{1/2} \hat{\omega}_{ijt})} \\ &= \frac{\text{Cov}(\theta(t-s)^{1/2} \omega_{ijt}, (\widehat{\theta(t-s)^{1/2} \omega_{ijt}})^{1/2} \hat{\omega}_{ijt})}{\sqrt{\text{Var}(\theta(t-s)^{1/2} \omega_{ijt})} \sqrt{\text{Var}(\theta(t-s)^{1/2} \hat{\omega}_{ijt})}} \end{aligned}$$

To

$$s = 1; 2 \dots T$$

where in  $\omega_{ijt}$  To maximize  $\Phi_{X,S}(\lambda_j)$  is chosen. By applying MODWT to multivariate time series  $X$  with order  $J$  we can obtain  $J$  number of MODWT coefficients of length  $T$ ,

$$\tilde{W}_j = \{W_{j0}, W_{j1}, \dots, W_{j,T-1}\}.$$

By equation (1), the scale  $\lambda_j$  The WLMC method is a non-linear function of all  $W_{j,t}$   $n(n-1)/2$  weighted correlations. On the other hand, as shown in equation (2), it can be expressed in terms of all weighted variances and covariances  $W_{j,t}$  explained. Hence, the adaptive WLMC estimator can be derived based on MODWT as follows

$$\begin{aligned} \phi_{X,S}(\lambda_j) &= \sqrt{1 - \frac{1}{\max \text{diag } \tilde{P}_{j;s}^{-1}}} \\ &= \frac{\text{Cov}(\theta(t-s)^{1/2} \tilde{\omega}_{ijt}, (\widehat{\theta(t-s)^{1/2} \tilde{\omega}_{ijt}})^{1/2} \hat{\tilde{\omega}}_{ijt})}{\sqrt{\text{Var}(\theta(t-s)^{1/2} \tilde{\omega}_{ijt})} \sqrt{\text{Var}(\theta(t-s)^{1/2} \hat{\tilde{\omega}}_{ijt})}} \end{aligned}$$

:where the variance and covariance of the weighted wavelet can be estimated as follows

$$\text{Var}(\tilde{\omega}_{ijt}) = \frac{1}{T_j} \sum_{t=L_j-1}^{T-1} \theta(t-s) \tilde{\omega}_{ijt}^2 \quad s = 1, 2, \dots, \hat{T} \text{ To}$$

$$\text{Var}(\hat{\tilde{\omega}}_{ijt}) = \frac{1}{T_j} \sum_{t=L_j-1}^{T-1} \theta(t-s) \hat{\tilde{\omega}}_{ijt}^2 \quad s = 1, 2, \dots, \hat{T} \text{ To}$$

$$\text{Cov}(\omega_{ijt}, \hat{\omega}_{ijt}) = \frac{1}{T_j} \sum_{t=L_j-1}^{T-1} \theta(t-s) \hat{\omega}_{ijt} \hat{\omega}_{ijt}$$

$\hat{\omega}_{ij}$  It is chosen so that the regression  $\hat{\omega}_{ij}$  On a set regressions of  $\{\tilde{w}_{kj}, k \neq i\}$  leads to the maximization of the coefficient of determination  $\hat{\omega}_{ij}$  It shows the fitting values. The number of wavelet coefficients affected by the boundary associated with the wavelet filter of length  $L$  and scale  $\lambda_j$  It is calculated as  $L_j = (2^j - 1)(L - 1) + 1$ . Then the number of wavelet coefficients without influence. Boundary conditions as  $\tilde{T}_j = T - L_j - 1$  it will be obtained confidence intervals using Fisher's transformation. Fisher transform is defined as creates  $\text{arctanh}(r)$ ; where  $\text{arctanh}(\cdot)$  is the inverse hyperbolic tangent function and  $r$  is the sample correlation value

and it is used to construct the confidence interval of the population correlation, which is based fact that if the on  $X, Y$  ( $\text{byp} = \text{Corr}(X, Y)$ ) follows a bivariate normal distribution, then one can approximate the transformed sample correlation coefficient calculated from pairs of independent observations  $T$  to be normally distributed by mean  $\text{arctanh}(r)$  and variance  $(T - 3)^{-1}$ . Here, the confidence intervals by applying this method to the local multiple correlation coefficient of the sample wavelet  $\tilde{\Phi}_{X,s}(\lambda_j)$ : It is estimated as follows

Suppose  $\{X_t\}$  the realization of a multivariate Gaussian random process and suppose

$$\tilde{W}_j = (\tilde{W}_{j0} \dots \tilde{W}_{j,T-1}) = \left\{ \tilde{W}_{j1j0} \dots \tilde{W}_{jnjo}, (\tilde{W}_{1j1T} \dots \tilde{W}_{1jT-1}) \right\}, j = 1, 2, \dots, J$$

be the vectors of wavelet coefficients that apply a MODWT of order  $J$  to each of the univariate time series  $(x_{i1}, x_{i2}, \dots, x_{iT})$  are obtained  $i = 1, 2, \dots, n$ . If  $\tilde{\Phi}_{X,j}(\lambda_j)$  is the multiple local correlation of the sample wavelet obtained from equation (1), then  $\tilde{z}_j \sim \text{FN}(z_j, (T/2^j - 3)^{-1})$  where  $z_j = \text{arctanh}(\tilde{\Phi}_{X,s}(\lambda_j))$ ,  $\tilde{z}_j = \text{arctanh}(\tilde{\Phi}_{X,s}(\lambda_j))$  and FN stands for Cloned normal distribution. Is

100(1 -  $\alpha$ )% confidence interval for the true value  $\phi_{X,\tau}(\lambda_j)$  as

$$\text{CI}_{1-\alpha}(\phi_{X,\tau}(\lambda_j)) = \tanh(\tilde{z}_j - c_2 / \sqrt{T/2^j - 3}; \tilde{z}_j + c_1 = \sqrt{T/2^j - 3})$$

It turns out that in it  $c_1$  And  $c_2$  Critical values are normalized

As by Fernandez-Macho 2018 It was suggested, we choose a Gaussian window with length  $M = N/2^4$ .

#### 4. Results and discussion

Before starting the wavelet analysis, we want to see if there is long-term cointegration between the variables in question. In this regard, we apply Johansen's (1992) convergence test on four cryptocurrency prices. The result is presented in Table 1. From the results, it can be seen that there is a relationship between the analyzed cryptocurrencies and we move towards the wavelet analysis (Figure 1)

First, we want to see if we can identify Bitcoin as a potential market leader. For this purpose, from multiple wavelet correlation (WMC) and multiple wavelet correlation (WMCC) We use and obtain the results of the overall analysis period. Estimates are made from scales of 2-4 days (intra-week scale) to 16-32 days (monthly scale). The obtained results are shown in Figures 2 and 3.

Here, we see that the market is moderately correlated over the period of analysis. And on each scale, the cryptocurrency that maximizes the correlation value is plotted against a linear combination of other cryptoassets. Across all 4 scales, Bitcoin is the one found to maximize WMC, indicating Bitcoin as a potential leader/follower. In the next step, we try to confirm this

fact by estimating the wavelet multiple cross-correlation in the 36-day lag/advancement. The results are shown in Figure 2.

A cross-correlation chart explains the potential lag-acceleration relationship between cryptocurrency prices. Here, the cryptocurrency that maximizes the multiple correlation value against the linear combination of other currencies is shown in the top corner of the scale chart of all scales. We can see that Bitcoin maximizes WMC against other currencies on all scales.

However, since the highest WMCC value is achieved at zero delay, we cannot conclude that Bitcoin is ahead or behind other cryptocurrencies based on the test results alone. However, given that the Bitcoin account has the highest market capitalization in the cryptocurrency market, it can be assumed that Bitcoin is the market leader in the cryptocurrency market. Since WMCC identifies Bitcoin as a potential leader/follower, our assumption is not just based on simple observations, but is supported by statistical evidence

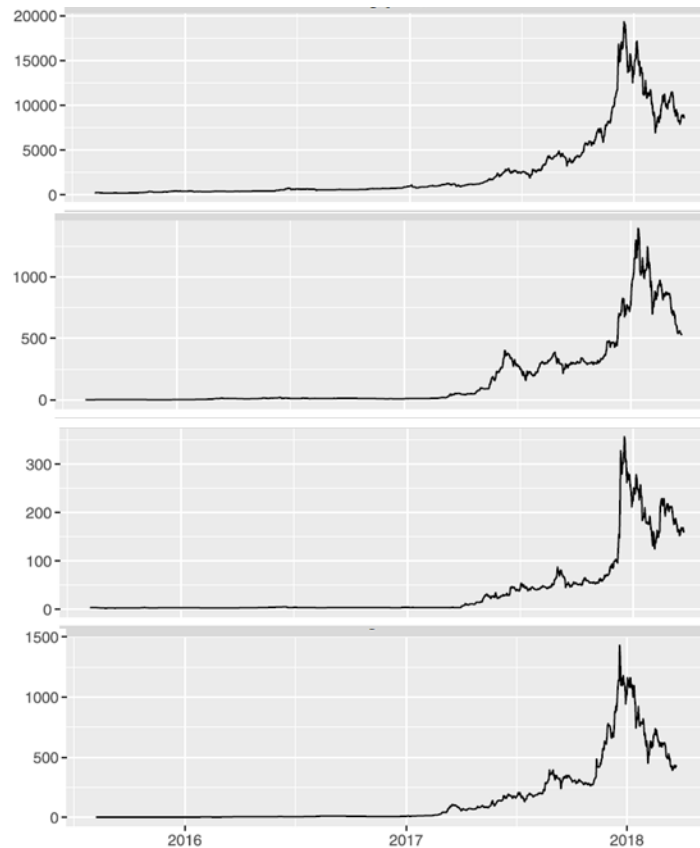
The next step in the analysis would be to obtain a detailed timeline of major price swings for the market leader. Details of important events in the Bitcoin price movement are provided in Table 2. If after this event, the price of bitcoin increases, we call the event positive, and similarly, any event that leads to an immediate drop in price is called a negative event.

### Integration relationship between cryptocurrencies Table 1

Unlimited Cumulative Rank Test (Maximum Eigenvalue)				
The probability of <sup>a</sup>	Critical value 0.05	Maximum Amounts special	special amount	hypothesis number (s)
0/0368	32.11832	33.19537	0.034127	nothing <sup>a</sup>
0.7628	25.82321	13.51833	0.014041	Maximum1
0.9534	19.38704	6.055783	0.006314	Maximum2
0.6117	12.51798	4.893530	0.005106	Maximum3

The maximum eigenvalue test indicates 1 cointegrated equation(s) at the 0.05 level

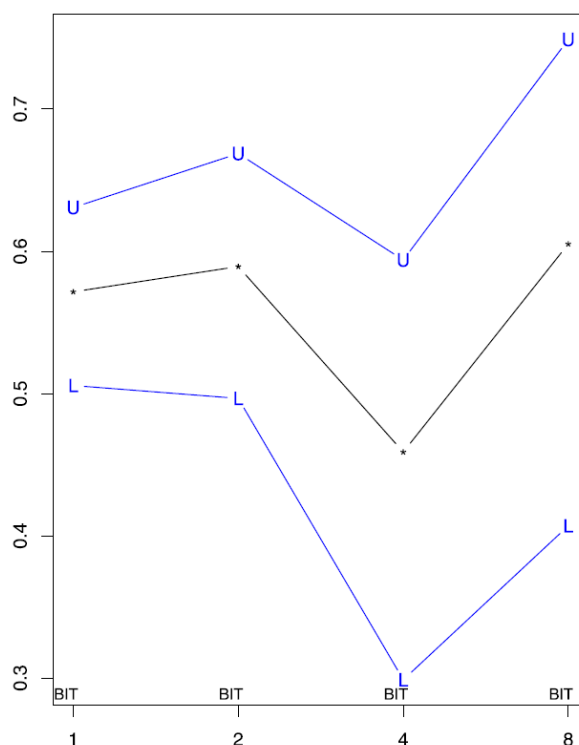
<sup>A</sup> shows the rejection of the hypothesis at the 0.05 level



**figure1 - The design of the time of cryptocurrencies**

During the analysis period, from the mentioned events, we can get a perspective on the conditions governing the Bitcoin markets. Our goal is to identify any potential patterns in the simultaneous movements of cryptocurrencies and see if we can correlate it with Bitcoin price movements. If the values of WLMC decrease with a negative news and increase with a positive news; We can confirm that the market is affected by changes in the price of cryptocurrencies. In this regard, we present the results of WLMC estimation; which is shown in figures 4, 5, 6 and 7





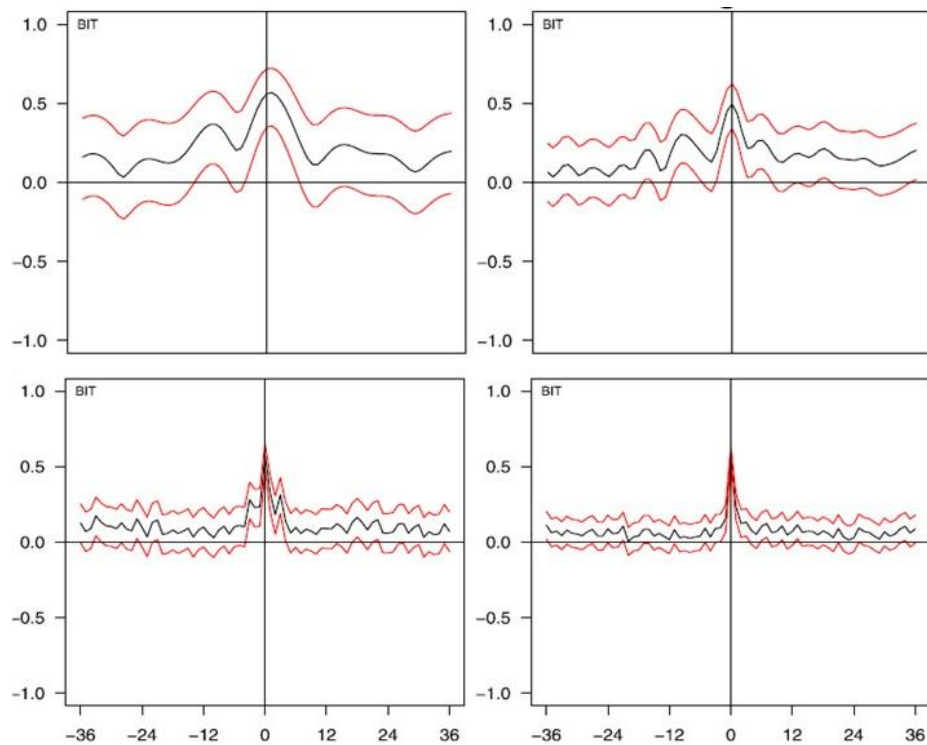
**Figure2-Wavelet Multiple Correlation for Cryptocurrency Prices**

By looking at WLMC values at different time scales, we can see a number of common factors. First, the correlation between markets is high at all time scales. Second, the nature of the correlation changes periodically and, of course, non-oscillating. Moreover, markets generally record the highest correlation values in early periods (Jan-2016). It takes almost 2 years for the market to reach the same high, and the intervening periods are marred by frequent fluctuations. As we move from smaller scales (high frequency) to larger scales (low frequency), the cyclical nature of the WLMC becomes smoother, meaning that the dominant fluctuations in the co-movement of cryptocurrencies are mostly short-term in nature.

In the following paragraphs, we present possible explanations behind the cyclic nature of joint movement. As we identified Bitcoin as a potential market leader with the help of wavelet correlation and correlation analysis, we try to explain WLMC based on specific events related to Bitcoin price.

WLMC values show a decreasing trend between August and September 2015. During this time, two major events occurred in the Bitcoin market. First, the arrest of CEO of the defunct cryptocurrency exchange Matt Gox, and then, the announcement of the Bitcoin fork. These two events led to a decrease in the value of Bitcoin, which is probably due to positive events such as the inclusion of Bitcoin in the list of goods in the United States, the elimination of value added tax by the European Union and the launch of the new Gemini exchange, providing a kind of insurance coverage to the capital. Recovery is shown in increasing WLMC values at all scales.

In January 2016, Mike Hearn, a major developer of Bitcoin, abandoned it, causing panic in the \$ crypto markets. This was reflected by a drop of about 35% in the price of Bitcoin. Later, WLMC was launched around April 2016, which coincided with the launch of the new OpenBazaar software, associated with Bitcoin, which was considered a better platform for transactions.



**Figure 3 . Correlation \_ Multiple wavelet reciprocals \_ Cryptocurrencies**

In July 2016, according to the Bitcoin issuance system, the Bitcoin block reward was reduced. This in turn led to an increase in the initial price of Bitcoin. However, immediately the correlation between Bitcoin and other markets decreases. One of the reasons for this behavior can be the fact that with the increase in the difficulty of obtaining Bitcoin, some miners and investors turn to other options and as a result, the wavelet correlation values decrease. The correlation hit its lowest point in August 2016, when the Hong Kong-based cryptocurrency exchange BitFinex was hacked. WLMC peaked again in November 2016, interestingly coinciding with the election of Donald Trump as President of the United States. Around this period, stock markets, particularly those in the United States, showed evidence of capital flight to assets traditionally considered safe. Some of these investments have gone to cryptocurrencies (Bouvier and Salmi 2017). and led to an increase in demand and as a result to an increase in prices. However, this abundance appears to be short-lived, as we see a sharp drop in correlation values. This coincides with the opposition of the United States Securities Exchange Commission ( SEC ). It is a crypto-exchange-traded fund ( ETF ) project proposed by the Winklos brothers. However, the correlation increased after Japan recognized Bitcoin as a legal tender.

**Table 2. Important events in the Bitcoin markets**

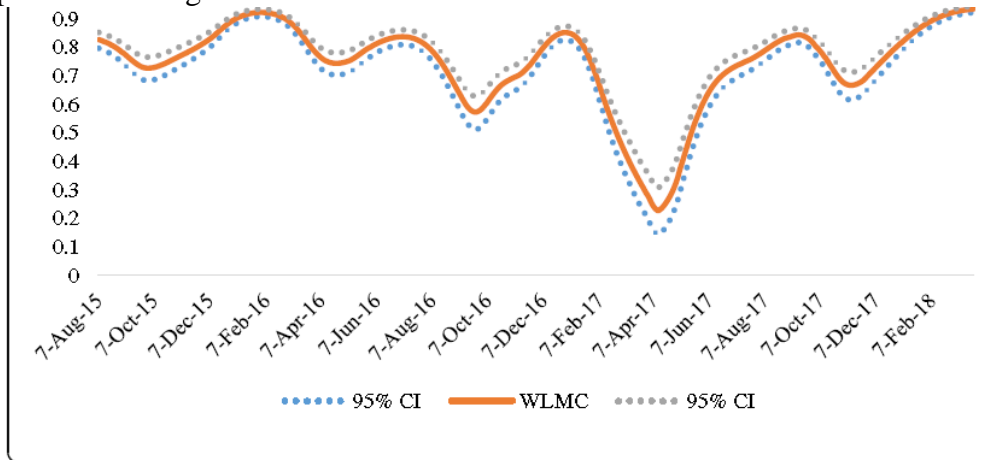
the nature	Bitcoin price reaction (after 10 days)	Event	period
negative	to \$283.04 to \$267.09	Mark Karpels, the CEO of cryptocurrency exchange Matt Gox, has been arrested in Japan .on charges of financial fraud	August 1, 2015
negative	to \$267.34 to \$214.3	A new fork (software upgrade) was released with the name BitcoinXT	August 15, 2015

Positive	\$234.65 to \$238.15	are designated as commodities by the US regulatory agencyCTFC	September 28, 2015
Positive	\$248.45 to \$268.01	was launched byFIDC Insurance	October 8, 2015
Positive	\$273.82 to \$318.43	The European Union does not impose VAT on Bitcoin	October 22, 2015
Positive	\$323.35 to \$366.67	The Bitcoin article was featured on the front page of The Economist	October 31, 2015
negative	\$431.76 to \$397.92	Mike Hearn, the developer, gave up on Bitcoin	January 14, 216
Positive	\$420.61 to \$426.68	A new decentralized market software calledOpenBazaar was launched	April 4, 2016
Positive	\$652.14 to \$674.03	Bitcoin block reward halved	July 9, 2016
negative	\$594.86 to \$591.36	Bitfinex hacked, \$ 72 million lost	August 2, 2016
Positive	\$7,266.36 to \$749.1	Donald Trump was elected as the President of the United States	November 9, 2016
negative	\$1,201.86 to \$1,037.85	Winclos cryptoETF application rejected bySEC in US	March 10, 2017
Positive	\$1,085.03 to \$1,215.69	Japan declares Bitcoin as legal tender	April 1, 2017
Positive	\$2,787.85 to \$3,383.89	Bitcoin is divided into Bitcoin Cash and Bitcoin	August 1, 2017
negative	\$4,668.5 to \$4,223.82	China bansICOs for cryptocurrency	September 3, 2017
negative	\$4,166.59 to \$3,807.07	JP Morgan chairman calls Bitcoin a scam	September 12, 2017
Positive	\$5,682.85 to \$7,261.41	A new fork in Bitcoin launched Bitcoin Gold	October 25, 2017
Positive	\$6,121.79 to \$7,255.21	CMIE Announces Bitcoin Futures	October 31, 2017
Positive	\$7,143.47 to \$7,844.44	The proposed fork has been cancelled	November 8, 2017
Positive	\$14,594.78 to \$17,010.5	CBOE Bitcoin Futures Launched	December 11, 2017

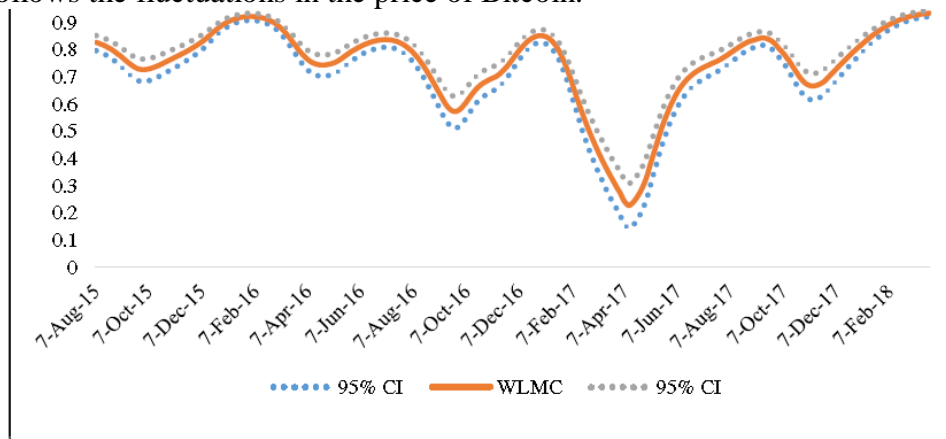
As discussed in the introduction section, in the past few years cryptocurrencies have entered. However, around August 2017, we see a further decrease in WLMC values. The reason for this can be attributed to uncertainty about a potential Bitcoin fork. In August 2017, the fork resulted in a new cryptocurrency called Bitcoin Cash. Around the same time, the Chinese government began cracking down on cryptocurrency markets. Since China is considered one of the main hubs of cryptocurrency activity, this crackdown added to the existing uncertainty and led to a decrease in the value of WLMC. The market appears to have rallied after the Chinese crackdown, with WLMC's rise in value coinciding with positive events such as the listing of Bitcoin by CBS Global Martex Company And CME Trading Group and the proposal to cancel the fork in Bitcoin prices, we are witnessing this.

the market with several new assets. It will be interesting to see how these assets move in the market with respect to the major cryptocurrencies. Our goal is to see if they move against the

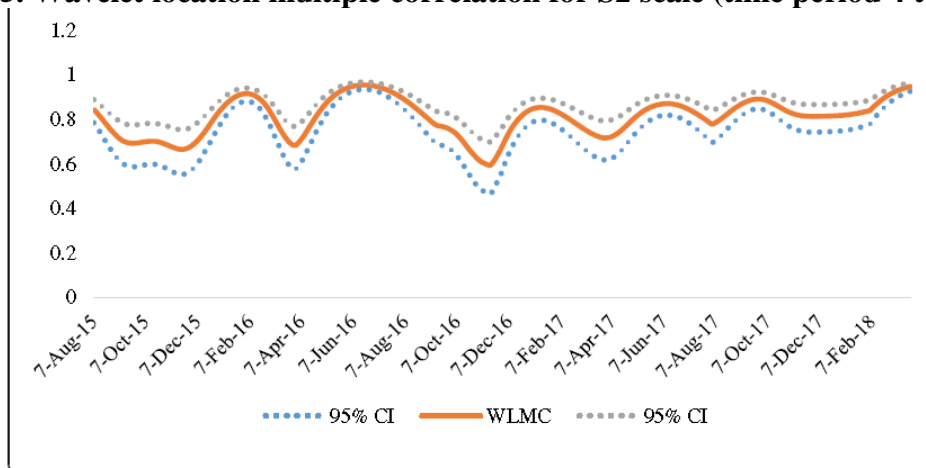
direction of the market. For this purpose, we estimate the WLMC values for the returns of a set of 10 cryptocurrencies. Here are six additional cryptocurrencies named RedCoin, DigixDow, LuckyCoin, Bitmark, EdgeCoin And Anobtinium included in the study. These currencies were randomly selected with different values in the market. The result of WLMC estimation is presented in Figure 1.



**Figure 4 . Wavelet location multiple correlation for scale 1 (time period of 2 to 4 days )**  
 From the results, it can be seen that apart from a fluctuation around 2016, the correlation values are around 1. This presents an interesting picture. Due to the results of WMC and WMCC , Bitcoin is recognized as the market leader. Despite the correlation value of 1 for the larger period, it can be said that the market, especially when we consider the smaller currencies, always follows the fluctuations in the price of Bitcoin.



**Figure 5. Wavelet location multiple correlation for S2 scale (time period 4 to 8 days)**



### Figure 6. Wavelet location multiple correlation for S3 scale (time period 8 to 16 days)

From these cases, we can draw conclusions about the behavior of investors. When the price of Bitcoin falls, the correlation structure between Bitcoin and other currencies collapses, indicating that agents are moving away from crypto assets. But when Bitcoin is on the rise, it is reflected in other crypto assets as well, cementing Bitcoin's position as the market leader. Fluctuations are repeated frequently during the analysis period, which is to be expected as the cryptocurrency market is still in its infancy. It is difficult to comment on whether the cryptocurrency market will become less volatile in the near future. By introducing cryptocurrencies with traditional financial assets, it is likely that a better trading and regulatory framework will be created. However, it is still too early to comment on that and we have no assumptions about it

## 5. Conclusion

We investigated the time-varying simultaneous movement patterns of the cryptocurrency market with the help of wavelet-based methods. The double daily exchange rates of four major cryptocurrencies namely Bitcoin, Ethereum, Lite and Dashcoin from August 7, 2015 to March 24, 2018 were used for analysis. First, Bitcoin using multiple correlation wave and mutual correlation, we identified as a potential market leader. Next, local multiple correlation wave We estimated for the price of the specified cryptocurrencies. Through the results, we can see that the correlation is of a periodic cyclical nature and the price of cryptocurrencies is affected by the movement of the price of Bitcoin.

the demand for digital currency assets and thus the , When the price of Bitcoin is increasing price of other cryptocurrencies increases. Conversely, any drop in the price of Bitcoin is immediately reflected in the price of other cryptocurrencies

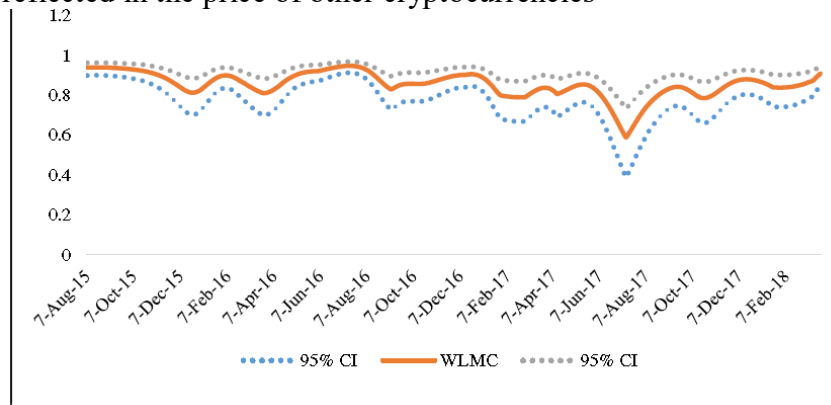
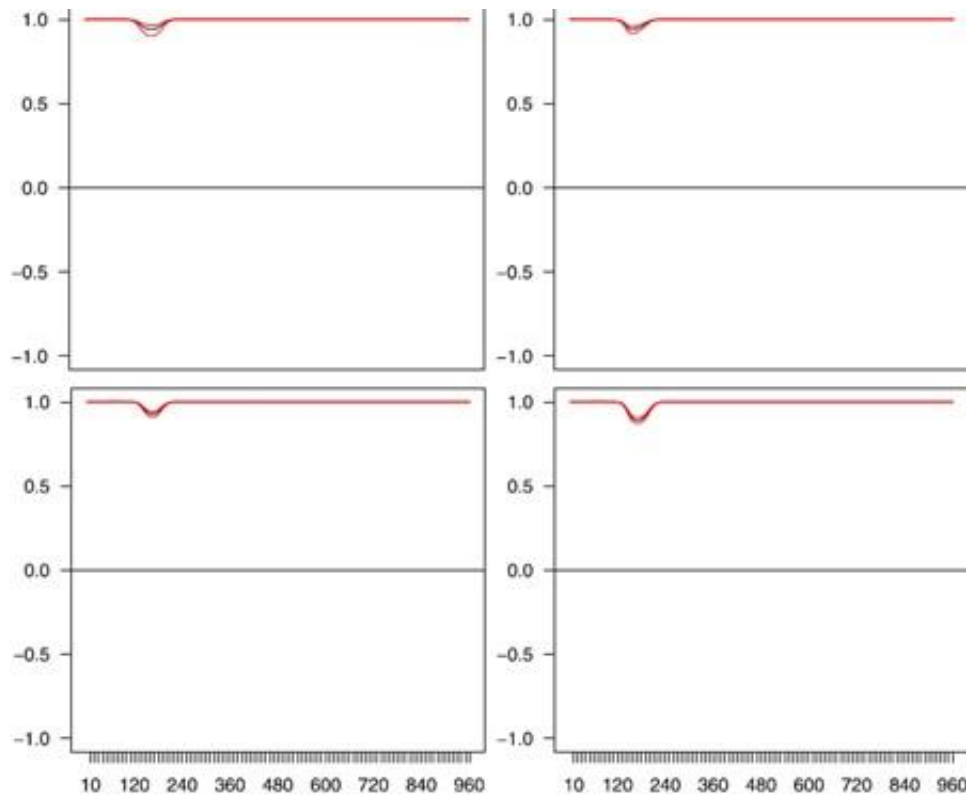


Figure 7. Wavelet location multiple correlation for the S4 scale ( 16 to 32 day time period)



**Figure 8. Wavelet location multiple correlation diagram of ten cryptocurrencies**

From an investor's perspective, this pairing of other cryptocurrencies with Bitcoin creates a dilemma. While crypto assets can act as a hedge in a traditional portfolio along with other assets such as stocks and bonds, we do not recommend building a portfolio consisting entirely of crypto assets. Based on the evidence from the analysis, creating a portfolio based on cryptocurrencies at this point in time can be a risky business, as altcoin prices are mainly influenced by the price of Bitcoin, and any shock in Bitcoin is immediately transmitted to the altcoin. to be

Even looking at the market value out of balance in the cryptocurrency market; With Bitcoin accounting for nearly 50% of the total market capitalization, it would be unwise to build a portfolio that consists entirely of crypto assets.

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## **The role of urban management in the development of urban tourism**

### **Case example Creative City of Isfahan**

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#### **Abstract:**

In the last century, tourism has been recognized as one of the most important tools for improving the quality of economic, social and cultural dimensions in cities. If this industry is used creatively, it has many positive results for both the tourist community and the host community. Therefore, it is necessary to pay attention to the effective factors in tourism development and planning in this field. Therefore, according to the competitiveness of the global arena and the growth of the tourism place, the existence of plans and written approaches is more important than any other It feels like another time . Urban management ,whose purpose is to provide urban services and organization; It has a key role in the organization of urban tourism destinations, in addition to establishing the destination's position in the current competitive era, it provides numerous benefits and advantages in various aspects of the city for local communities and the satisfaction of tourists. In other words, it can be said that tourism development has a close relationship with urban management . existence Research Analysis is descriptive . The tool used Library studies research and Examining authentic documents and documents is the framework of its concept with the examination of texts, publications and articles . Edited and presented.

**keywords :**Urban management, urban tourism, creative city, spatial indicators of creative city, Isfahan

### **1.Introduction**

In today's world, the tourism industry is considered one of the largest and most diverse service industries in the world . Many countries have this dynamic industry The main source of income is employment Reproduction, private sector growth and development They know the underlying structure . Tourism industry to Somewhat in development It is so important for the economy and society of countries that economists called it " invisible exports ] " 35] .Many city officials also consider tourism as a factor to accelerate the process of urban improvement [22] .

To realize tourism development, urban management is the most important tool. In this way, urban management, which is formed from the organization of agents, forces and resources

to manage affairs and respond to the needs of city residents, and includes the functions of planning, implementation, monitoring and control [14] Regarding It organizes and shapes the city, prepares and manages the exploitation of attractions ,improves and restores historical sites, develops green spaces and parks ,advertises and markets tourism capacities of cities and their spheres of influence [6] .Since urban tourism has become a kind of competitive process between metropolises , urban management tries to provide definitions, set goals, judge between various options in the field of investment and purpose, and create a suitable management structure and commercialize urban tourism products . To take an effective step towards sustainable local development. Development of urban tourism by improving quantitative and qualitative dimensions with maximum efficiency is one of the most important activities of executive management of cities{2}

Cities are managed to ensure the well-being and comfort of their residents . Urban management has a wide range of organizations and plays an important role in the success of urban development plans and plans, as well as meeting the needs of the population , traffic flow in the city, public welfare, housing, land use, recreation, culture , Economy is in charge of infrastructure facilities and the like [ 37 ] .The city is considered as a source of development and the position of urban management plays a very important and determining role in the process of city development and urban settlement improvement. From another point of view, urban management can be considered in the direction of a lawful and sustainable development .This case is more important because the way of managing the optimal flow of urban life can play the most important role in improving human settlements and sustainability of urban development [18] .This research is about the role of urban management on development To evaluate the urban tourism industry in the creative city of Isfahan .

## **1.Theoretical**

### **1.1 Urban Management**

The concept of urban management in holistic definitions is beyond the mere concept of managing city affairs and is related to social, political and economic structures and an active role in development . has a city In this view, urban management is a strategic responsibility that also brings operational results and consequences ,and for this reason, its interaction with the fields of power , politics ,society and urban economy is inevitable [34] .City director , Methods and processes is that of Needs and desires to protect and protect humanity [24] and not only includes the management of urban organizations and complexes , but also includes the management of matters related to the process of urban development and functioning at different organizational levels [31] .

Urban management is a broad organization consisting of formal and informal elements that are effective and relevant in various social, economic and physical dimensions of urban life, which manages , controls, guides and develops all It is responsible for the stable side of the city and has a large organization . The main goal of urban management is to create a livable environment for everyone, along with social justice, economic efficiency and sustainability It is environmental and urban management within the boundaries of land and urban housing, social services and the infrastructure of economic and biological development Environmental to It enters seamlessly be [17] .

## 1.2 City tour

Tourism urban, one From The most important And complicated the most Activities \_ Spatial And human place At Society urban is and from 1980s time \_ That cities of many To Side destinations Important in the present Development They were; come in the literature Tourism became [13] .To Opinion Pundits, Tourism urban One the opportunity big cultural, social And economic for Metropolises And Mother cities of global To Existence brings , That this the opportunity Role Very effective At Promotion Quality The life of citizens At Dimensions Different Can \_ performance slow down At fact this industry At Society urban as Activity Fourth urban life On Basis assign to give Spaces special To passing times leisure And needs Different recreational, Heritage, historical Role Very important At structures Spatial, cultural, social And Economic To self assign given [15] .

Urban tourism includes the activities of international and domestic tourists as well as local residents in urban areas to visit natural landscapes, facilities and infrastructure and other attractive urban elements [25] .Urban tourism is a type of tourism activity that takes place in the urban space, and its inherent characteristics are based on non-agricultural economy, such as administration, production, trade and services, and with the existence of transportation hubs [7] .Cities with various attractions including museums, monuments, theaters, sports stadiums, parks , Amusement Park, centers Buy, areas With architecture historical And places \_ related To Accidents Important Or Persons famous, They are often considered important tourist destinations . Volume a lot From Possibilities Tourism Like the place residence, Cedar Food, connections carry And quote And other tourism services, At cities fact are That Visit does From areas Around And self City, From they Use They do [9] .

## 1.3Creative City

Today, attention to the concept of creativity is raised in the world has been and to Constantly growing and learning Is . This concept is based on the use of cultural facilities And Henry to The title of valuable assets in In line with attraction Persons active\_ Educated and\_ We have no emphasis has [29] .Creative city, a new topic with the aim of achieving development Knowledge-oriented, in order to realize creative cities . In addition to the role of creativity in the growth and shaping of the city, the removal of physical, social and cultural restrictions and barriers from the cities is considered so that creativity as a driving force causes the economic growth and development of the city [33] .

The idea of a creative city is based on the belief that culture can play an important role in the regeneration process of cities, creative industries not only improve the quality of life of citizens through the improvement of the social fabric of the city, but also give the opportunity to the appearance of the culture of different historical periods and strata and minorities. society and ultimately ,strengthening the city's economic cycle, but also strengthens the sense of social solidarity among the city's residents and leads to the definition of a unique identity for the city in the minds of residents and tourists 16 .

cities of Creative cities are able to Solve your daily problems New solutions \_ Presentation do cities of Creative actually on productions cultural are focused; that's mean Production Cultural goods and services which is the center of creativity are considered The

same is true of every creator \_\_ Human Capital \_ Creative emphasizes . The concept of creative city with many of concepts other link ate that of Sentence Baide mentioned creative industries, cultural industries, cultural activities and artistic activities of the city and knowledge economy [27] .

### 1.1. Isfahan

Isfahan city in 435 Kilometer of Tehran And it is located in the south of this city. City It has a geographical longitude of 51 39 degrees 38 minutes 40 seconds east and latitude 32 degrees 38 minutes 30 seconds north Is . The city is divided into fifteen districts and Outside the limits of Yeniz city from the west towards Khomeini Shahr , from the south of Safa Mountain and Sepahan Shahr, from the north side to Shah Yan Shahr and from the east It leads to the plain of Sajz . The population of Isfahan in the year 1385 over 1 , 583 , 609 people Been That This number was in 120 , 756 , 126 people per year 2015 1,961,260 people has arrived [23] .

Isfahan city with many cultural and historical attractions, Zayandeh river Rivers and industries Depressed hand Individual and most importantly to The title of creative city of industries Manual registration UNESCO in 2015 It is one of the famous tourist destinations in Iran, which has a national and international reputation Al - Mullalli has This city in all days of the year Especially in tourism seasons, it is considered among the top ten tourist destinations of the country [20] .

## 1. indicators of the creative city for the development of urban tourism

The creative city is a new method in urban planning that explains how people can think, plan and act creatively in cities and shows how cities can be made lively and livable through the use of people's thoughts and talents . [32] [In the creative city, urban issues are creatively and with collective thinking of the main owners of urban spaces, i.e. citizens and business owners, together with managers and urban planners [26] .To attract capital Human and creative, cities and related areas must have special characteristics that can become a creative city [28] .

In order to be realized and developed, every approach and topic needs to identify its related components and indicators so that by knowing and focusing on these indicators , it is possible to implement and develop the desired topic. In this regard, urban tourism is not an exception to this rule and it should be stated that this important thing happens according to various ways and cases in the context of the city and it can show itself in various criteria and by using these criteria and planning In relation to them, the development of urban tourism can be provided.

### A- Spatial indicators of the creative city from Richard Florida's point of view

- 1- Diversity : functional diversity ,distinctive neighborhood, sufficient density
- 2- Special amenities : dedicated sports facilities, per capita restaurants and entertainment places, public spaces For informal meetings
- 3- Cultural vitality : cultural and artistic events, performance venues per capita live ones
- 4- Aesthetic : architecture, parks , urban heritage

### b -Spatial indicators of the creative city from Vanulu's point of view



- 1- View : the existence of a sign symbols, elements and diverse visions that are integrated while being multiplicity
- 2- Art : Promoting new arts and strengthening old artistic heritage City
- 3- Diversity : a city full of different races and ethnicities of the world and high tourist potential
- 4- Public spaces : the existence of many parks, construction and improvement of public places and new civic spaces
- 5- Higher education : number of universities and scientific centers and research in the city [30]

## 2. Development Urban management and urban tourism

Today ,the tourism industry, especially its urban branch, has a special place in countries and plays an active and effective role in improving the economic ,social and cultural structure in developing countries . Cities have many tourist attractions and always attract many tourists to them , so the development of sustainable urban tourism and its wise management requires careful planning . In this regard, the role of urban management, especially municipalities, is of double importance . the first Condition Success every City At Development Tourism, Existence infrastructure \_ suitable for urban And Management Wisely And prudent At arenas \_ political, cultural, social and... Is . The second Condition To Guaranteed success politics Development Tourism urban, Amish attractions \_ City And Creation Facilities And facilities Is That access to the attractions particle for direct object More than ever easy slow [13] On basis two Condition mentioned Can \_ statement had That City tour From aspects \_ various Role effectiveness At Structure And sustainability areas has it [3]

Urban tourism without detailed planning and without paying attention to the capabilities of the landscape Cognitive, local, cultural and social for the area The opinion will lead to problems. Having sufficient knowledge about the capabilities of the region for the development of tourism from the environmental, social and economic point of view and knowledge about the expectations of local people and tourists are among the planning requirements for sustainable urban tourism. From Where urban management to achieve the goals and criteria of sustainable development in economic, social, physical and biological dimensions The environment of urban settlements has a fundamental role [4] and in fact, the placement of urban management in development studies creates and Multi-attitudinal expansion It has been next [36] So we can say, to In order to achieve proper development Considering the importance of tourism in urban communities, urban management can be effective.

On the one hand, tourism development can have positive economic, socio-cultural and even biological effects and benefits to have an environment in the tourist society and on the other hand ,negative effects in different dimensions Especially in the afterlife environment, follow ; Therefore, to In order to create a balance in this field So that the positive effects are more than the negative effects, it is necessary to adopt fundamental policies through the planning and management process [8]. Based on this, the development of urban tourism by improving quantitative and qualitative dimensions and with the maximum efficiency of close communication with optimal urban management in Applying effective methods of organizing and managing this industry in cities [5]

At mostly countries Municipalities \_ the most important Role particle for direct object At Development tourism urban have, Why That municipality At organization And shaping \_

To City the most important institution Is And At fact this management consistent And coordinated urban Is That Cause Activities \_ same direction it is possible . Therefore ,among the most important Capabilities \_ Management urban that for Development Tourism It can be implemented and includes the following:

- 1- notification delivery And Advertisement : Marketing At Tourism Importance basic have And Role important At guidance tourists ifa he does From where That At cities the trustee specific To Advertise about attractions \_ Tourism urban Existence does not have Management urban According to Mission overall self To Help To Development urban Can \_ To Advertise about Attractions \_ And Facilities Tourism variety Najir Brochures advertising, Creation Base internet, Advertising Television And radio and pay
- 2- equip Spaces Tourism : Part From Spaces recreational And leisure Creation done By Municipalities \_ Can \_ Ability Use To tourists particle for direct object also had be \_
- 3- Creation Parking And Stops \_ At areas Tourism : parking The most important Need tourists Is That With car Personal And To the face solo Travel they do, supply this place Can \_ Income Very are you well also To Municipality To follow had be \_
- 4- guidance Tourists : in City And Village With Installation boards numerous Guidance in addition to guiding tourists cause Decrease Bar traffic At City becomes \_ \_
- 5- investment \_ At Background Tourism : supply Spaces accommodation, Spaces recreational And entertainment And Parking lots Can \_ plus On Return investment \_ prosperity Economic And Tourism particle for direct object also At Area Creation ] 21 [A tourism-friendly city should have a number of conditions such as the beauty and dynamism of the urban image ,the existence of symbols and structures in accordance with the historical antiquity of the city, the existence of a clean environment , public thoroughfares and wide and beautiful streets to facilitate the movement of vehicles.

## **2.The position of urban management in the development of urban tourism in the creative city of Isfahan**

Management urban one From the pillars Main City creative Is That Must has ability Creation Creativity At City And Citizens be The main focus of urban management should be on creating areas for the creativity of citizens and people with interests and opinions in urban issues and plans. In fact, urban management plays the role of facilitator and provider of the emergence and use of creativity [12] .

Isfahan is one of the best cities in Iran. During the 100 years of its evolution , this city has become one of the most valuable cities in the world . The roots of the city go back to at least 2000 years ago . But by choosing it as the capital in the 11th and 12th centuries and again in the 16th centuries And 17 became the most important city of the country. In the recent period, the city has expanded tremendously and its old structure has been complemented by new urban developments . These developments, which were in harmony with older buildings, have turned Isfahan into a unique Iranian city [19] .With the blessing of historical and natural attractions, Isfahan has the ability to achieve a prestigious position in the world and can become a national and international tourist destination [11] .

Isfahan as the capital of the province due to the acceptance of all kinds of immigrant groups and the integration of groups and ethnicities , with different cultures, the existence of numerous university centers, the acceptance and attraction of students, the existence of cultural

and cultural institutions and having many historical and touristic attractions. In 1394 to As the first Iranian city to become a member of the UNESCO Creative Cities network in the field of handicrafts and arts Income people. The acquisition of both the title of world and creative city of handicrafts was due to the pursuit and practice of the group of urban and municipal management in the field of handicrafts and to Due to the demand and continuity of Isfahan municipality in this area, Isfahan to The title of World Handicrafts City was registered and currently this collection is the secretary of Isfahan World Handicrafts City. Also, Isfahan Municipality has carried out various activities to increase the prosperity of creative industries and practical use of creativity in formulating local development plans.

Isfahan city to The title of Central Province of Iran has a historical history and in terms of tourism industry , it is one of the few provinces that is well known in the country and the world. Therefore ,turning the city into a tourism destination brand is one of the important tasks that the city management in the creative city should pay attention to. Creating infrastructures and providing favorable conditions and improving the urban environment in this area will increase the recognition and respect of being in a place as a resident, visitor, merchant, etc. And its reputation follows [10] .But the municipality to Alone cannot be responsible for the development of urban tourism . In this direction, without a doubt, the municipality needs to have the capacities of various institutions, the public community, and the private sector by its side, and to realize this, it is necessary for the managers and urban planners to pay attention to the measures related to urban management, which are stated in Table No. 1. has been put on the agenda for the development of urban tourism 1

## Figure 1: Urban management actions

## 2. Discussion

Tourism To Title one From The most important Industry Development Stable, the opportunity big cultural, social And economic To Metropolises And Mother cities of global From Sentence Metropolises Iran Has provided . Development Tourism urban With Promotion Dimensions a little And Qualitative With Maximum Returns one From the most important Activities \_ Major Management executive cities At Evening Present Is . To The reason for the special nature of tourism is a strong strategic attitude in the field of policy making, planning , management and the future Care is needed ; Because sustainable growth and development in tourism is a time-consuming activity that must be accompanied by a plan Future planning and development should be able to promote this industry in a better way.

Urban management is one of the influential factors in tourism development . In this regard, urban management , regarding the development of urban tourism , needs to consider the economic benefits and social consequences of tourism .Management includes a systematic approach in which the dynamics of tourism is considered in the framework of supply and demand with an emphasis on sustainability. The tourism industry includes various activities and is related to economic, social and cultural sectors It is directly and indirectly related . Therefore, comprehensive study is one of the main factors in creating transformation in the tourism sector Positive, negative effects and regional view of development It is urban tourism . In this regard, effective planning and management is considered to strengthen the positive

effects and reduce the negative effects in order to create a positive attitude towards the effects of tourism in the society .

Isfahan is an attractive Iranian city There are many and a privileged position in the field of tourism At Iran And the world has it And one From cities of historical With support cultural artistic And has Unique features A person in the field of art And architecture Is. This city has also been selected as one of the creative cities of UNESCO . However, compared to the efforts of other cities in the world in attracting tourists and earning income from the tourism industry, despite the many capacities, it is not in a favorable situation.

Based on the spatial indicators of the creative city for the development of urban tourism defined by Florida and Vanolo, the greatest potential of Isfahan city in the field of urban tourism development is related to art indicators such as arts and crafts, urban landscape index, cultural vitality index and special amenities index. It is that city officials should use specific and operational planning to exploit these opportunities and strengths for the development of urban tourism, and by strengthening these indicators in all fields, create the necessary and suitable platforms and conditions for the creation, cultivation and expansion of creative ideas. Provide in the city. In this context, the use of urban elites, expert professors, thoughtful managers can be effective and by holding festivals , celebrations and local ceremonies and assigning more credit to art, culture, and urban identity, they can provide the necessary grounds for the development of urban tourism.

Handicrafts are other components Effective At Tourism Esfahan is and with Cooperation Ministry Heritage cultural And Beneficiaries Area Tourism Infrastructure should be provided for tourists to visit Art And Industry manual come in Esfahan become \_ Activity At space virtual At Format release Picture, the movie documentary, Presence At Exhibition Hi Domestic and foreign, holding short training workshops And Tall Period, exchange professional Universities Inside And Out, Holding Festivals And weeks cultural two Or How many sideways And Presence At events international related To Area Industry creative, Role able attention At Increase Consciousness about Isfahan has creative assets .

The existence of tourist attractions is one of the other important elements in the field of tourism development and attracting tourists . In fact, the tourist's motivation to visit the place is the presence of attractions, and without attractions , tourism cannot be formed. The rich culture of the city of Isfahan is one of the important capitals that has appeared in different parts of the city. Among them, we can mention Naqsh Jahan Square, which contains various elements such as the market, mosque and Aali Qapu Palace. Since most of the tourism spaces of Isfahan are concentrated in the central and historical core, the organization of these attractions and the use of successful models and ideas implemented to create new tourist attractions in other regions and areas that lack attractions should be considered. to be Because the attractions of a city have a great impact on a tourist's decision to visit and stay in the city, and it is considered as a motivational factor in the destination, and the more diverse, unique and attractive these attractions are, the more attractive they can be. and attract more tourists.

By planning and providing solutions in areas where there are fewer attractions or no attractions at all, new attractions should be created and attractions diversified in order to attract more tourists and increase the opportunity to create jobs and earn money. Creating and maintaining buildings in the urban space and revitalizing and protecting the urban heritage leads to the spread of tourism culture and the promotion of the city will be . reproductive axis

The river can also be in the field Urban tourism should be considered important and essential. The title is an opportunity to improve the cultural, social, economic, physical, and life dimensions be environmental. Despite the decrease in the attractiveness of the river during droughts, this axis is still attractive and dynamic for tourists and can attract tourists.

Among other things that should be taken into consideration is to pay attention to the social and cultural issues of the city, including attention to security, rule of law, peace, hospitality, etc., in order to build credibility to attract the opinion and trust of citizens and tourists. We cannot hope for the growth of urban tourism until the social sphere of a city is in a favorable condition. On the other hand, if the city management emphasizes the role of the people as influential factors in the various affairs of the city, the local people are ready to cooperate with the city managers; In addition, this mutual participation and cooperation will bring countless benefits for both the city managers and the local people.

Since planning for city uses including tourism. One of the most important and difficult parts of urban management programs is, the uses related to the tourism sector, including the important uses of the city, should be given careful attention and evaluation, considering the role of the tourist that the city has become. Rejection. Therefore, city management by creating city attractions such as (treasures, museums, galleries, local, national and international exhibitions, etc.). With the aim of attracting domestic and foreign tourists and sustainable development. To take basic measures. A metropolis that wants the tourism industry to be prominent in that city, must have a different attitude to tourist uses. To include its features and requirements, such as determining the limits and capacity of users, the amount and type of users, accessibility, traffic, etc., in city planning.

In order for the metropolis of Isfahan to be able to. In order to develop urban tourism and gain a place to compete with other cities and benefit from its various advantages, it is necessary for the management and urban institutions to. The trustees should take a special look and prepare the necessary platform for the realization of the effective components of urban management for the development of urban tourism as much as possible. Therefore, emphasis. On Development Activities \_ Tourism development urban, renovation Textures \_ historical city, Rebuilding Spaces recreational. At this Area With Presentation Facilities Appropriate, competition. At direction Development Stable Tourism urban With Attention To Presentation needs tourists, At next to the Reinforcement participation Sections \_ private And Citizens. At Elimination this needs, it seems necessary. Efficient management and planning to improve urban spaces, preserve the cultural, historical and identity elements of the city and promote social interactions at the city level and benefit from the floor. \_ Creative and elite and create Beds study Different. At this Area Also should be the case Importance And planning \_ Management executive City appointment take.

Existence Advertising Internal And Foreign. At Area cognition tourism Urban, tourism dynamics urban, education the force Expert. At Society, change attitude Officials And Citizens Ratio To attraction tourists urban, Presentation behaviors Appropriate. With this guests, Control problems And Difficulties tourists, Attention To process Process Presentation Information item Need To Tourists, creation and development of suitable transportation infrastructures in the field Tourism, strengthening and creating accommodation and tourism spaces for accommodation of tourists, participation of private and public sector, coordination between managers of institutions related to tourism, revision of rules, regulations, approvals and laws.



related to the program Rezi in general and related to tourism management , providing banking facilities and legal support for the development of accommodation and entertainment facilities can be the most important part solutions tourism development urban At City tour acceptable Esfahan be.

,if the policies and approaches are not paid attention to, the tourism of Isfahan metropolis cannot reach its true position . According to this Harmful It is the city administration At To take advantage of these opportunities Correction It takes a step towards shortcomings and weaknesses And with him Levitbandi correct Programs based on The correct books and original , from sources financial and Humanity should make the most of the city .

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## **Analysis of the effects of climatic factors on the worn-out urban fabric**

**(Case study : the central context of Mashhad city )**

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### **Abstract**

City And Climate is two man-made and natural systems , which have a close influence on each other. Climate, As far as it relates to human comfort, The result of factors such as sunlight , air temperature and humidity, wind and rainfall . Important The most destructive factors of worn tissues are climate. The aim of this article was to analyze the effects of the climatic factors of Mashhad on the worn-out urban tissues of May . This research is an applied research in terms of its purpose and based on the method of data collection , it is the description of FIP , and in terms of the method of analyzing and analyzing the data , it is It is a type of correlation . The research questionnaire was compiled using indicators extracted from the study of book sources, scientific articles, viewpoints and theories related to climate and physical indicators of worn tissue in two criteria and 26 indicators . For analysis and analysis Structural equations ( Smart Pls 4 ) have been used for the calculations . Statistical Society It has been calculated as 150 people who were questioned randomly. It was done for the officials and experts of climate and urban planning based on the snow neck sampling ; After removing incomplete questionnaires, 148 questionnaires were used and analyzed. According to them, the validity of the questionnaire was positive. Therefore , the questionnaires used in the research have sufficient content and form validity . Is. In order to examine the construct validity of the present study , only internal consistency was examined . The questions were filled through basic calculation according to the Cronbach 's alpha coefficient , and the Cronbach 's alpha coefficient is higher than 7 . Was calculated; which indicates the reliability of the research tool. The results of the research show ; In the descriptive part, indicators such as Continuous erosion of walls , reduction of building resistance , impermeability , unpleasant air in the surfaces of the building's body is more important in affecting the worn-out physical fabric of the city.

**Keywords** Climate, worn-out urban fabric, central part of Mashhad city

## :Introduction

All man-made and natural factors in the city and even the people themselves are involved in continuous and slow changes. Such changes cause the erosion of the city and change the texture of the city. One of the most important factors in the destruction of worn tissues is the climate. (They have, 1387). Climate is one of the most important geophysical factors, which is used in modeling the geographical space Shaping environmental conditions participates and plays an important role in establishing or not establishing human settlements. the buildings To Purpose Access To environmental Appropriate direction supply comfort Man, Designing be . Conditions environmental And climatic, Parameters Very important At Designing Building are

In mutual relations between construction projects and climate, there are two general aspects; The effects of weather on the design and shape of the building and its establishment, and secondly, the direct effects of weather on construction activities

Elements architecture That shell thermal Building take shape ;they give) ,Walls ,Windows the floor And Bam( in a way able attention On Climate Internal Building And as a result .Conditions comfort Man Effective .are. (Emadian

Climate, As far as it relates to human comfort, The result of factors such as: sunshine, air temperature and humidity, wind and rainfall. Temperature is one of the most important elements that must be considered in the design of a residential unit. Temperature fluctuations during the day and night and the use of building materials that undergo contraction and expansion should be taken into consideration. Buildings should be designed so as not to absorb the heat of the sun. Moisture is also a potential factor in endangering the health and comfort of building residents, which damages the beauty and materials of the building

Rainfall also increases the destructive effects of humidity and has direct physical effects on open surfaces. Highways, alleys and streets should be designed in such a way that the runoff .from rainfall can be drained at the right time

The effect of the load on the building is in the natural ventilation of the building. In general, a ,building should be designed to withstand the elements and weather factors . (Ataei2014).(

The climate of any geographical place, It has special suitable conditions that, at the same time, It also brings limitations in the field of urban design. In fact, the city and the climate are two man-made and natural systems that closely influence each other . In the design of different spaces of the city: such as buildings, Green spaces , passages, etc. In addition to paying attention to functional qualities, visual and aesthetic, It is necessary to pay attention to the type of climate of the city and comply with the climatic design rules; And ignoring this issue, It ,creates a special mesh . (Rasoulzadeh.(2012)In fact, the city and the climate are two man-made and natural systems that closely influence each other. Climatic conditions, along with other environmental factors, are among the most important factors in the formation and development of cities and the continuation of urban life. Climate, as far as it relates to human comfort, is the result of factors such as: sunlight, air temperature and humidity, wind and rainfall. In the design of different spaces of the city: such as buildings, green spaces, roads, it is necessary to pay attention to the type of climate of the city and comply with the climatic

design rules; And neglecting this issue causes certain problems. cognition climatic every Area Can At order Program tiny urban And architecture Role major to do

With Attention To that Conditions climatic Role determination doer At Formation Features architecture native areas urban and rural ,has it ID differences of climatic And its effect On body And buildings City From actions Is That On Basis it can solutions useful particle for direct object At direction architecture compatible With Climate And Development Stable .Presentation gave

the first Target Major Designing ,climatic Decrease waste heat Building and use From Energy Hi renewal acceptable Because sunshine And Wind .Is The second Target Major Designing climatic protection building in equal to radiation sunshine And Third Target Interest get From Energy solar Is. Three goals remember done Major the most Goals Designing climatic considered may to be cognition Climate every Area From Important the most Agents Program tiny environmental Is). ,Success2015.(

, Currently, according to the forecasts of the United Nations55of the world 's population % lives in urban areas , and this is expected to increase to68 by % 2050 ,forever ( Hikmat . 0 (1400).

Countries with a set of challenges such as lack of land , high unemployment rate , lack of sufficient infrastructure and environmental challenges in In the near future , it has led to unequal distribution to achieve desirable economic and social facilities and the path to achieve balanced and comprehensive development, and has brought unfortunate consequences to the body of urban tissues . so that these problems and inadequacies ; All aspects It has affected the ,urbanization and sometimes it has disturbed the urban life (Abam and Abedini(2017)On . the other hand, cities have lost their connection with nature due to the fundamental changes that have occurred in their activity and body for more than a century . Air and noise pollution caused by the concentration of industry and motor vehicles , the excessive and unlimited development of cities horizontally and vertically , the production of the history of production . D. The appearance of greenhouse effects and heat compensation is only part of the general ,.results of the changes .(Khozani et al(2014)One of these major problems is the formation . of dilapidated urban structures, which are also faced with challenges such as insecurity, non-participation, unreasonable increase in land prices , inability At Depreciation investment The body of buildings, the increase in the amount of social anomalies, the lack of optimal access to medical and health services, the lack of suitable jobs, the inability to provide appropriate help in times of crisis, as well as the lack of compatibility with today's urban life and modern urban development have structural and infrastructural problems. One of the reasons for the formation of these structures is the uneven development of cities, transportation problems, traffic, weak urban management system, migration, insecurity, non-participation, excessive ,increase in land prices and inability to invest. (Mozen(2013).

phenomenon Acquaintance Development urbanization At Conditions Growth quick population And expansion Inhibition inescapable cities That Low And over At many of the countries other also At Sections historical Different updated ,done At Iran, in two Decade So From Revolution did more obvious Found .Is population Textures Central many From City I see moved done are Process exhaustion Texture Hi Discharge done intensity taken And this Texture I see To Safe from anomalies social conversion done are ,.Rasouli et al)2015.(

At years Lately The growth of B procedure in a hurry cities Difficulties urban many created .Is this Difficulties all aspect urbanization Underneath the effect self appointment Data And What maybe That Life urban particle for direct object disturbed has done Is. one From this Difficulties able Attention in cities Existence Texture Hi worn out may Hope that self Source many from problems urban From Sentence the issues economic- social, physical- physical, life environmental And security may be That All Y These Background Instability particle for direct object in the cities provide done .Is

areas old urban That At Time Shape Giri, space Answerable to dynasty levels needs inhabitants self Been and, in P changes cognitive technology And change At needs biological, social And Economic now Lacking Function Strong are this areas when Location

And the center wealth and power cities They were, but At Conditions current) in most Cities ( from as Possession From Infrastructure I see And Services urban weak And in terms of physical untidy are. ,Buchani)1383 ( .

In the last few years , Paying attention to the tissues worn out One of the main issues of concern for organizations and institutions and city administrators is that the inability of these organizations in solving urban problems has caused that in Scientific circles and universities should also address this important issue . What is known today as tissues Inefficient is studied by urban scientists ; In fact, it is a process product There are many forms that evolved in the , form of the old form has fallen ( Keshavarz2019.(

It is meant by texture (urban texture) a connected area that has been formed with different morphologies during the urban life within the city limits or its periphery in continuity and connection with the city. This area can consist of buildings, collections, roads, spaces, facilities .and urban equipment or a combination of them

The context of the city is; From the granularity and interweaving of urban spaces and elements that have been compactly or discretely replaced according to the characteristics of the natural environment, especially topography and climate within the city limits, i.e. urban blocks and ,neighborhoods. (Tusli1368The worn-out fabric is one of the legal areas of the city, which .( is exposed to physical, environmental and economic destruction due to physical wear and tear, improper access to sewage, facilities and services, and vulnerable urban infrastructure. ,.Hosseini et al)2017One of the major problems of old cities is the existence of dilapidated .( structures in them, which itself has become the beginning of many urban problems and economic-social, physical-physical, environmental and security issues and has led to - ,instability in many cities. Has provided. (Ebrahimzadeh and Maleki2011.(

Over a long period of time and based on the experiences of the past, the worn-out texture has ,gone through its evolutionary process (Mashhadizadeh Dehaghani2013The worn-out urban .( fabric has a high vulnerability factor, and for this reason, they have a low residential, ,.environmental and economic value (Mohammadi et al2013Dilapidated context refers to .( urban spaces with low economic value that are caused by inappropriate social, economic and environmental issues and the lack of vulnerable urban infrastructure. In urban areas, when the conditions for the favorable social and economic environment are not provided, the dilapidated fabric expands. Therefore, the concept of urban fabric deterioration is related to 2017) ,efficiency compared to other urban areas. (Rezaei.



According to the results in the worn out fabric of the city, down to be Quality ,buildings Materials ,Structural Low width to be ,passages Anomalies Hi ,social being below Income residents And Absence Ability At renovation And improvement Texture Cause done Is That this Texture I see Day To Day

To his problems was added And To place Hi Confused And destructive conversion become so the solution thinking To Elimination this Difficulties Necessary Is. (Asdian And ,Colleagues.2013times the past architecture And Urban ,cities as able Specified From Agents climatic effective It was like that That At Designing houses Attention special Oh you may became during decades Lately Transformations social And changes Economic Development cities And Growth urbanization particle for direct object followed Is. Looking for this changes the face And Texture cities Also change Found. nowadays At mostly Planning ,urban Attention To Climate and studies Geographical Basis Work is Climate To Title one From The most important Factor item Check in construction Buildings study appointment Takes

In the meantime; Examining the amount of physical wear and tear of worn-out urban tissues is of great importance; which should be determined based on the research framework, the components and physical indicators of tissues. From the point of view of the Supreme Council of Urban Planning and Architecture

Iran, which was approved on 11/2/1385 Indicators for identifying worn tissue include ; fineness, instability, and impermeability, among which instability is the most important factor .for identifying wear

In general, inefficient, worn out, undeveloped or unstable urban tissues are the result of the decline in the quality of life and environment and the decrease in the efficiency and functionality of urban tissues that is achieved with the passage of time. In general, as long as life stagnates in an area of the city for any reason, the urban fabric of that area is in the process of wear and tear. Due to physical wear and tear, these tissues are highly vulnerable to changes in temperature, precipitation, humidity, etc., and also have low spatial, environmental, .economic and social values

Temperature is one of the most important elements that must be considered in the design of a residential unit. Temperature fluctuations during the day and night and the use of building materials that undergo contraction and expansion should be taken into consideration. Sunlight is also absorbed by the effects of the earth's surface and turns into energy resulting from the absorption of short solar radiation on the earth's surface. (Afshari Azad, 1387). Buildings should be designed in such a way that they do not absorb the heat of the sun. Moisture is also a potential factor in endangering the health and comfort of building residents, which damages the beauty and materials of the building. Rainfall also increases the destructive effects of moisture and has direct physical effects on open surfaces. Highways, alleys and streets should be designed in such a way that the runoff from rainfall can be drained at the right time. On the other hand, rain causes moist air to rise. The elements of urban form are building height, building type, occupancy level, subdivision, block size, block shape, building density. Urban form can be defined as a part of urban morphological studies affecting the ambient temperature with the variables of height to width ratio, building wall materials, roof and ground covering, which can affect the ambient temperature by the level of access to sunlight, wind flow. , air temperature and surfaces have a significant effect. In addition, design parameters such as building materials, the effect of thermal mass, plants, water, types of shade or sun control also

have an effect on reducing the temperature of urban environments. The findings indicate that the higher the ratio of height to width, the less access to sunlight to the environment and as a result, the temperature of the environment decreases. Also, shading caused by the ratio of height to width, the presence of plants and wind in urban valleys can reduce the ambient temperature.

:In the following; We examine foreign and domestic research related to the research topic

- ) Eliasson2000has studied the use of climate knowledge in urban planning in an article. (
- ) Yulmaz and Menivaoglu2008investigated the design strategies using solar energy in (southeast Turkey and after comparing traditional and modern houses, they wanted to design
- ) ,houses using solar energy. Amato Vehas2009in another study, conducted in connection (with the architectural climate, concluded that to achieve comfort, one should pay attention to .the location and direction of the buildings and the climate of these areas
- ) ,.Salvati et al2019in a research with analytical tools, investigated the Mediterranean urban ,(context. According to the research results, the horizontal density and vertical density of buildings play a major role in increasing the temperature in urban areas. The background results indicate that in the current research, the effect of climatic factors on the body of urban worn-out tissue has not been investigated before, and it is new in terms of the use of indicators .and methodology and can be used for future researches . and fills the research gap

In his internal research, Kasmai (1372) has divided the country of Iran into different climatic regions and according to Mahani's criteria and Olgi's bioclimatic table and constructional bioclimatic table, the principles and generalities of architecture compatible with the climate in many parts of Iran has specified Pirnia, (1372), has investigated various climatic, geographical and social aspects of traditional Iranian architecture in the past and present. Asayesh, (1378), evaluated the bioclimate and thermal needs of buildings in Tabriz city. In order to determine the desirability of comfort conditions in schools in Yazd city, Omidred et al (2013) investigated the important climatic elements of the city and then determined climatic comfort with the help of Mahani, Giuni, Terjong bioclimatic indicators and using the psychometric model according to Avanz method. . The results of this study showed; that for about 55% of the year, the air in Yazd city has been out of the comfort zone in terms of temperature and humidity. In a research, Sahamah, (2015) investigated the degree of climatic classification and its compatibility with the principles of native architecture in the cities of Razavi Khorasan province. According to the results, the important principles of architecture compatible with the climate include minimizing the thermal exchange of the building wall for winter and summer, proper efficiency of light and solar energy, proper ventilation and moisture supply, safety against climatic hazards. Darbani et al. 2016, in a research, they investigated the environmental effects of changes in the geometry of the urban fabric on the ambient temperature and external thermal comfort in the dry climate of dMashha d. The findings show that the change in configuration geometry

By increasing the urban ratio and external thermal comfort of the pedestrians, the street can ,have an effect on reducing the ambient temperature in Mashhad. Emadian(2017)in a , research, evaluated the thermal performance of earth-sheltered buildings in cold seasons in Yazd and concluded that by benefiting from the idea of earth-sheltered architecture, it is

possible to save a lot of energy consumption during cold seasons in the climate. It was hot and dry

,Akbari et al(2018)They conducted a research with the aim of optimizing the orientation of ; the building in the efficiency of solar radiation in a hot and dry climate, by examining the amount of direct energy received by the vertical surfaces of the building. They concluded that the best direction for establishment is 180 degrees south and then 165 degrees southeast

,Farkhi et al(2000)in a research, analyzed the analysis of energy efficiency in models of the , optimal clustering pattern of residential buildings is strongly influenced by morphological factors such as neighbors, form, dimensions and pattern of the building, block pattern and also the spatial structure of the communication network, among which the role of the building pattern and the structure of the communication network is more prominent. . Therefore, with the help of energy consumption simulation, before the implementation of the plan or at the stage of presenting the proposed options, it is possible to achieve optimal forms in components (individual buildings) and urban combinations (residential structures)

State Khorasan Razavi one From The provinces of the country Is That Process urbanization At it quickly Face To Increase Is. In the center of this province, following the natural growth of the population and the desire for urbanization for various reasons, the city of Mashhad faced a sudden and increasing expansion. During the expansion of urbanization, some parts of the cities were left behind from the main process of development and modernization of the city due to a set of prevailing economic and social factors, and textures were formed; which often have similar physical characteristics. The physical characteristics of the mentioned tissues have a mutual effect on the social and economic characteristics of the residents, the continuation of cycles is said , the final product of which is wear and tear in different physical, social, cultural, economic, and environmental dimensions. At ,Result do to give Research Hi related With the effect Climate on the worn-out urban fabric For the compatibility of each What

More Climate and city And Elimination Difficulties worn texture Necessary Is. The purpose of writing this article is to investigate the influence of climatic factors in the design of urban settlements and especially the buildings of the worn-out urban fabric of Mashhad

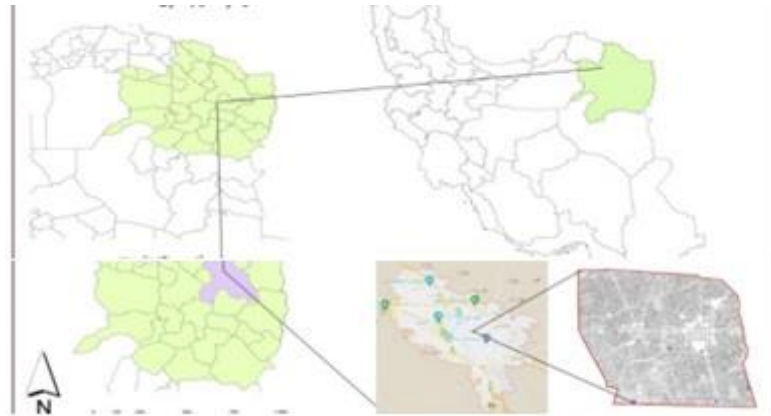
### **Location of the studied area**

The city of Mashhad, the capital of Razavi Khorasan province, with an area of 351 square kilometers, is located in the northeast of Iran at a longitude of 59° 15' to 60° 36' and a latitude of 35° 43' to 37° 8' and in the Kashf River basin. It is located between the mountain range of

Binaloud and Hezar Masjid. The height of the city above sea level is about 1050 meters (maximum 1150 meters and minimum 950 meters). Its population is 2,766,257 people. (Iran Statistical Center, 2015). Mashhad metropolis has 13 urban areas that have different positions in terms of social, economic and cultural characteristics, and a total area of about 29 thousand hectares . The population density of the city is about 4.111 people per square kilometer .

(Mashhad Municipality Information Technology Organization, 2018). The central part of Mashhad is more than 39.50% of the area of the central part of the city, which belongs to the first core of Mashhad. This primary core is related to 1270 AH. Also, it has grown by about 31.20% during the years 1270 to 1310. During the years 1310 to 1335 19.95% of the limited

was formed. In other words, about 95.65% of the area was formed before 1335. During the years 1335 to 1345, 3.42% was added to the central sector. By the end of 1355, the area of the central part has been completely formed. (map number one).



Map1 Geographical location of the central part of Mashhad city -

The state of land use in the center of Mashhad city shows that about 48% of the area is related to residential uses and 25.9% is also related to mixed uses. 67.2% is related to tourism and entertainment uses and 26.3% is also related to administrative - police use. Is. According to the information of the mayor of Mashhad, in the central part, about 39 units have clay and mud materials, 532 units also have clay and wood materials. Also, in this area 7558 units are made of brick and wood. At the area of the central part is about 25.25% of the building before 1345. 99.44 percent of the years 45 to 54, were formed. Also 44.31 percent of private sector 55 years up to 64 have been made. The survey shows that in the central part, about 1375 percent has a metal skeleton. and 1.01, also have reinforced concrete skeleton. In this range 25.85 lacks skeleton. The survey shows that about 60% of the units in the central part of the building are 1 story, which are about 47, Percent From the area of the mattress Gives. Also 79.29 percent of the buildings are 2 stories, which Buildings also occupy 38.34. of the area 25/5 The percentage of buildings are 3 stories, and these buildings also occupy 10.69 of the area. In the same area of buildings The high-rise is also under construction and development; So that 14 buildings with 4 floors and 10 buildings with 10 floors have been built. This number of buildings is less than 1 The fabric of the center. of the building area % of Mashhad city, which was formed around the Holy Shrine of Imam Reza (AS), is considered part of the worn-out texture of the city. which is the foundation of Mashhad city and acts as the heart of the city and the dynamic economy of the city slow Considering that the city of Mashhad has variable weather, but it is moderate and tends to be cold and dry, and it has hot and dry summers and cold and wet winters; The important role of such a climate is more effective on the disordered and ineffective state of the worn-out fabric; so that the interference of pedestrian and rider crossings, new inefficiencies in traffic in the area, lack of parking and green space, lack of public service centers such as suitable accommodation and Lack of proper and sufficient health services, inappropriate width of roads, quality of F.T The bottom of the building, the impenetrability of the residential fabric, lack of structure In the central urban context, one of the other consequences of the formation of such a context. Therefore, according to the issues and problems raised in the central part of Mashhad, the question arises that what are the effects of climatic parameters on the body of worn-out tissues of the city

## : Research Methodology

This research is an applied research in terms of its purpose and based on the method of data collection, it is the description of FIP, and in terms of the method of analyzing and analyzing the data, it is a type of correlation. After categorizing the data, research criteria and indicators were extracted from theoretical bases and research literature. Compilation of the research questionnaire using the indicators extracted from the study

of books, scientific articles, views and theories related to climate and physical indicators of worn tissue were done in two criteria and 26 indicators. For analysis and analysis The effects of structural equations Smart PIs 4 has been taken advantage of. According to the statistics, (center of Iran in 2015 the research population was equal to 3,100,000 people)

N = 3100000	t = 1.96	d = 0.08	p = 0.5	q = 0.5
$n = \frac{\frac{t^2 pq}{d^2}}{1 + \frac{1}{N}(\frac{t^2 pq}{d^2} - 1)} = 150$				

According to the size of the statistical population of the research and based on the Cochran formula, the sampling size among the people of this The number of statistical population (households) has been calculated as 150 people; which have been questioned randomly. It was done for the officials and experts of climate and urban planning based on the snow neck sampling; After removing incomplete questionnaires, 148 questionnaires were used and analyzed. Their opinion about the validity of the questionnaire was positive. Therefore, the questionnaires used in the research have sufficient content and form validity. Is. In order to examine the construct validity of the present study, only internal consistency was examined. The questions were filled through basic calculation according to the Cronbach's alpha coefficient, and the Cronbach's alpha coefficient was higher than 7. Was calculated; which indicates the reliability of the research tool. As mentioned earlier; To compile the questionnaire, the obtained indicators that were the result of the study of scientific sources related to climatic parameters and worn-out urban fabric have been used

## Research findings

### 1.4 Inferential part

Before analyzing with structural equations, descriptive statistics of the variables used in the case study Was investigated. The average, as one of the central parameters, indicates the center of gravity of the society, and in other words, it shows that if the average is placed instead of all the observations of the society; No change is made in the total data of the society. Also the variance and standard deviation show the variable number in the statistical population. The results of descriptive statistics are presented in the table below. also, The level of importance of each of the research indicators in relation to temperature, rainfall, sunshine and

humidity (independent variables) presented, according to experts and ordinary people. Was investigated. Therefore, the index Continuous erosion of walls with an average of 4.48, standard deviation of 0.927 and variance index of reduction of building resistance with an average of 4.3 standard deviation of 1.05 variance of 1.11 impermeability index with an average of 4.22 standard deviation of 1.04 variance of 1.097 index of unpleasant air in the surfaces of the building body with Average 4.28 average, 0.925 and variance 856/0 Is obtained In the scale of 5 the value of the most important index was obtained, and the index without city furniture is with an average of 3.93/standard deviation, 0.980/and variance 961 Is obtained. ; which has the least importance from the point of view It was a statistical sample. Table No. 1 shows the most important and least important indicators

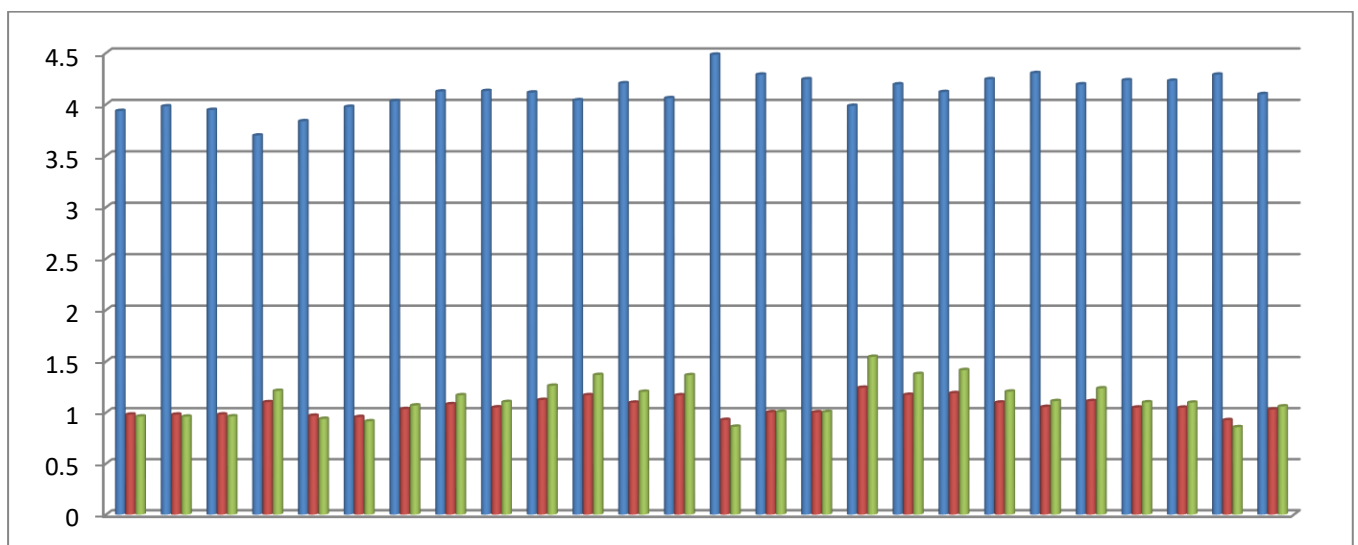
Table 1 Descriptive data of research variables -

Variance	Deviation with Ar	Average	Indicators
.961	.98020	3.9353	No city furniture
.960	.97959	3.9801	Water infiltration on the foundation of the building
.962	.98081	3.9453	Reduction of aging resistance over time
1.212	1.10111	3.6965	The meeting of the building over time
.938	.96846	3.8358	Increasing wear and tear of the building structure
.914	.95623	3.9751	Cracks in the walls
1.069	1.03398	4.0299	Reducing the life of the building
1.169	1.08141	4.1244	Reducing the color resistance of the building
1.103	1.05033	4.1294	Decreasing the quality of the building
1.262	1.12332	4.1144	Change the size of building materials
1.368	1.16979	4.0398	Improper sanitation and sewage disposal system
1.203	1.09690	4.2040	Inadequate quality of education buildings
1.366	1.16894	4.0597	The presence of stains on the wall and ceiling



.861	.92787	4.4826	Continuous erosion of walls
1.006	1.00315	4.2886	The invasion of insects and fungi into the outer space
1.005	1.00263	4.2438	Natural ventilation of the space inside the building
1.545	1.24289	3.9851	Providing comfortable heat
1.377	1.17353	4.1940	Reducing the cost of electricity consumption
1.416	1.18982	4.1194	Extensive lighting during the day
1.205	1.09785	4.2438	Generating more heat during the day
1.112	1.05472	4.3035	Reducing the resistance of the building
1.237	1.11228	4.1940	Improper quality of Ibn Yah
1.100	1.04883	4.2338	The conditions of residential units
1.097	1.04755	4.2289	Impenetrable penetration
.856	.92537	4.2886	Unpleasant air on the surfaces of the building body
1.060	1.02959	4.0995	Reducing the strength of the building structure

the chart1Data Hi Descriptive Indicator Hi Research -

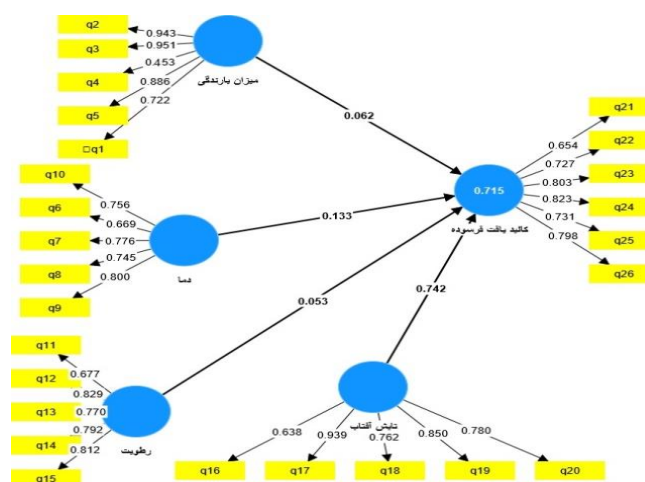


Assessment And Fitness The model of the effect of climatic factors on the worn - out fabric (body ) of the city

A - Review Reliability Indicator Ha : This Check From Three the way Coefficients loads factor, Coefficients Alpha Cronbach and reliability hybrid the face took

Coefficients loads Factor : load a factor From through Computing the amount of Correlation Indicator Hi One Structure With it Structure Computing may to be If this the amount of equal to And Or More From Amount 4/. be, affirmative this content Is That Variance Among Structure And Indicators it From Variance error Size get it Structure More Been And Reliability At item it Structure able accept Is . all Coefficients loads a factor Indicator uestions this Model From 4/. More Is That sign From Appropriate to be this Criterion s

Diagram1 Factorial model of the influence of climatic factors on the worn - out fabric (body . ) of the city



Alpha Cronbach : Alpha Cronbach standard To test Reliability And gauge Oh you Appropriate To Assessment sustainability internal considered may to be the amount of Alpha Cronbach higher From7 At Model Indicator Reliability able accept is ( table No ./3.

Reliability Combined : This Criterion To the device Verts And Partners Introduction done And Excellence it Ratio To Alpha Cronbach At this Is That Reliability Structure I see No To the face absolute But With Attention To Correlation Structure their With Each other Computing may to be At pink That the amount of Reliability hybrid To every Structure above the7be, ./ sign From Reliability internal Appropriate To Model Hi Size get has it )Nunnally, 1994:90 ( this tip Necessary Is That At Studies Science human Reliability hybrid, Criterion better From . ) Alpha Cronbach To the count may Roud 2010:79 ( Vinzi and et al, (

B - Review narrative Indicator Ha : Index narrative Convergent medium Variance Extraction became Or Criterion Average Variance Extraction done That sign the giver Average Variance

Among every Structure With Indicator Hi self Is, To narrative is used to be the amount of Average Variance Extraction done Above5 Convergence able accept particle for ./

direct object sign give ( table2

Table2Convergent validity, composite reliability and Cronbach's alpha of research indicators .

convergent validity )AVE (	Basis of leaving Turkey	Cronbach 's alpha	Variables
0.64	0.873	0.855	sunshine
0.563	0.819	0.814	temperature
0.605	0.894	0.846	humidity
0.645	0.943	0.85	The amount of rainfall
0.575	0.855	0.851	The body is worn out

Considering that the numbers of Cronbach's alpha, composite reliability (internalconsistency) and AVE are all in the relevant range  $\neg$ , it  $\neg$ is possible to confirm the appropriateness of the reliability and convergent validity of the research model. In addition, the factor load of each of the research measures to check the reliability and validity of the construct is given as described in the table below (Table 3). As can  $\neg$ be seen in the table, the factor loadings of the variables are all above 0.4, as a result, the reliability and structural validity  $\neg$ of the measures  $\neg$ .of the research model can be verified. also confirmed

Factor loadings of the influence of climatic factors on the worn - out (physical) fabric of the city , the relationship between independent and dependent variables is shown by means of factor loading . The load factor is a value between zero and k . It can be seen that all observed independent variables have positive and significant regression coefficients with. their scales

Based on the results of Table 3, the most important component The factors that have an impact on the city's worn-out fabric are: in the index of rainfall, water intrusion on the foundation of the building with a factor load of 943, increasing wear and tear of the building structure with a factor factor of 951. In the index of temperature, cracking in the walls and reducing the life of the building, respectively, 800/ , 756/ 0 And in the index of continuous erosion of walls 812/,reduction of building resistance 829/., among the sun radiation index, the object of providing thermal comfort 939/, lighting

Wide during the day850And among the subjects of worn tissue, improper sanitation and ./ sewage disposal system with a factor load of803 and unacceptable influence of ./823Is . / obtained

Table3Factor loadings of the variables of each construct .

factor load	Description of the question	Caller number	Indicator
722/0	Reducing the strength of the building structure	1	The amount of rainfall
943/0	Water infiltration at the foundation of the building	2	
951/0	Increasing wear and tear of the building structure	3	
453/0	Building settlement over time	4	
886/0	A decrease in resistance over time	5	
669/0	Decreasing the quality of the building	6	temperature
776/0	Changing the size of building materials	7	humidity
745/0	Reducing the color resistance of the building	8	
800/0	Cracks in the walls	9	
756/0	Reducing the life of the building	10	
677/0	Unpleasant air in the physical surfaces of the building	11	
829/0	Reducing the resistance of the building	12	
770/0	Stains on the wall and ceiling	13	
792/0	Invasion of insects and fungi to the outer space	14	
812/0	Continuous erosion of walls	15	
648/0	Natural ventilation of the interior of the building	16	
939/0	Providing thermal comfort	17	sunshine
762/0	Reducing electricity consumption costs	18	
850/0	Extensive lighting during the day	19	
780/0	More heat production during the day	20	
654/0	The conditions of residential units	21	
727/0	Quality Improper building	22	
803/0	Improper sanitation and sewage disposal system	23	
823/0	Unacceptable influence	24	
731/0	Quality Improper education buildings	25	
798/0	No city furniture	26	

#### 4-3 The coefficients of the path and the result of the test of relationships between variables

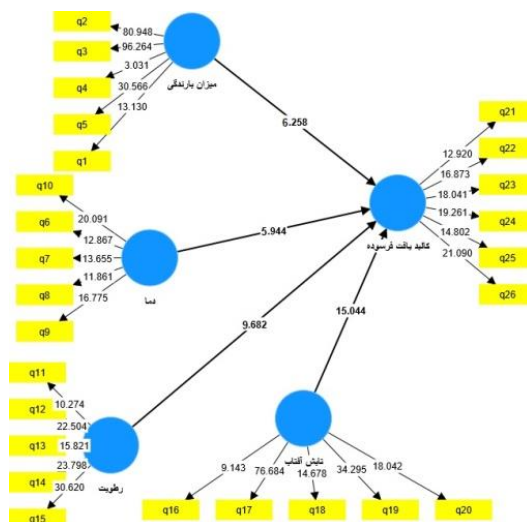
elementary the most Criterion To test Relation Among Structure I see At Model ( section Structural ) , Coefficients meaningful Is That With Use From order boot Strep At soft App able view Is . At pink That the amount of this Coefficients From 1/96 More be, sign From health Relation Among Structure I see And At Result confirmation hypothesis Hi Research At level 95 certainty Is . Must Attention had That % t numbers only health Relation I see particle for direct object sign Data And intensity Relation Among Structure I see particle for direct object not can measure ) Vareza Zadeh's judgment 2012 According to Table Under . (the influence of all component It is confirmed on the body of worn tissue

Table 3 , Path coefficient values . T-Value independent and dependent factors ,

Result	T-Value	Path coefficients	dependent agent	Independent agent	Relation
confirmation	00./0	15.044	The body is worn out	sunshine	Sunlight has an effect on the body's .worn tissue
confirmation	000./0	5.944	The body is worn out	temperature	Temperature affects the body of worn .tissue
confirmation	000./0	9.682	The body is worn out	humidity	Moisture has an effect on the body of .worn tissue
confirmation	000./.	6.258	The body is worn out	Rainfall rate	The amount of precipitation has an .effect on the body of worn tissue

If the path coefficients are positive; The relationships between the variables are direct and 3) show their influence. Otherwise, the relationship is not direct (Table

2 Chart. Significant coefficients of the variables of each structure (T-statistics



Results result From Meaningful model Research sign may to give Kidney Hypotheses Research confirmation done are To Kind Oh you That The amount of rainfall with a path coefficient of 6.258 impact Positive And meaningful On The body is worn out has it . Also, , temperature, humidity and sunlight influence with coefficients of 5.944 , 9.682 and 15.044 respectively. Positive And Meaningful On The body is worn out particle for direct object sign 2may (Chart

## Conclusion

Considering that climatic factors have a major effect on body tissue; Therefore, in the construction and design of buildings, climatic conditions and their effects must be taken into account To Considered as a very important factor. This research with The aim of influencing the climatic indicators on the worn-out physical fabric of the city; The central structure of Mashhad city has been completed . The dilapidated urban context in Mashhad, in addition to inadequate urban facilities, the existence of social and cultural anomalies , dilapidated and poor quality buildings and in

In addition to these cases, climatic factors play an important role in reducing the lifespan of the building and reducing its durability and the dissatisfaction of Baft residents. Comparison ) , of the results of the pesent research with researches such as Darbani et al 2016 Mohammadi ,( ) , et al 2017 ) , Azizi et al ,(2019) , Farkhi et al ,(2016) Mason et al ,(2020 ) , Salvati et al ,(2019 shows that the use of vegetation and wind flow in the passages of inefficient urban tissues , ( can have an effect on the amount of damage caused by rainfall and humidity. On the other hand, spatial and spatial analyzes of the negative consequences of climate can lead to the reduction of irreparable effects. Also, the optimal pattern of blocking of urban tissues and the spatial structure of road network based on the codified rules of urban planning are important

The limitations of the current research include many problems related to completing the questionnaire and interviewing experts and local residents. Also , the problems are related to .not providing accurate information about the effects of climate parameters on body tissue



The results of the research show that in the descriptive part , indicators such as Continuous erosion of walls , reduction of building resistance , impermeability , unpleasant air in the surfaces of the building's body is more important in affecting the worn-out physical fabric of the city.

In this research, deciding on the test of research hypotheses according to the model, through The test has been done. Considering that all paths were obtained in the conceptual model. It can be concluded that the research hypotheses are confirmed. This means that sunlight, temperature, humidity and the amount of rainfall have an effect on the body of worn tissue.

$H_0$  Sunlight, temperature, humidity and rainfall have no effect on the body of worn tissue

$H_1$ : Sunlight, temperature, humidity and rainfall have an effect on the body of worn tissue

The value of t-statistic for this radiation coefficient is 15.44, temperature is 5.94, humidity is 9.68 and rainfall is 6.25 and it is more than 1.96, which shows the significance of this coefficient at the 5% error level. In general, the results obtained from the estimation of the model indicate that the hypothesis Zero (  $H_0$  ) is rejected and its opposite hypothesis (  $H_1$  ), that is, the research hypothesis, is confirmed.

According to the results of the present study, if the weakness of some indicators (infiltration of water into the foundation of the building, increasing wear and tear of the building structure, continuous erosion of the walls, reducing the resistance of the building, providing thermal comfort, extensive lighting during the day, sanitary disposal system and inappropriate sewage and unacceptable penetration , cracking in the walls and reducing the life of the building) should be the priority of the authorities and experts ; The desire to live in these types of tissues increases and the role of climatic factors also decreases, which improves citizens' sense of security, and the sense of life expectancy and mental health in these settlements goes through the process of recovery. This happens by attracting investment and economic prosperity and people's participation.

### **Making suggestions**

Climatic parameters are one of the most important factors of tissue destruction. They are worn out in my city . To prevent tissue damage The dilapidated buildings of the city , as a result of climate factors , construction Create green spaces and water pools inside the city to adjust the day and night temperature changes . in different parts of the city , using materials with high reflection and impenetrable penetration to cover the roof of the house I see it is suggested. Also , to prevent weathering and moisture penetration , the fabric walls should be covered . cover the worn ones with grain materials , including clay , to prevent the entry of moisture and . drops Rain falls inside the wall

Considering the climate of this region, it is recommended to observe the following points in ; the architecture and design of urban buildings

proper use of resources and energy , prevention of air pollution , compliance with the environment and climate design goals , reduction of building heat loss , reduction of the effect of wind on building heat , taking advantage of Solar energy in the heat of the building ,

protection of the building in the heat of the building , taking advantage of the daily fluctuation of air temperature

Every building should be designed in such a way as to minimize the use of new resources . The shape and manner of establishing the building and the location of its interior spaces can be such that it increases the level of comfort inside the building , and at the same time , through insulation structural integrity , It caused the reduction of fossil fuel consumption

Use of trees, green space and water in Aban river The use of smart materials and modern materials in accordance with the dry climate and clean energy of the sun and wind in the . building The big ones are suggested according to the economic considerations

To achieve these goals, the following practical and effective steps can be taken in the study :area

Providing financial facilities to improve physical tissue cracking

The participation of local residents as an improvement of the condition of urban furniture

Using local capacities and potentials to optimize the sanitation and sewage disposal system

Compilation of the application program in order to provide the necessary constructions and eliminate their deficiency

Allocation of low-interest loans for the reconstruction of humid houses

Cooperation of civil institutions for the renovation of cracked and damaged walls

In addition to ensuring the thermal comfort of the residents , using natural energy and the capabilities of the area , the mid - step proposals have significantly reduced energy loss . And he minimized the heat and cold with the means of the place

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## Evaluating the culture of health,safety and environment In one of the country's gas companies using the cultural ladder

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### Abstract

Health, safety and environment In the subsidiaries of the Ministry of Oil, it is considered as a upcoming research in the relevant company with the purpose Therefore, the ; necessary matter of evaluation , Promotion and elimination of culture defects Health, safety and environment Organization using the culture ladder Health, safety and environment . done This research is a descriptive-analytical cross-sectional and applied study. The study population is all personnel It is an official and unofficial organization that, using the guidance of professors and statistical .consultants and also the type of study, the cultural ladder questionnaire checklist Health, safety and environment after A library study has been prepared . In this model, culture is classified into five levels from pathological to creative , each of which has its own unique characteristics . According to the findings of the research and self-assessment of culture health, safety and environment, The organization is in the stage of calculation , which by taking some corrective measures and the suggestions presented, it will soon be able to take the preventive .position of the cultural ladder Health, safety and environment and then enter the creative stage A significant and inverse relationship between the score Finally, there is a culture of safety . and the claim of the managers of this organization regarding the importance of health, safety and the environment , and according to the results, necessary measures should be taken to .improve the level of culture Health, safety and environment in the operational and administrative environment; Also, improve the performance of employees and improve the attitude of management at all levels of the organization. Therefore, establishing a dynamic and efficient safety culture among employees and managers will facilitate the movement of the organization to achieve higher safety standards.

**Keywords:** safety and envitomental,culture ladder model,culture evaluation,oil and gas industrial

### Introduction

The rapid movement towards industrialization and the lack of serious attention to safety principles have caused the rate of occupational accidents to increase in developing countries {1}In the new era, along with the rapid development of industry and technology , there are . many concerns about the bad consequences associated with it, threatening human life{2} .



<sup>11</sup> The destructive effects of these developments are similar to the events of Fizen (France) which has emerged in the form of human <sup>13</sup> and Chernobyl (Russia)<sup>12</sup> piperalpha (England) disasters and environmental pollution and generally disrupting the ecosystem has caused people to think more deeply about the consequences of not complying with safety, health and environmental issues in industrial activities{3} Factors such as human errors, overconfidence . in the safety of facilities, defects in design, lack of preparation in crisis situations, and in less developed countries, non-compliance with standards in technology transfer are among the .main causes of disasters Health, safety and environment Human and environmental principles have been . All the factors mentioned above are also present in the industries of our country, which have caused major accidents{4} On the other hand, safety, health and environment . experts have found that most of the accidents occur due to the unsafe behavior of people and despite the technical and engineering efforts and the establishment of laws and regulations, the costs of accidents are still heavy on the shoulders of the countries, for this reason, the promotion of culture Health, safety and environment It has been receiving more attention day ,by day{3.5}.

Culture Health, safety and environment It is a set of individual and group values, attitudes, .capabilities and behavioral patterns that create commitment and policies and programs Health, safety and environment , Determines an organization{6}safety culture and Health, safety and environment ,It is something where everyone is concerned about safety issues{7}an organization that culture Health, safety and environment It has a positive impact on individuals and groups Levels encourage to be active and responsive in these cases: predicting and managing risks and threats for all-round success, development and improvement of safety level, continuous improvement of operations, effectiveness and production{8}.

Creating a safety culture and Health, safety and environment By changing people's motivations regardless of occupational and organizational aspects, or changing people's behavior regardless of their motivations and organizational systems, as well as changing Systems will be doomed to failure without considering the interaction of psychological, behavioral and organizational factors(9). Based on the experience of creating a strong culture of health, safety and environment It is equally useful and necessary for all working levels in .the society such as workers, employers and also governments

Applying preventive methods in the field of health, safety and environment It has proven to be very effective in preventing accidents. One of the sure ways to reduce accidents is to improve culture Health, safety and environment is{10} . Self-assessment of health, safety and environmental culture is a comprehensive, systematic and regular review of activities and .achievements Health, safety and environment An organization using organizational excellence. The self-assessment process of the health, safety and environment culture makes it possible for the organization to clearly identify the strengths and areas that can be improved. In the initial evaluation and self-evaluation of health, safety and environment, The organization measures the process of improvement during successive operating periods within itself and at higher levels, the excellence of this work is done by comparing itself with local competitors, model organizations and first-rate organizations in Health, safety and environment takes place In these reviews, he pays attention to both the records and the future plans. The self-assessment of the health, safety and environment culture is done with the aim of checking the status of the organization or the company in reaching certain demands and is very useful in motivating the participation of the personnel{11.12}.

health, safety and environment requirements and standards in this company is considered

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<sup>13</sup> Feyzin disaster (France)

<sup>14</sup> Piper Alpha (England)

<sup>15</sup> Chernobyl (Russia)

as an important matter, especially by managers, and the culture of safety and Health, safety and environment. They consider it as one of the main priorities of their organization. Since the culture models of health, safety and environment are the basis of methods of investigation and evaluation of culture Health, safety and environment in the organization, the necessity and importance of research in this field is clear, so this research aims to evaluate the culture of health, safety and environment. The organization of the gas company of Tehran province using the cultural ladder Health, safety and environment done.

In the implementation of this project, first a questionnaire was designed, standardized and after the final approval by the senior consultants of the organization in the field of safety, it was distributed and completed among the official and non-official employees according to the statistical population of this project. With the help of statistical formula writing through Excel, the data collected as an output shows one of the culture levels. According to the final findings, of the organization, it is in the accounting stage, and with the implementation of the proposed measures, it will soon be able to take the preventive position of the culture ladder Health, safety and environment to get.

### materials and methods

This research is a descriptive-analytical cross-sectional study. The study population is all official and unofficial senior officials of the gas company of Tehran province. The instrument used in this research is the culture ladder self-assessment questionnaire Health, safety and environment. It is that it was prepared by using the guidance of professors and statistical advisors and also the type of study, and it was completed by the specified people according to the statistical population, and then according to the information collected by the questionnaire the analysis and scoring of the data was done. And the final output is determined by the statistical formula written in Excel, the level of the organization's culture. Questionnaire with the cooperation of the organization's research unit and after the approval of experts (health education and occupational health) and also safety experts. And it was used to fix some defects. The scoring method of this questionnaire is mentioned in table number 1.

health, safety and environment culture evaluation questionnaire includes 30 questions, which should be distributed among the employees as follows

- ✓ The statistical population of the company is 10% of the total population working in the company (sum of official and unofficial people). but the maximum number is 400 people
- ✓ 60% of this number are formal employees and 40% are informal employees
- ✓ In the official society 20% of the questionnaires are answered by managerial and supervisory levels 50% by operational employees, and 20% by non-operational employees. (administrative) and 10% is completed by health, safety and environment staff
- ✓ In the informal society, it is done in the same way, that is 20% of managerial and supervisory ranks 50% of operational employees 20% of non-operational employees. (administrative) and 10% of health, safety and environmental workers

The best way to understand culture Health, safety and environment is the use of culture ladder. Each stage has a series of unique characteristics and is along its previous level. This ladder is like a road map that tells us our organization in terms of culture Health, safety and environment. Where is it located and when will be the next stage they will go there. The five steps of this ladder are:

At this level, people are not paying attention to health , safety and :<sup>14</sup> Pathological environment . Just follow the rules Properly Health, safety and environment have not understood{1} .

At this level of safety, it is taken seriously only when the accident occurs has :<sup>15</sup> Reactive occurred People say sentences like " it's a dangerous business " and " You must be careful " or " people who see the accident are the cause of it " are expressed . At this level, managers take safety seriously , but they feel that people do not follow what they said{1} .

Accountant : At this level of management organization Health, safety and environment Successfully established and because Health, safety and environment Focusing on statistics is taken very seriously. Data is collected and analyzed. A lot of audits are done. At this level, deaths still occur, and when deaths occur, the organization is surprised [1] .

Health, safety and environment <sup>16</sup>Preventive : At this level It is not managed based on past events . Not only the prevention of past incidents is emphasized, but also the possible mistakes that will happen in the future are taken into consideration. In organizations with a preventive level of people's culture Health, safety and environment are involved At this level, the number of people working in the field Health, safety and environment reduced and have only an advisory role. As the organization rises Awareness and trust have also increased and people accept responsibilities better and more easily1.

Creative organizations have very high standards and try to act beyond the rules :<sup>17</sup> Creative and regulations. These organizations are very honest about the defect and use the defects to improve, not to blame them, they do n't expect the right work, but they expect better work. Management knows that employees trust him and will share issues with him{1}

**Table1Score guide for health, safety and environment culture ladder questionnaire -**

Answer					Question	Row
Complete ly agree	ok	I have no opinion	Opposite	Complete ly opposite		
0	1	2	3	4	In my work environment, sometimes it is necessary to ignoreHSE rules and regulations to preserve production	1
4	3	2	1	0	The senior management of this group considersHSE as a serious matter .	2
4	3	2	1	0	keep their subordinates in the flow ofHSE issues and problems .	3
0	1	2	3	4	Management is more concerned withHSE display in the form of exhibition, speech and poster installation. It is up to its implementation in practice	4

<sup>16</sup> Pathological

<sup>17</sup> Reactive

<sup>19</sup> Proactive

<sup>20</sup> Generative

4	3	2	1	0	Workers and employees of this group have easy access to their managers and can share their problems with them.	5
4	3	2	1	0	makes firm and quick decisions when dealing with HSE problems and concerns .	6
0	1	2	3	4	All the efforts of the managers and supervisors in supportingHSE are only in the direction of obtaining the top rankof HSE at the end of the yearIt is	7
4	3	2	1	0	HSE trainings are such that people can express their opinions. for better Present the situation.	8
4	3	2	1	0	If I work safely and pay attention toHSE regulations I will be thanked and appreciated.	9
0	1	2	3	4	The company I work for is more concerned with maintaining anHSE record.It is good until you really think about safety And the health of people.	10
4	3	2	1	0	In my work environment, according to the reports of the causes of the accidents, provide solutions to prevent their reoccurrenceIt will be	11
4	3	2	1	0	If the people working here feel that a job or task is unsafe, they will not do it	12
0	1	2	3	4	do not blame others after the accident	13
4	3	2	1	0	are fully familiar withHSE rules and regulations related to their jobs	14
4	3	2	1	0	do their best to improve theHSE level	15
0	1	2	3	4	The investigation and investigation of accidents or incidents that are so-called beneficial is done for the reason that finally Put the blame on one person.	16
4	3	2	1	0	The employees working in this group are so skilled in their work that they are unlikely to have an accident	17
4	3	2	1	0	observeHSE principles even in cases where no one is supervising their work	18
4	3	2	1	0	People receive their HSEtraining before starting their work in this group	19
4	3	2	1	0	Employees are encouraged to submit their ideas to improve theHSE situation .	20
4	3	2	1	0	react against people who ignoreHSE rules and regulations .	21

0	1	2	3	4	Despite the increase in HSE cultural activities safety , issues are still more important than occupational health. And it is the environment.	22
4	3	2	1	0	The employees of this group learn to make mistakes instead of being punished. Do not repeat.	23
4	3	2	1	0	The management of this group is ready to receive the opinions and suggestions of employees regarding HSE .	24
0	1	2	3	4	In my environment, performing some jobs safely and in accordance with HSE rules and regulations the , problem and It has a lot of energy.	25
4	3	2	1	0	In my work environment, accidents and incidents that are so-called good are always reported	26
4	3	2	1	0	The HSE trainings that I have gone through have covered all the health problems and hazards related to my work .	27
0	1	2	3	4	The employees working in this group are forced to ignore the rules and regulations due to management pressure	28
4	3	2	1	0	HSE principles is the first priority of employees when doing work	29
0	1	2	3	4	Group management in some cases of employee violations of HSE rules and procedures ignores	30

### Research findings

The basis for scoring the output data to identify the levels of the health, safety and environment culture ladder is defined according to Table 2 and at the end according to the questionnaires filled by 400 personnel and the points entered for each question, based on the findings of this study, the final output is as The report on the signs of establishment in 10 sections is explained in Table 3. After data collection and data analysis, the state of culture . Health, safety and environment Gas Company of Tehran Province in Mar Haleh The accountant decided that after taking the necessary measures, the organization can pass this stage and enter the preventive stage.

**Table2 range of each level of culture ladder of core**

Levels of the culture ladder	Score
Pathological_ _	0.75 - 0
_ Reactive_ _	1.5 - 0.751
_ calculator_ _	99/2 – 1/51
_ _ Proactive_ _	75 / 3-3
_ Generative_ _	4-76 / 3

**Table3The final result of the evaluation of health, safety and environment culture -**

Evaluating the level of health, safety and environment culture	Results	Establishment signs	Row
Calculative_ _	2/35	A planned process in which "preventing problems and reviewing the process" is included and the level of commitment and care in each manager and employee is high.	1
Calculative_ _	2/68	Senior management is among those who are directly involved after the incident.	2
Calculative_ _	2/49	Managers create conditions for employees to be able to solve the problems they face.	3
Calculative_ _	2/13	All in all, there is little paperwork and a lot of thinking .	4
Calculative_ _	2/46	The issue of determining the culprit is no longer an issue.	5
Calculative_ _	2/53	There is a clear and two-way flow between managers and employees, so that the management gets information directly from what has been prepared.	6
Calculative_ _	2/55	Among the employees, there is a confidence that they are able to recognize situations and make changes through systematic follow-ups.	7
Calculative_ _	2/50	Employees are afraid to talk about risks.	8
Calculative_ _	2/35	Employees are trusted to carry out most of the planning.	9
Calculative_ _	2/48	All levels are actively available and the information obtained from the reports is used on a daily basis.	10
Calculative_ _	2/45	The final result of the evaluation of health, safety and environment culture	



## Conclusion

Based on the results obtained from this study in the self - assessment of culture . Health, safety and environment, employees do not show much interest in training subjects ; Also , it seems that due to the organization of training classes just to pass the course by the unit Health, safety and environment And by compulsion, the employees do not have much desire to participate in these classes . They are only looking for a score to keep their jobs, and to solve this problem , they can be helped by the effective presence of other organizations, such as the fire department , the Red Crescent , the Ministry of Health , etc. In this case, training cases with more practical load should be taught in the working environment of people , because with the corona epidemic and the provision of online training platform , we still see the continuation of the process of authorized training in most courses . Y Health, safety and environment We are the gas company of Tehran province and it is now that the importance of practical training in the work environment is clear . In addition to the discussion of training regarding maneuvers which is held periodically , should be dealt with seriously and if there are defects in the holding it should be canceled and the order to repeat the maneuver should be given as soon as possible , Because the negligent execution of the maneuver and the inappropriate arrival of the experts . Health, safety and environment Headquarters of Tehran Gas Company is the only reason for implementation There is a lot of administrative errors and when an accident occurs, there is no coordination and preparation not only within the organization but also with other relevant organizations such as the water and sewage company , the electricity company, and the fire department . It will not look for the emergency sign.

Based on the results , when accidents occur , senior management is directly involved and all employees feel personally responsible when others have accidents , but the implementation of such behaviors is only after It keeps the organization at the accountant level from the occurrence of the accident and does not allow the employees to activate their minds to implement the safety culture and accept responsibility under normal conditions and also He seeks the attention of managers to frequent and frequent visits to the departments and to monitor the work of his employees . As a result , the establishment of management for accurate communication between the leadership , culture and performance can be considered as a dynamic research . of the important issues regarding health, safety and environment is to inform the employees about health, safety and environment issues, and in this study , the workplace was placed in the accounting stage. At this stage of the ladder, management has a lot to say but little opportunity to communicate from the bottom up . As after the calculator stage is the proactive stage , one of the solutions to take this stage to the proactive stage is to invite the management to continue the discussions . We should get this attitude that dialogue with working groups is useful and this should be a two - way process , in addition to involving employees in decision - making . and asking them to provide a solution creates a sense of ownership in them , which in turn can lead to safe behaviors , positive atmosphere and safe culture.

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## Comparison of self-esteem and irrational beliefs in women candidates and non-candidates for hair mesotherapy

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### Abstract

The purpose of the research is three Self - esteem and irrational beliefs in women candidates and non candidates for hair mesotherapy that a retrospective study method was used . The statistical population included women who were candidates and non - candidates for hair mesotherapy in the spring of 2014 Kalinik Pwest and Moronik Qazouin visited . The sample . consisted of 300 people who were selected as ilable sampling . To collect information from the questionnaire \_ Respect Rosenberg himself And Jones - Ahvaz illogical beliefs test was used. The results showed that there is a statistically significant difference in the self-esteem of women candidates and non - candidates for hair mesotherapy , and the level of self-esteem in women who are candidates for hair mesotherapy is lower than that of women who are not candidates for hair mesotherapy, but the results are different . There was no significance in the . illogical beliefs of women candidates and non - candidates for hair mesotherapy  $P > 0.05$ .

**Keywords:** self respect, irrational beliefs-hair mesotherapy

### Introduction

Androgenetic female alopecia or hair loss with a female pattern is one of the most common types of hair loss in women [1] . FPHL is characterized by progressive shrinking of hair follicles and reduction in hair density, mainly in the central parietal area of the scalp. [2] FPHL , One of the most common disorders is hair loss , but with increasing age 55 of women over % 70 years of age experience hair loss with a predictable pattern . They experience attention , , and the progression of the disease occurs in a small number of patients science . Typically FPHL ] It reaches the first peak during the fertile years and the second peak after menopause 3 In a Brazilian study, it was found that . [68 of women between the ages of %20 and 29 suffer from hair loss [4-5] reported the prevalence of female pattern hair loss of .2.52 in % postmenopausal women with an average age of 58 years. It is interesting to note that the objects FPHL varies by residence and ethnicity . \_ For example , the breakdown and analysis of student population prevalence showed that the overall prevalence FPHL is 28.6% . That At areas % Rural is significantly more than urban areas. and is significantly related to family history 6

To date, there are several non-surgical methods for hair regrowth, but the results vary. These include finasteride The position of It is oral , minoxidil , dexamethasone treatment , PRP

] .microsozen treatment , laser treatment , etc ,7-8For patients who do not respond to drug . [ treatment , surgical intervention can be considered . Various surgical techniques , including hair transplantation , hair growth microcrop , mesotherapy with growth factors , deep micron and engineered hair follicle stem cells . e available[9 Mesotherapy is a minimally invasive [ technique that involves injecting a mixture of agents It is an active drug in diluted doses intradermally[10 Patients in [ In addition to the potential reduction of systemic adverse effects, this treatment achieves the effectiveness and durability of the treatment[11 The main [ criticisms related to mesotherapy are related to the lack of standardization regarding the form of application, factors It is actively used and the frequency of meetings[10] Pain can be a . limitation for this complementary therapy method be\_ Options for reducing pain in patients undergoing scalp mesotherapy Non-drugs such as vibratory anesthesia devices are considered safe, effective and simple, which cause Tactile distractions are applied in situ and thus provide comfort during the procedure[12 In addition to local pain from punctures and mild [ headaches, complications such as persistent edema, infection Microbial, urticaria, skin necrosis, panniculitis, acromia and cicatricial alopecia have already been reported.However, it is believed that part of these adverse effects are more related to the clinical indication Inadequate, insufficient asepsis, use of non-sterile materials and even performing this procedure by a specialist It is non-medical than mesotherapy itself[11 Although studies have [ shown that mesotherapy can be an auxiliary option for treatmentFPHL Considered that although it is minimally invasive, it is essential to be treated by a medical professional with Clinical and pharmaceutical experience, following aseptic regulations according to the method, with the aim of preventing complications mentioned should be done. [13 [[14] stated in the results of their research: the overall satisfaction of patients with female androgenetics on a scale between1 and 10 for performing mesotherapy after three treatment sessions was , 6.3

It seems that the psychosocial impact of hair loss is more severe in women compared to men be[15] And\_Hair loss is one of the most anxiety - provoking and uncomfortable skin . conditions2021 Alessandrini. Hair loss not only affects the beauty , but also strongly affects the psychological state of people[16 For women, thick and healthy hair signifies a sense of self-respect, self-confidence, and ability They involve change, security, and social interaction . These elements that become chronic and Treatment resistance is associated with it, it has an important negative effect on the quality of life of women[17 In society, a head full of hair is [ considered a key part of the ideal body image , and androgenetic alopecia can have a significant .effect on a person's appearance and dignity[18 Studies show that many sufferers of [ androgenetic alopecia suffer from feelings of anxiety, helplessness and reduced self-esteem [15] And self-respect is closely related to satisfaction in terms of appearance .[19-20] Highly . visible hair loss results in a greater negative impact on functioning, emotional.regulation, self-confidence, and feelings of stigma[21]

Another variable that can be investigated in women candidates for hair mesotherapy is .irrational beliefs[22]They believe that physical changes lead to the formation of a negative body image and subsequently cognition Negative thoughts involve the person's mind instrument d. Patients who have changes in their physical appearance experience many cognitive changes, including dissatisfaction with their appearance, running away from themselves, and negative thoughts about themselves[23] Beliefs play an important role in . reducing mental health in people applying for cosmetic surgery , and it seems that people's

dissatisfaction with their body image under the influence of personal and environmental factors .can lead to incorrect evaluations, negative thoughts and emotions in them[24] Hair loss, loss . of one or both breasts and visible scars in women with breast cancer are related to their thoughts and feelings[25-26] In the study .[27] it was reported that people applying for , cosmetic surgery scored higher in two indicators of body mass and irrational beliefs. Also, some research findings showed that cosmetic surgery is related to negative descriptions of body appearance[28] The psychosocial impact of hair loss is often due to its nature Medically . benign , its annoying conditions are ignored Addressing the psychological aspects of androgenetic alopecia can take care Comprehensive , from the patient and improve patient outcomes[15] Based on this, the present study was conducted with the aim of comparing self . - esteem and illogical beliefs in women candidates and non - candidates for hair mesotherapy

## definitions

### Define your dignity

Among the meta-ethical characteristics, self-respect is the organization of a person between self-concept and ideal self. Self-esteem is a person's view of himself, and this view is neither magnified nor exaggerated, nor belittled and despised. True or healthy self-esteem is the final judgment that a human has about himself and is made up of ability and value based on reality. When a person has false self-esteem, he has an exaggerated sense of worth, which is caused ] by a misunderstanding of disabilities and is used as a defense mechanism[29] Self-esteem . comes from a sense of value and confidence that a person has his own abilities Therefore, self-esteem is a kind of personal evaluation that causes a person to pay attention to himself will be [30 High self-esteem has signs that include efficient behavior, initiative, high empathy, [ decision-making power, and problem-solving ability[31] During failure, these people will . have correct and realistic judgments about themselves and do not blame themselves for their nature and capabilities[32] .

### Definition of logical beliefs

Irrational beliefs are thoughts that dominate the human mind and affect the interpretation and giving meaning to events. give[33 Actually ; \_ They are compulsive tendencies that lead [ to confusion and anxiety in people[34 Logical beliefs are beliefs that are desirable, useful [ and flexible are below These beliefs are based on reality and have been confirmed in practice . Irrational beliefs are thoughts and opinions that are not compatible with reality and are formed based on suspicion and personal opinions are These beliefs are forced, committed and absolute are accompanied[35 Irrational beliefs include the need for approval and support from others, [ high expectations of oneself, tendency to blame oneself, reaction to failure, emotional irresponsibility, preoccupation with anxiety, avoidance From issues, dependence, despair towards change and perfectionism Such beliefs in dealing with external events and stimuli create emotional consequences such as fear, anxiety, anger, guilt, sadness, hostility and depression. slow In fact, these are human beliefs which determines the type, state and intensity of his emotions and behavior slow[36

## theories

The level of self - esteem is different in women candidates and non - candidates for hair mesotherapy

The amount of illogical beliefs in women candidates and non - candidates for hair mesotherapy is different

## **materials and methods**

### **research method**

In this research, the method of post- event study (Ali-comparisons) was used

Statistical population and sample

The statistical population of this research includes Candidate women , etc He was a candidate for hair mesotherapy , which was performed in the spring of 1402 at the skin and hair clinic . They visited Qazvin city . Using the available sampling method, 300 people were selected as a sample, of which 150 were candidates for hair mesotherapy and the other 150 were candidates for hair mesotherapy Tools

### **) Self Esteem Scale RSES (**

Ronberg's self-esteem scale ( RSES ) [37] It was made in 2008. The scoring of this scale is using a 4-point Likert scale, in which the answer completely agree is given a score of 4 and completely disagree is given a score of 1 . In the study [38], the reliability of this scale was reported as 0.84 using the internal consistency method and 0.84 with a two-week interval, and 0.67 at a 5-month interval. At Research They are also stated that This scale has a negative relationship with the neuroticism subscale Meaningful and small scale extroversions, Empiricism and task-oriented from Neo's personality questionnaire Positive and meaningful relationship It has and does not agree with the subscale, these results indicate the convergent and divergent validity of this scale. In the study [39] , for the reliability of this scale, the internal consistency coefficients of the items in the entire student sample were 0.84, male students 0.87, and female students 0.80 . Obtained. The correlation coefficients between each of the items of the scale with the total score of the items ranged from 0.56 to 0.72 and all At the  $P > 0.001$  level It was meaningful . At Research The analysis between the above scale and the death obsession scale in the whole sample was -0.34, in male students -0.44, And in Female students - 0.27, a significant negative relationship was seen, which indicates the divergent validity of Rosenberg's dignity scale. **Jones ' irrational** .

### **beliefs test**

Jones Irrational Beliefs Test ( 4IBT - A ) It was designed in [40] with 40 questions. Scoring this questionnaire The use of a 5-point Likert scale is used to respond strongly I strongly disagree with score 1 I agree , grade 5 will be rejected . [40] reported the internal consistency of the irrational beliefs test between 0.45 and 0.72, the test - retest coefficient as 0.92. In their research, the concurrent validity of irrational beliefs test with psychiatric problems was reported as 0.61. In the study [41] , the reliability of this test was reported as 0.86 for the whole test using Cronbach's alpha method. At Research they narrative A. N \_ questionnaire With Use From Method convergent validity 0.81 ;  $P < 0.001$  Report became . Also, the convergent validity coefficient of the test 4IBT-A and IBT equal to 0.87 were obtained

### **Implementation method and statistical analysis**

according to the statistical population of this research , which included women candidates , and non- candidates for hair mesotherapy , who went to the skin and hair clinic in Qazvin in the spring of 1402 . were, the target population was identified, and the purpose of the research was explained to a number of them who were available, and those who were willing to participate in the research were invited to cooperate, and after obtaining informed consent, the



–mentioned questionnaires were provided to them, so After completion, all the questionnaires were collected and scored according to the principles of information confidentiality, and using spss 26 software, the data were compared to compare the averages of two independent groups to determine the significance of the research hypotheses, and  $p > 0.05$  was considered significant . was taken

## findings

**Table1** Descriptive statistics .

The standard deviation	Average	highest score	lowest score	Number	group	Variable
566/4	20/22	36	14	150	Candidate for hair mesotherapy	self respect
501/4	09/25	34	12	150	Not a candidate for hair mesotherapy	
540/19	57/121	162	80	150	Candidate for hair mesotherapy	Irrational beliefs
710/19	05/120	161	78	150	Not a candidate for hair mesotherapy	

The results of the above table show that the average level of self-esteem in candidates for hair mesotherapy was 22.20 and in non-candidates for hair mesotherapy was 25.09. Also, the average amount of irrational beliefs in people who are candidates for hair mesotherapy is 121.57 and in people who are not candidates for hair mesotherapy It was 120/05

**Table2** Smirnov Kolomogrove test related to research variables .

Result	Significance level	Amara Kolmogorov-Smirnov	group	changeable
It is normal	0.071	0.063	Candidate for hair mesotherapy	self respect
It is normal	0.084	0.068	Not a candidate for hair mesotherapy	
It is normal	0.200	0.044	Candidate for hair mesotherapy	Irrational beliefs
It is normal	0.200	0.048	Not a candidate for hair mesotherapy	

According to the results of Table 2, it can be seen that for all the investigated variables in the two groups of hair mesotherapy candidates and non-candidates for hair mesotherapy, the P-value is greater than 0.05. Therefore, the assumption of normality of the variables in the mentioned groups has been confirmed.

**Table 3. Test comparing the averages –of two independent groups**

<b>95% interval difference</b>	<b>confidence of the</b>	<b>Difference of –means</b>	<b>Significance level</b>	<b>Degrees of freedom</b>	<b>t</b>	<b>Variable</b>
upper line	lower limit					
924/3	863/1	0.893	0.000	298	257/5	<b>self respect</b>
5/973	946/2-	513/1	0.505	298	0.668	<b>Irrational beliefs</b>

Based on the results presented –in Table 3, since the significance level obtained from the study of the difference in the mean scores of self-esteem of two groups of candidates for hair mesotherapy and non-candidates for hair mesotherapy is smaller compared to the significance level of alpha 0.05 –, it can be concluded that there is a significant difference between candidates for hair mesotherapy and non-candidates for hair mesotherapy in terms of self-respect . According to the average scores of this variable presented in the table of descriptive statistics, it can be –said that the level of self-esteem in the candidate for hair mesotherapy is higher than the level of self-esteem in Non-candidates for hair mesotherapy are less.

On the other hand, based on the significance level obtained from the study of the difference between the mean scores of irrational beliefs of two groups of candidates for hair mesotherapy and non-candidates for hair mesotherapy , it can be concluded that between candidates for hair mesotherapy , the significance level of alpha is 0.05 –There is no significant difference between hair mesotherapy and non-candidates for hair mesotherapy in terms of the amount of irrational beliefs . According to the mean scores of this variable presented in the table of descriptive statistics, it can –be said that the amount of irrational beliefs in the candidate for hair mesotherapy is higher than the amount of irrational beliefs in There are more –non-candidates for hair mesotherapy , but this difference in scores is not statistically significant.

## Conclusion

The present study was conducted with the aim of comparing self - respect and irrational beliefs in women candidates and non - candidates for hair mesotherapy . In this research, the candidate and non- candidate women for hair mesotherapy , who had referred to K. P. Post and Moronic Qazvin clinic in the spring of 2014 , and the sample consisted of 300 people . which were selected as –available sampling . After data collection and statistical analysis, the results showed that there is a statistically significant difference in the self-esteem of women candidates and non - candidates for hair mesotherapy , and the level of self-esteem is lower in women candidates for hair mesotherapy . of women who are not candidates for mesotherapy , but the results did not show a significant difference in the illogical beliefs of candidates and non - candidates for mesotherapy , and in We will continue to review these results.

The first hypothesis of the research indicated that the level of self- esteem is different in women candidates and non - candidates for hair mesotherapy , and according to the obtained results, this hypothesis was confirmed . The result of this hypothesis is in line with the results of Okerman and Jafarni's research [42] . They concluded by examining androgenetic alopecia

in women that postmenopausal women with hair loss experience loss of self-confidence and low self-esteem. Also, Muller et al. [1] confirmed the impact of this drop on the quality of life. Alessandrani et al [16] mentioned in their research results that people suffering from hair loss often lack self-confidence. Nilfroshan 2023, by examining the quality of life and self-esteem in hair transplant applicants, concluded that patients with androgenetic alopecia experience a significant decrease in self-esteem and quality of life. [43] Wen et al. [44] by studying people with Of the 58 participants who actively sought medical treatment, 88% reported androgenetic alopecia. Report they did That fall Hair the effect negative On Life everyday they Yes, 75 percent Report they did That fall Hair the effect It had a negative effect on their self-esteem, and 50 percent reported social problems because of their hair loss. Recent research has shown that in addition to increasing self-esteem, cosmetic surgery increases self-confidence and .physical attractiveness[20] [45]

To explain this research finding, it can be stated that: Androgenetic alopecia is the most . common cause of hair loss in men and women In a society that values hair and does not associate it with attractiveness, its lack can have devastating psychological consequences. , the problem of hair loss in them can bring more destructive psychological consequences for them, among these consequences can be the loss of dignity in women with hair loss, because they lose a large part of their hair, They feel that they have also lost their beautiful appearance, and the fear of social acceptance and when others find out that their hair loss puts them at a disadvantage from a social point of view, can have a significant impact on their mentalhealth .15] and causes them to lose self-confidence and self-respect. On the other hand, it can be stated that those affected by hair loss often feel that they look older than they are, fear social rejection when looking for a romantic partner[46] and hair loss can satisfy Reduce body , image drastically[47] that these feelings and dissatisfaction with the appearance are seen more in women and can lead to a decrease in self-esteem in them, so it can be concluded that women who are candidates for hair mesotherapy have lower self-esteem than non-candidates. and .maybe one of the reasons for the request for mesotherapy is this factor

The second hypothesis of the research indicated that the amount of illogical beliefs in women candidates and non - candidates for hair mesotherapy is different. And according to the obtained results, this hypothesis was rejected. The results of the following studies are inconsistent with the results of the present study, in this regard, the results of Khabaz et al[48] showed that variables of negative body image and irrational beliefs mediate the cognitive regulation of emotion. Predictors of tendency to cosmetic surgery in women were and beliefs about The appearance of the relationship between body image and schema Hey appearance that of the attitude Inefficient and illogical things are made specifies to be slow down[49] .Wang et al[50] showed that irrational beliefs about appearance are only seen as a criterion of .beauty in women applying for cosmetic surgery. to be Torani et al[51]The results showed that metacognitive therapy and emotion regulation skills have been significantly effective in reducing the trend towards fashion, irrational beliefs and fusion of thought-action compared to the control group in women applying for cosmetic surgery

To explain the disparity between the results of this research and the aforementioned studies, it can be stated that the majority of the population of the above research were women applying for facial cosmetic surgery, and minor defects on the face or body are more important than hair loss in the early stages in women. It has attracted from them that it can intensify their irrational beliefs about the appearance, but in the current study, women with hair loss who are

candidates for mesotherapy, their hair loss is not in the final stages, which completely and compared to the rest of the body slow, so these women do not have irrational beliefs about their hair loss

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## Investigating strategies for detecting wind power generation system sensor problems

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### Abstract

With the reforms in Iran , Iran's economy shows a rapid development process . Therefore , in such a social context , the demand for energy from all strata has improved significantly . For fossil energies such as coal and oil , because they are renewable energies , in order to obtain water for the sustainable development of social production , we must Actively find alternatives to solve the energy crisis In the analysis and analysis of this article , based on the current wind power generation system , sensor error diagnosis in real operations is analyzed and analyzed . Go back to the efficiency of the overall operation of the wind power generation system for eternal improvement .

**Key words** : sensor defective wind power generation system ; Photovoltaic energy source ; Construction management

### Introduction

In the design of the wind power generation system , the sensor has always been a very important component , in the daily operation process , mainly using the wind power generation system to collect information . Its data is comprehensive and its transmission to the main control system . and the main control system It does a comprehensive analysis and analysis of all data information and finally sends the relevant instruction information to eliminate the error in a targeted manner .

### Structure and working principle of wind turbine

In the operation process , wind turbines can be basically divided into vertical generators and horizontal axis wind generators . In the analysis and analysis of this article , the deep analysis is mainly in the direction of the horizontal axis wind turbine . In the mattress process A wind turbine can basically be divided into five different parts : windmill , support , wind direction control , tower base and generator which is the main system . They form the output power control . In these five different parts of control, they must play their role together . During the work , the part of the windmill is made up of the propeller, brake, and the hub of the pitch change device . The back part mainly consists of rotor rooms , main rooms , Connecting rooms , gearboxes and couplings have been formed . Risk control is controlled by the deviation system as the main control unit so that the operations of the soul can be realized. In the current performance of turbines Wind , the effect of sufficient wind flow is zero, which drives the blades to rotate with high efficiency, and at the same time , the energy of the wind is completely converted into the energy of the shaft movement in the wind turbine . slow In this way , the effect of the wind turbine in the process of rotation can be used to drive the gearbox to make sure that the generator is working . and converts its movement al energy However , turbine is affected by the wind speed ation , it directly leads to certain rbine position . d occurs when the fluctuations are too high , and at the same time , when the sensor is installed , its position is also there . It is also relatively unique, so that hen One error occ , it is oftn difficult to determine the exact location of the sensor error . The failure of the sensor is basically due to the piracyOr

Wear and tear after long -term operation cannot be corrected in time, which in turn has a \_ direct effect on the entire wind power system . Therefore , for the wind power generation system , in order to ensure that these problems can be solved in the first time , it is necessary to effectively monitor the fault in real time . Y The interior of the system has been realized in . order to ensure long - term operation of the wind power system

### **Diagnosis of wind turbine system sensor failure**

Currently , in the process of Basically , the wind turbine system can be divided into two different ways .The first case is to perform targeted diagnosis based on model analysis . In the process of analysis and analysis of the model , the relevant staff will basically use the observer method for operations . Among them , in the process of use , mainly based on system input . The measurable output is designed and then the error of the wind power generation system is estimated based on that

### **Dependency analysis model method**

At present , the problem diagnosis methods based on model dependent analysis can be basically divided into linear analysis methods and risky model analysis methods . I did But in the evaluation of the error using this method , it is done based on a non linear system , so the algorithm is not very useful in real use . There is also a certain inconsistency in the use of the theme algorithm . However , in this kind of evaluation , it is still the same There is a relatively specific analytical effect

#### **3-1-1- Observer method**

In the process of using the observer method, it is the type of observation and analysis of the whole process of the system . Using such an observer , the generated gain matrix can often be realized online and the data can be targeted for the unknown parameters of the remaining sequence of the structure . oppression He analyzed and arranged for the rest Sequences of slowthrust faults in order to achieve simple operations in real operations , the observer can be used to achieve targeted processing . However , this method of replacing equipment also has its own disadvantages . is , in real processing , it can only deal with some sudden failures . For other errors , purposeful processing is not well understood . In the development process at this stage , some experts and experts have suggested an observation method that is applied by using an observer . simplified , It can be used well in non - linear systems . In this way , in the analysis and analysis of nonlinear characteristic parameters , it is considered as an unknown parameter , so that the applied observer It can identify the target parameter on its own parameters.

#### **3-1-2- \_ Filter method**

Compared with the traditional observer , in the process of using the filter , it can provide clearer technical characteristics . First of all, in use, there is a large amount of calculation, and the accuracy of the model is not high . Such devices are designed using the Extended Kalman Filter method for direct estimation and analysis of their contributing structures . However , for such a successful diagnostic method , specific data information should be obtained in advance during the application process . For example, in the processing process , it is often influenced by the initial value of the strength model , and it is necessary to perform statistical and analytical analysis of its values . But due to the effect of noise , when the parameters in the statistical process are unknown , it directly leads to residual errors . Therefore , this error estimation method is not very sensitive to gradual errors

### **A method that does not depend on the analytical model**

In diagnosing the fault of the current sensor of the wind power generation system, due to the complexity of the fault problems presented by the system, it is often necessary to build an analytical mathematical model. The precision in the analysis of reality is unremarkable. In the process of building such a model, it often leads to a lot of error, so it leads to the inability to accurately analyze and analyze the data model. Therefore, it is often influenced by mistakes in the processing process and as a result, a false positive problem is created. Secondly, the method of defect identification, analysis and analysis, which does not depend on the model, has been given more attention 1

### **3-1-3- The method of identifying phase reasoning**

The current phase diagnosis technique is a method that does not have a higher accuracy in the objective diagnosis process. In the real analysis process, the full use of membership functions and phase laws is used to realize phase identification analysis [ 2 ]. In the process of diagnosis, it often leads to a certain degree of ambiguity in errors. Therefore, it leads to creation One How many defects will be found in the diagnosis process. After several error points appear, there will be a definite phase relationship with the error signs. In such an analytical process, it is necessary to perform a targeted evaluation of its defect based on the fuzzy language in order to find the point of the defect with the fastest time

### **3-1-4- Breakdown and wavelet analysis**

For analysis and analysis of non - stationary signals, a method based on analysis and wavelet analysis to perform accurate evaluation and analysis and analysis of error problems it is The wavelet analysis and analysis method does not have high requirements for the power system as a whole, and in actual practice, it is almost similar to the neural network analysis method [ 3 ]. In the operation process, the advantages of traditional hardware technology are used and a certain amount of superposition processing is performed on emerging signals. and then a series of wavelet functions are formed. For the formation of local functions, the interpretation of the wavelet basis is abandoned. which highlights the more obvious features and benefits. For this type of analysis formula, under low frequency resolution and low flicker, there is often higher frequency resolution. Therefore, there are also specific differences in the breakdown and analysis of the high frequency part.

### **3-1-5- Neural network method**

In the process of using the neural network method, A.N One method is to leave the module using neurons to build the network structure. Such an analytical method often has a strong mapping ability and its information is in the range of neural weights, which can greatly improve the strength of the network. The reverse transmission theme algorithm can also be very good. Use order. And the features of the neural network and the advantages of its stability and then the full use of the weight adjustment method to realize the analysis and analysis [ 4 ]. In addition, in the process of weight distribution, analysis and analysis, the value of its error function can be easily analyzed and analyzed, and analysis and analysis are targeted. It can be realized to achieve a good exit. Second, because of the mutual influence between neurons. At the same time, in the process of actual transmission of information, there will often be degrees of error. On the other hand, systematic adjustment and targeted analysis of the traditional system is needed. In this type of information processing, the two-star transmission method not only causes confusion, but also reduces the amount of error, so it directly affects the information transmission process to some extent. He puts it

### **3-1-6- \_ Expert system method**

Therefore, this method has shown obvious changes after long-term development. For example, the use of the first generation expert diagnosis method is mainly to deal with some shallow errors in sensors. With the development of technology, in the analysis and analysis process, the use and processing of deep knowledge becomes more possible than before and as a result of the innovative development of diagnosis. Its professional is not guaranteed. Under such analytical method, it is mainly to build a system to extract knowledge points from the knowledge and professional content of some sensors, and it should also be completely arranged in the computer. Relying on the computer system, we can analyze and process the targeted damage that has occurred to the maximum extent. It meets the processing of the current computer system. On the other hand, it can be handled well in the process of analysis and analysis, and some of the results can be found in time and it applied computer system to improve the processing effect to the maximum extent.

### 3-2 Analysis and analysis of dual-fed wind power generation system

In the analysis process at this stage, the analysis and analysis method of the isolation system based on the double-fed induction generator, using the model building method to perform the structure analysis. It is purposeful, therefore, it is also necessary in the actual analysis of sensor failure in wind power generation systems to provide the possibility of accurate assessment. In such an analytical mode, the modeling method can be used to form a non-strategic evaluation system to be used for internal sensor failure problems, and to understand the transfer rate of data changes in the structure specifically and intuitively. Only by fully understanding the effects of changes in the system can we prevent serious structural damage. At the same time, it is necessary to accurately assess the quality of the product in order not to be influenced by external factors. In this case of error isolation, it is also possible to obtain the error waveform and domain information directly. In order to make a good foot for the fault-tolerant control plan, and the realization of the purposeful management of the error and its solution, after such an analysis and analysis, also fulfills the effect of the current error processing to a large extent. he does.

### 4- Conclusion

In summary, wind power generation has become an important research target in the world, therefore, in the long-term development process, accurate error assessment for the sensor is necessary.

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## Review of several methods based on wavelet transform for data steganography

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### Abstract

To control and secure the transmission of information on the Internet, from steganography Data encryption is used to ensure the security of the encrypted message. Data classification can be used in the area of transformation and communication. Wavelet conversion methods that are in the field of conversion. Or the frequency in this are presented in the article, they are good against attacks and intruders, and they are difficult to be hacked by eavesdropping. Invisibility, security and strength are used.

**key words : Steganography, transform and spatial domain, wavelet transform, embedding capacity, imperceptibility**

Introduction  
With the development of information technology, information security is a major concern in the interactive environment where there is no security for sending PMs to the recipient. A technology called Nahan Nagar Steganography It is assumed that the security of the secret communication and does not guarantee the protection of information. Data encryption hides the secret message in each of the receiver's images and sends the secret message in such a way that the message is only for the sender and The grater should be visible. Nahan Nagar Y That is, hiding a secret message behind a KPM is common and it is the art of hiding a message in a communication channel, so that a certain type of information is hidden in other types of information [2, 1]. Steganography is the art and science of placing hidden messages in a masked message, in such a way that no one except the sender and receiver of the message suspects the existence of the hidden message. don't So that the information is not disturbed If it is not discovered, new steganography techniques are used.

These techniques usually work based on perceptual clarity, data capacity, security, and computational costs. Although significant progress in related research For the past years, steganography has been used to control and secure communications and transfer information on the Internet. If data encryption is used, it does not guarantee the security of the hidden message. The classification of data can be used in the area of transformation and space for covert communications, military communications and multimedia. Shud3The methods used in the field ofL Or the frequency in this are presented in the article, they are good against attacks and intruders, and they are difficult to be hacked by eavesdropping, invisibility, security and robustness are used. In this article, the concept of data encryption and steganography techniques are first presented in the two fields of frequency and location. Then



the methods Frequency domain based on wavelet transform are presented . And then the importance and necessity of conducting research on the security and confidentiality of information with data steganography based on wavelet will be explained . And with the conducted investigations, data steganography methods based on wavelet transform have better efficiency and performance than other methods in the spatial domain and transform domain 4.

Also, the analysis of very important methods for hiding confidential information in a picture is accepted . And the provided barouches are recommended for their importance Methods based on wavelet transformation in data steganography should be specified .

## Theory and background

steganograph It means to hide a secret message behind a normal KPM consisting of two words . Steganos Meaning of cover and word Graphia It is taken to mean writing . steganograph It is an ancient method that has been done for thousands of years and in different ways to preserve private communications [ 5 ] .

The first use of steganography can be seen in the years before Christ , when people in ancient Greece wrote messages on wood and covered it with wax , which The title acted as a covering tool . The Romans used different forms of invisible inks that were used to decode those messages with light and heat . During the war During the Second World War , the Germans introduced a format that made all documents , photos , and maps the size of a dot and could be attached to a common worksheet . who use the method of hiding the encrypted message in a seemingly normal message and hide their message in a scattered form within a text [ 5 ] .

The security of data during transmission in the network can be used by one of two methods of combining them , the first is encryption , the other is data hiding . Steganography is different from cryptography , and the two concepts are completely different, and we will point out their differences below . Early cryptography techniques existed in ancient times and it seems that most of the early civilizations used cryptography to some extent [ 6 ] .

Watermarking Steganography means hiding the existence of a message in another media ( audio , video , image , communication ) . steganograph It means to hide the hidden PM behind a regular PM . And it is an ancient method that has been done for thousands of years and in different ways to preserve private communications. One of the important issues in the exchange of confidential messages on the Internet is the issue of security of information exchange . In this article , the wavelet conversion method is more secure and robust during transmission due to the use of carrier image wavelet conversion , and its penetration and diagnosis is more difficult for ordinary people . Is .

Images are the most important media used , especially on the Internet , and they are considered as carriers of cover in cloaking. Hiding information , in addition to its use in cloaking in order to preserve property rights , is a means for It is considered a hidden communication[7] .

## The importance and necessity of doing research

In the topic of image processing and encryption, images are known as the most important media due to their capacity and relative resistance to attacks . Image steganography is a technique for hiding hidden data in an overlay image and in order to prevent hackers from accessing hidden data , which causes security . The data will be Steganography has been used in order to keep secret information safe during transmission through various communication channels such as the Internet . In steganography , the algorithm of encryption and decryption themes is used to hide and extract data in images . The protection of confidential information against enemies and intruders and the discussion of data security are the most important goals of steganography . And the importance and necessity of doing this article is . So far , many algorithms have been proposed in this field , not in universities and industry 8.

in this According to this article , the security and quality of hidden images are two important factors in transmission in the network and the Internet . Information hiding methods based on wavelet transform are not presented in this context which have better efficiency and performance in concealment . According to water exchange criteria such as PSNR and SSIM , MSE and QI and other important criteria in hiding the best method among the methods carried out in the frequency domain articles on the wavelet transform which is multi - transform The wavy type is selected . Then , three new methods that have more security and strength of quality are described . Their advantages and disadvantages are based on the evaluation criteria . Remakhfi is examined by other methods of the articles . In the steganograph One of the most effective measures of image quality PSNR is the similarity between the original image It measures the coverage and the hidden image . A higher value of PSNR means that there is less variation between the hidden resolution and the overlay resolution . hidden , they are more invisible . The efficiency of steganography techniques is usually based on the transparency of perception , capacity of information , security and the costs of calculations . Therefore , the objective of this research is to choose the best steganography methods based on wavelet transform , which ensure the security and stability of the data . Transferring data, especially images , on the Internet It does not guarantee the network [ 9 ] .

### Definition of steganography

steganograph Encrypting can be defined as the art of hiding confidential data inside the cover object . In this process , the secret message must remain in the cover object . be hidden so that no one except the sender and the receiver will be informed of its existence. In other words, if the existence of confidential PM is revealed , the encryption plan has failed. However , all encryption methods must comply with common requirements , in this regard , for the important characteristics of any information encryption system , parameters such as Clarity , strength or resistance , the container of the encryption system \_ For information hiding , security and complexity , he pointed out that usually achieving superiority in one leads to weaker results in other parameters . It is important that in hiding the information should not be discoverable visually or aurally . A photo is a covert image . Penetrability and high load capacity are some of the important parts of any cryptographic mode [ 2, 10 ] .

The concept and general expression in steganography

- Data : First information The principle that should be found in the transmission communication is hidden . The data can be a plain text . An image , audio file , and audio file .
- Carrier : The main skeleton of image encryption includes a carrier that includes a KPM . It is a cover image [ 11 ] .
- Cover data : audio , image , text , etc. files that are used to embed information in it . Information means any binary data It is a special sign that is used for embedding in the cover object .
- Confidential data : The file contains the information that is obtained after embedding the data in the cover . Encryption resolution after embedding data in the transmission path can be affected by deliberate changes . Yaghi Ramdi will be rejected . This change can be intentional attacks such as the intentional embedding of data in it and The usual changes on the image such as compression and changes caused by noise in the transmission path [ 7 ] .

2. Hidden analysis : It is a science that examines the characteristics of the essence of images . This knowledge , by extracting the statistical analyzes that are sensitive to the placement of PMS , using a classification system , the process of diagnosing PMS in the cover media . It does the hidden writing .
3. Encryption key : the confidential key agreed between the sender and the receiver , which is used to improve the security level of the information embedding and retrieval algorithm . It is called encryption . It is possible that the information before embedding is encrypted using an encryption key and based on one of the symmetric or asymmetric key encryption algorithms . And then they are hidden in the cover. The encryption key can be different from the encryption key [ 8] .
4. No watermark : The expansion of multimedia systems and the use of the Internet has made it possible to access digital information and copy them easily . The media has created various digital media such as images , audio files , and videos . Therefore , the issue of data protection against copying and forgery is very important . For the same reason , we must use some solutions for copy control . Copyright protection includes identity verification and identification of legal copies of any image . The digital watermarking method of adding a visible structure . If invisible , they can be branded . Although this method has advantages , it also has some drawbacks , among which are the loss of the password , the change of the contents during the transfer , and the time spent for decryption . and returning the data and some other points from this point [ 9,10].

Encryption : Encryption provides a method for establishing secure communication . This prevents access to information by unauthorized people who are usually known as hackers . In encryption It is called -plain text ( PT ) and encrypted text ( CT ) . One key and the desired input , one simple text in the output to An encrypted text is converted into a secure one - time encryption scheme , so that unauthorized persons and hackers cannot extract any information from the plaintext of the key . In other words , cryptography in the digital space is an algorithm that converts your original and transparent text into an incomparable text . Reading by the PM carrier converts it . The encryption scheme algorithm usually uses a special key parameter for the data conversion process . Some of the encryption scheme algorithms They have one key for encryption and decryption called symmetric encryption , and also for encryption , they use one -public key and one private key . [11]

Decoding : It is an operation that with Use From The decryption key returns the encrypted PM to the original PM . From the point of view , this algorithm is the reverse of the encryption algorithm and is obtained by decoding the original data on the receiver side , which has many applications . [ 12 ] .

Wavelet : A is a small wave and wavelet functions It 's also the same as the small face are . The sinusoidal signals are in the form of waves , and the difference with the sine signal is that the sine signal did not occur at a specific moment in time , and this signal is It begins at infinity and lasts forever , while a wave is located at a specific moment in time . This feature allows wavelet transform to obtain time information at the same time in addition to frequency information , which is widely used in data steganography in the field of transform . has [12].

Steganography process

Steganography is the art and science of communication that hides -the existence of communication . To -that Write It is also called masking , because it uses a message mask to send any important hidden messages . In the process of steganography , the hidden data is first

hidden in the intensity, which is called the cover object, and thus it forms the stego object. and then this new object can be transferred to the storage. By using different techniques, it is possible to visualize the hidden data in the form of an image. A music file even send a DVD file by embedding it in the carrier, so A hidden signal is formed. At the end of the receiver, the hidden data can be retrieved from the stego signal –using different algorithms. Non - destangography consists of 4 basic components as follows [ 13 ] :

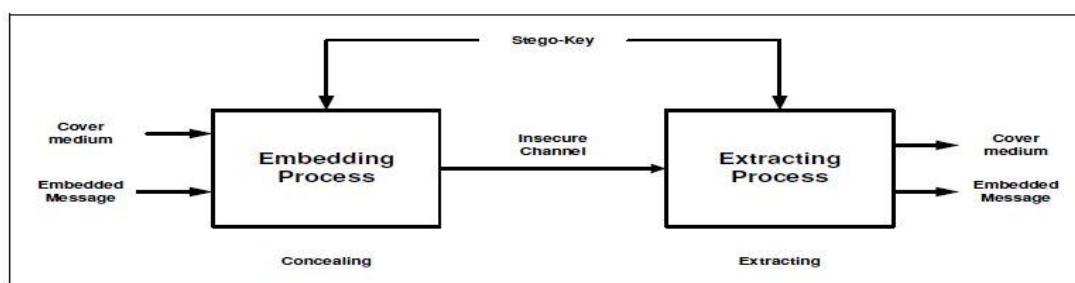
Algorithm for embedding the theme of the cover

Secret ( confidential ) PM : cover object ( text , image , audio and video )

The whole secret Sharing ( between sender and receiver )

Algorithm of the theme of data extraction

Whenever any of the above components is discovered by an unauthorized person, the encryption system will lose its security and will no longer be reliable. sender and receiver are very important and should not be disclosed. If this communication is leaked, the security Information is at risk, and it is easy to find hidden information by performing statistical calculations on the media used, and it is possible to prevent unauthorized people from sending this data in the network. [ 11 ]



## 1 :( Steganography process 9

### Objectives of steganography

The main purpose of steganography is to establish my communication in a completely non - identifiable way and to prevent suspicion for the transmission of hidden data. hers from knowing the hidden information, but also prevents others from thinking that this information even exists. If the steganography method makes someone suspect that the information in a There is a carrier medium, in this case the method has failed. The objectives of data encryption T .<sup>22</sup> and confidentiality<sup>21</sup> Kaparchag ,<sup>20</sup> . reproducibility ,<sup>19</sup> intangibility<sup>18</sup> , are: capacity container \_ Data objects container resolution Impervious Touch refers to the efficiency with which data can be hidden ing imperceptible . idden data can be reproduced from the hidden image regardless of filtering and cn . ally , confidentiality are related to the transmission of .[13] data without errors . The objectives of cryptography are shown in Table 1

<sup>21</sup> Intangibility

<sup>22</sup> Capacity

<sup>23</sup> Recovering Ability

<sup>24</sup> Integrity

<sup>25</sup> Confidentiality

**Table (1): Objectives of covert writing [ 13]**

<b>Confidentiality</b>	<b>integrity</b>	<b>recovering ability</b>	<b>intangibility</b>	<b>Capacity</b>
<b>confidentiality</b>	<b>integrity</b>	<b>Recovery ability</b>	<b>Intangibility</b>	<b>Capacity</b>

between steganography and encryption

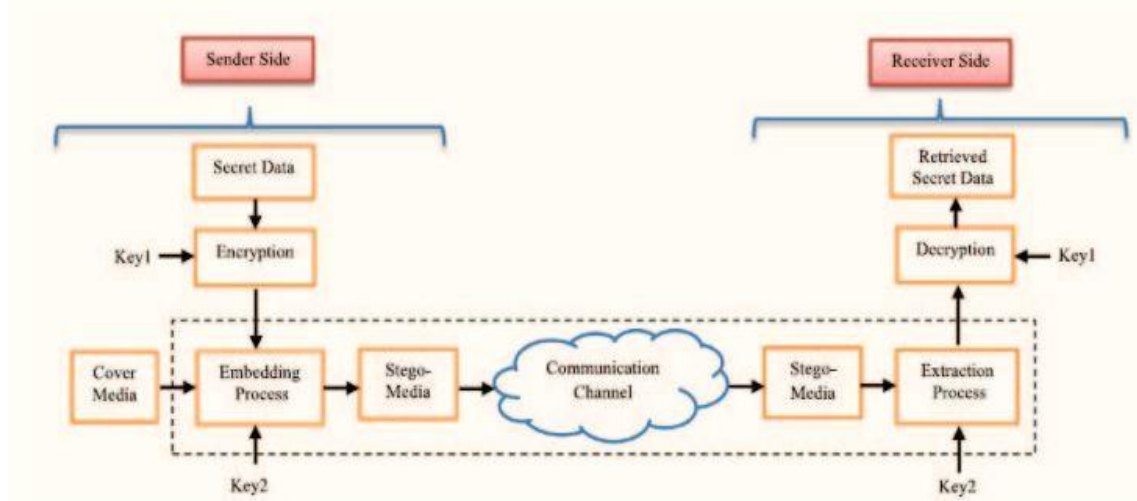
For data protection Secrets against unauthorized access , confidentiality and all TPMS use two techniques , cryptography and encryption . to be Cryptographic techniques are used to protect digital data during transmission from sender to receiver . Process . The data is encrypted in the sender and decrypted in the receiver after the drop . Hence , there is no other way to protect the data [ 14. [

But the techniques of cryptography , A hidden data directly inside an embedding media and we will always remain in it . For encrypted data transmission , it is not necessary to remove the cover signal because it is given as a signal . The language is inserted that does not have any adverse effect on the original data . In hiding the data in the image , the human eye should not distinguish between the original image and the image . to sense the hidden information. Information encryption is under the collection of information concealment science , in which it is tried to communicate information confidentially to another party in an insecure communication . reach \_ Insecure communication is a communication in which anyone can access the communication channel [11] .Cryptography is also a part of te science of hiding information . Cryptography is different from obfuscation . \_ Thereis a news communication channel , but because the PM is encrypted , it cannot access its contents . ( sound ) does not know.

Encrypting and hiding information are two main categories in information security systems . \_ Both approaches are directed towards information security , but their techniques are different . Stealth is the art of hiding a secure password within various types of digital media . The challenge The principle in this method is to hide important data in an overlay without destroying any part of the overlay. The important point in steganography is that the covers should be resistant to identification and the injection of confidential and hidden information in them should not change their appearance and their usual nature . If it is revealed in any way that in one picture Audio files contain confidential information , so to speak, the cover is exposed and there is a possibility of hiding and extracting information [ 14. [

By changing the appearance of confidential PM , encryption methods generate other information under the name of encrypted text , which often have an incomprehensible and random form . Not visible . To Phrase In other words , the presence of confidential information or the sending of a confidential message is completely clear in encryption , but only the predetermined recipient has the ability to retrieve the information , this is that viewing the encrypted data on the channel will attract the attention of the attackers . secretly , by creating a disturbance in the communication channel , it will make it difficult for the receiver to send information . In this case , with the successful implementation of the encryption method Communication from the attacker's point of view , in addition to providing information security , communication security will also be provided . This method will not replace cryptography, however , it is meant to complement it [ 11 , 12 ] . Figure 2 shows the difference between cryptography and steganography .





**Figure ( 2 ): The difference between cryptography and steganography [ 11,12]**  
**between steganography and watermark is not**

In many cases, the concept of watermarking is wrong taken Watermarking is another class of information hiding place, where Multimedia data for copyright purposes or identity verification are involved. Digital encryption is an emerging technique that has been proposed to protect intellectual property and copyright. The internal image of the hidden digital source is called watermark. In the past, the technology that can protect the material and spiritual rights of the digital media and protect it from copies There was no permission to prevent the action. This attracted the attention of the research community and led to the birth of digital watermarking. In digital watermarking, information is directly included in the data. Embedded multimedia The embedded information is called a watermark. This added signal should include enough information to achieve the desired level of security. It is added to the original signal in a way, firstly, it is invisible and secondly, it cannot be easily removed, or the minimum amount of processing required for its unauthorized removal is such that it significantly reduces in the quality of the original data [ 14 ]. Digital images are widely used due to the presence of a large amount of additional information in the field of encryption. Guy Rand Data hiding can be classified into digital watermarking and encryption.

The issue raised in watermarking is that the information hidden in the digital media is related to that media and is used to validate the work. The main purpose of watermarking is to enter information in the cover object which is the original signal so that it cannot be changed or destroyed, and in case of tampering, the cover object Completely unused.

In the watermark, by putting a special effect on it A document that is text, image, sound or video, we can copy it. In fact, the watermark should be seen by everyone in order to minimize the possibility of copying, while in hiding, we are looking for the fact that no one will notice the existence of data in the image. Generally, image hiding can be defined as the process of hiding private and confidential data in images, without creating any significant changes on the image of the Turkish language. he did The information embedded in the cover image can be text messages, binary bits, etc. Yes Another hidden image The classification should be done in such a way that the deviation of the image coverage is reduced as much as possible. This is very important, because the details of the overlay image must be preserved so that the hidden image is similar to the overlay image. Therefore, eavesdroppers cannot detect the presence of any added information within the image. Another important factor to consider is the payload. This method defines the amount of header data that can be placed inside the overlay image. The ability of the cryptography theme algorithm to resist various attacks on it is generally called



its strength . Cryptography technique means embedding secondary data and information . It is in digital content so that humans cannot easily notice their existence , but its identification is done by computer algorithms . rejection It can be said that watermarking is not a collection of steganography . It is a covert image . In watermarking , the cover is important , but in steganography , the confidential message is important [ 15 ] .

### Techniques used in steganography

The rapid development of Internet technology has transferred more and more multimedia information online . the security of multimedia data dissemination in a public channel faces a great threat . Encryption and encryption methods are used to protect data . Encryption turns hidden content into a fake code , but makes it easy to arouse the suspicion of an eavesdropper . The process of mapping in terms of the field of operations into two categories : location and frequency Y a t b d i l t a k s y m which have been used in the field of transformation of various methods in the articles . The methods of discrete case transformation and discrete Fourier transformation and wavelet transformation which in this end In this letter , wavelet - based frequency techniques are examined [ 16 ] .

#### Space field A place

In this category of methods , in order to perform hiding operations , no conversion is done on the coverage signal , and all the actions related to hiding in the area \_\_ \_ The place is \_\_ \_ . appliedSpace domain schemes place the secure message bits directly in the cover bits . In the space domain , the information bits are directly They are hidden on the pixels of the cover image . The field of location includes those algorithmic themes that embed the bits of the language into the bits of the language and in performing the encoding operations Any conversion on the cover signal is not accepted

Spatial - type cryptography techniques have high embeddability , but they are exposed to any small changes In the field of space , there are different methods , which is the simplest method \_ LSB displacement\_In this method , PM bits are less valuable every Pixels are <sup>23</sup> hidden and used in many articles . This method is against attacks like filtering and compression like techniqueJPEG is sensitive , but its implementation is simple and has a high capacity . In spite of its high capacity , location - based hiding methods have very low resistance . It is necessary to find ways to increase the resistance of hidden information resolution . For the . resistance of data images , we use the methods of the field of transformation Other .[16] methods performed in the space field are PVD andEMD method, which are mainly used in many articles. In general, among the methods , they are not resistant against attacks due to the fact that the bits are not directly replaced in the pixels of the overlay image , and easy implementation and capacity It has a higher value and a longer execution time during ] steganography17] .

#### <sup>24</sup> \_ The field of fever Frequency

In these methods , the secret message is embedded in the signal transformation space of the cover , including the frequency domain . Latent mapping in the field of transformation is better than the field of location in terms of resistance and transparency. In this method , instead of the field of location , information is hidden inside the fields of image transformation , such as frequency . It can be said that it has high resistance to the field of location. Therefore, the

methods of cryptography in the field of transformation were created and expanded . The frequency domain is used to improve the strength of the encryption . In the transformation domain , PAM is embedded after applying a suitable transformation to the image , which allows \_ It allows more bits to be hidden without changing the pixel values of the spatial domain of the image [ 17 ] . Even if this process is more complicated than the domain method . space , the hidden data is located in stronger areas that provide higher resistance to statistical attacks and are unlikely to be deciphered by unintended intruders . \_ It is the type of methods that the information of PAM bits is placed on all the bits of the values of the desired conversion The confidential API is -embedded in the space of signal conversion , therefore , it cannot be said that one of the best methods of information security is hidden are many domain transformation techniques that can be widely used in many areas of image processing , including data hiding [ 18 ]

Discrete Norse TransformDCT Discrete Fourier Transform , (DFT and Wavelet ( Transform \_ DiscreteDWT and L \_ Integer Wavelet ( IWT )\_ <sup>25</sup> The most famous transformations are those used in domain transformation methods . These transformations are applied to overlay and overlay images to improve visual quality Improve existing methods in data mapping and extraction . In general , the conversion methods use the difference method to increase the robustness and reduce the distortions , which increases the security when transmittinginformation 18 .

A review of three steganography techniques

In Table 2, there is a comparison of the three techniques of the inter - technical review Steganography has been shown in two widely used fields in the field of steganography , which is the field of easy implementation and more embedding capacity , more execution time , but less security and strength . They have . In contrast to the methods of conversion Or they have a higher frequency of security and transparency and penetration

**Table2 Comparison and review of data steganography techniques 18**

transpar ency	Penetrab ility	Reduc e distort ion	Stren gth	Implement ation	executi on time	Capac ity	secur ity	<b>Steganogr aphy technique</b>
fewer	More	fewer	fewer	simple	More	More	fewer	<b>spatial domain</b>
More	fewer	More	fewer	complicate d	fewer	fewer	More	<b>Conversio n field</b>

Encryption methods in the frequency domain

Frequency techniques including PAM embedding by adjusting the coefficients in the field of transformation , including the discrete kinematics transform and discrete instantaneous transform , wavelet transform It is known that the wavelet transform has different types and includes discrete wavelet transform , continuous wavelet transform , wavelet transform of real . number . The transform can be Or \_ He applied an image to its sub - sections The displacement process is done by modifying some of the coefficients , which are selected

according to the type of protection . If we want our signal to be imperceptible , the upper limit The frequency range is selected But if we want our MPM to be strong , the lower range of the frequency spectrum is selected . Usually, the coefficients that need to be corrected belong to the middle range of the frequency spectrum , so that a balance between the perceptual uncertainty and robustness is obtained [ 19 ] . The frequency domains used in the articles are : divided into three categories , which are explained below and are

- 1) Discrete change of person
- 2) Discrete Fourier transform
- 3) Wavelet transform : which includes three methods , which are : Wavelet transform Adjoint , discrete wavelet transform and wavelet transform of real number 30 \_ .

#### Discrete Class Transform DCT <sup>26</sup>

It is a domain transform technique that is widely used in first - generation transform - based mapping systems and later replaced by DWT dueto its capacity It has been replaced by better penetration . It has been used as a popular tool for transferring bits in higher frequency sub - bands The method has no choice of direction for the diagonal features and invariant change . Discrete Lexinous transformation is also a method That mostly It is used in \_ watermarking . This technique separates the image into sub - bands of different desired areas based on the visual quality of the image . The frequency domain changes slowly DCT is applied in sub - sections of the image with the size of x pixels . In each of these sections after the transformation DCT the energy is transferred to the lower frequencies in the upper left , corner , which causes the rest of the matrix with very high values , which leads to the opportunity to ignore them . And doing the compression , find the transmission . The main challenge Find \_ A suitable displacement factor in terms of strength and lack of visibility . compared to the watermarking method DCT can be widely used in image processing applications for pattern recognition and noise filtering . Alternatives to DCT are wavelet transform methods , which are These researches are presented and reviewed . The tendency to use wavelets in signal processing and analysis instead of \_ In addition to DCT , there is a DCT because of higher security .

#### Discrete Fourier Transform DFT <sup>27</sup>

Discrete Fourier transform is a transformation that transforms a finite sequence of equally spaced samples of a function into an equal length sequence of equally spaced samples Discrete time transforms . In image processing , samples are pixels One is an image . Watermarking is mainly applied in medium frequency bands , because high frequencies show the original information , which causes any visual change in the range

A space focused on radio frequencies The bottom with compression techniques overtaking ] May Rand14.

The use of watermarking in the middle frequencies makes it simultaneously strong and unnoticeable . The output of the Fourier transform has real and imaginary components . That Information particle for direct object Both At Size And Both At Phase Tuzi is slow . Since the size of the information is less than the phase , it is recommended that the watermarking be done with a large change of displacement If there is , the rotation of the radius vector in the convolutional plane is used

Any function of to that the face \_ A new period appeared as a collection It should be expressed from the sine and axine members of the family of innumerable frequencies , each of which is multiplied by a factor  $b$  . Also , the functions \_ which are bounded but not alternating , can be defined as the integral of the sine and sine functions multiplied by a weight function that is instantaneous One of these functions Fourier series and Fourier transform representations share an important property that allows them to reconstruct the original function without losing any information . and also appear again in the original domain of the function . The Fourier transform may be the next or two - dimensional . There may be analog and discrete Fourier transforms .

### Wavelet transform

Wavelet is a group of mathematical functions that is used to analyze the signal based on its frequency components , the resolution of each component is equal to its scale . Wavelet transform is the analysis of a wavelet function Wavelet transform is effectively used as a powerful tool in many different fields , including signal processing theory , physics , astronomy , and image processing . They are used approximately . This is the principle of the wavelet transform to overcome the weaknesses and limitations of the Fourier transform . Unlike the Fourier transform , this transform can be In the case of non - stationary signals and dynamic systems , it is also used . In comparison with the instantaneous transformation , it can be said that the transformation Wavelet has very good localization feature . Instant change A pictograph has a large number of coefficients . Because the basic functions of the Fourier transform are sinusoidal and sinusoidal functions , whose range is constant in the entire interval While the wave functions are the functions that most of their energy is concentrated in a small interval and quickly converge Therefore , with the appropriate selection of the mother wavelets , it is possible to perform better compression in comparison with Fourier transform . Fourier transform for signal analysis from one head It uses sine waves with different frequencies

in this The signal mode is left A line of sinusoidal signals is displayed But the wavelet transform uses a number of functions called wavelets , each of which has a different scale . As we know the meaning of the word wavelet , it is a small wave and the wavelet functions are also exactly the same . It is clear that the signal does not occur at a specific moment in time . A signal starts at infinity and continues forever , while a wavelet is located at a specific moment in time This allows the wavelet transform to obtain time information in addition to the frequency information . Because the wavelet is located in time , as a result , the original signal can be at different moments of time in the wavelet. This is due to Ricky Fitt 's measurement , interest in area coding , low bit rate transmission , which is rapidly It works . and is also compatible with the human visual system Quality provides good understanding

The examination of the wavelets may be different from two types of drugs

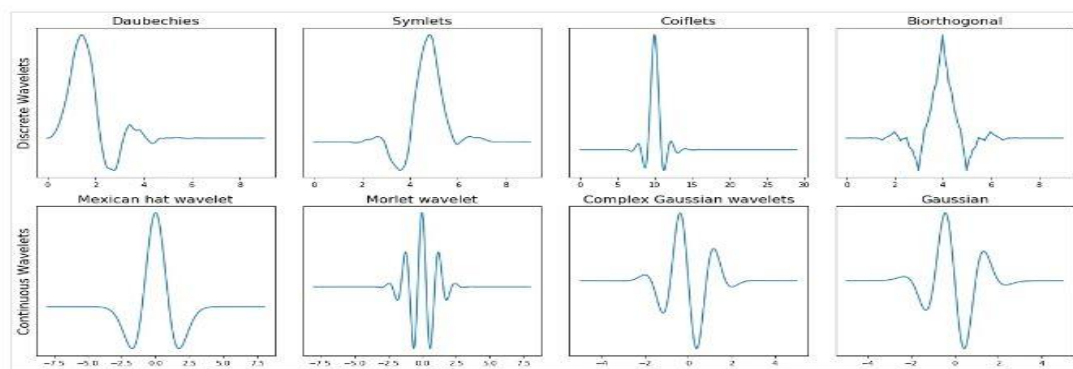
### Continuous wavelet transformCWT

The continuous wavelet transform is a transformation that takes the continuous function in time to the time and frequency space , and the continuous wavelet is the value of the scaling factor and the displacement of the continuous numbers . Therefore , there are countless number of wavelets , but when we talk about the discrete wavelet transform , the main difference that exists is that of the discrete wavelet for the discrete factor . 100 % transferable \_ Discrete wavelet transform is used in this transformation , it is discrete only in two domains of scale and displacement , and it is not discrete in time domain . Compressed Wavelet Conversion ( CWT ) is a complex value format to DWT \_ To \_ CWT , with the wavelets in one of the base wavelets , one extension and one change . Discrete wavelet transform has been used in most articles . \_

which will be presented later by studying the articles [23] . Mathematically , A continuous wavelet transform equation 1

$$X_w(a, b) = \frac{1}{|a|^{\frac{1}{2}}} \int_{-\infty}^{\infty} x(t) \psi\left(\frac{t-b}{a}\right) dt$$

In the above formula  $\psi(t)$  is the parent wavelet of the base which By factor  $a$  is scaled and shifted by the factor  $b$  The value of the scale factor and shift are continuous numbers , so there are countless number of wavelets . We discuss discretely , the main difference that exists is that discrete values are used for the scaling and displacement factor in this transformation . The important point What exists is that the discrete wavelet transform is discrete only in the two domains of scale and displacement and is not discrete in the time domain . Continuous wavelet transform CWT The function generated by the mother wavelet is useful for analyzing complex signal information and extracting interesting patterns It provides different frequency , As shown in Figure .CWT is a correlation between a signal and a series of wavelets



**Figure: a picture of several families of discrete wavelet in the top row and continuous wavelet in the bottom row**

### Discrete Wavelet Transform DWT

In comparison with other cryptography methods in the articles , this method is relatively new and efficient in terms of calculations , so its use has increased It includes the displacement of the PM hidden image by modifying the wavelet coefficients of the image used as a cover for the transmission of the hidden image . The discrete wavelet transformation is due to Its wide application in the dish Or \_ impenetrable in the military field \_ It is used as a defense . Therefore, the original PM is transmitted by the receiver without loss or resistance . The use of discrete wavelet transform enables independent processing of the resulting components without noticeable interaction between them . and therefore makes the process of imperceptible displacement more effective\_

In this conversion , the time domain passes through low - pass and high - pass filters , respectively , to extract low and high frequencies . This process It is repeated several times . and each time a part of the signal is pulled out Unlike spatial domain methods , hidden PMs are located in high frequency coefficients obtained from discrete wavelet transform The fit of the image remains unchanged in the analysis DWT divides the signal into two categories . by dividing the signal for different scales and frequency bands It means approximation and details DWT : uses two sets of functions Banding and wavelet are done with low and high . filters , respectively In other words , only half of the samples in one signal are enough to represent the whole signal and double the frequency separation

Discrete wavelet transform DWT is widely used in signal processing , watermarking and image compression DWTOne decomposes the image mathematically into a set of . functions known as wavelets Wavelets are generated by transforming and expanding the



existing original wavelet The image is decomposed by performing row operations followed by column operations . In row operations , for the first level of analysis , the base filter  $N$ -pass extracts the approximate components of  $B$  , and the high -pass filter extracts partial components , each with length  $N$  Then, the same operation is performed using two halves , as a result of the first level of analysis , the image is divided into four parts called approximation , (  $LL$  ) horizontal (  $LH$  ), ) vertical (  $VH$  ) and diagonal (  $HH$  ) are separated . Approximation (  $LL$  ) band contains the low frequency information of the image For each successive level of analysis , the approximate band of the previous level is used as input . In the second level , of decomposition DWT is applied to the  $LL_1$  band , which divides it into four sub - bands . In the third level of analysis DWT on  $LL_2$  . applies Finally , four sub - bands are obtained from the third level , which include  $LL_3$  ,  $LH_3$  ,  $HH_3$  ,  $HL_3$  . Therefore , in most cases , data embedding is done in  $LH$  and  $HL$  medium frequency bands . In DWT based on embedding  $LSB$  bits of hidden data at times ,  $LSB$  of the band Quantized DWTs are stored . Therefore the payload , DWT is less, but security is higher

In other words , the wavelet transform describes the multi - resolution decomposition . process in terms of expanding an image over a set of wavelet basis functions Discrete wavelet has its excellent spatial frequency embedding DWT divides the signal into high and low frequency parts The high- frequency part contains information about the edge components , while the low - frequency part is further divided into high and low-frequency parts . The high - frequency components are usually used for encoding are used , because the human eye is less sensitive to changes in edges. In two-dimensional applications , for each level of analysis , first DWT in the vertical direction and then DWT in It is executed in the horizontal direction . After the first level of decomposition , there are four subbands  $LL$  ,  $LH$  ,  $HL$  and  $HH$  For each successive level of decomposition , the subbands  $LL$  of the previous , level is used as input . To perform the second level decomposition DWT is applied to  $LL_1$  which divides the , 1 band  $LL_1$  band : into four sub - bands , which are  $LL_2$  ,  $LH_2$  ,  $HL_2$  and  $HH_2$  in which The method hides the cover images as input and divides the cover image , .

An example of a well-known discrete wavelet in the papers is Haar wavelet HAAR ( which works on the data by calculating the sum and differences of the adjacent elements . , This wavelet is first on the adjacent horizontal elements and then on It works on adjacent vertical elements . Which of the good properties of the wavelet transform is that the transform is equal to its inverse . Since the change in the wavelet is used , it is clear that The information is not exposed to the attack . Each transformation calculates the energy of the data in the shift to the upper left corner . The discrete wavelet transformation solves the problem of robustness and security issues . It has been solved and this feature enlarges the embedded area and . improves security So DWT leads to higher sensitivity and higher PSNR One of the main . reasons for using discrete transform is its simplicity The process followed is two - dimensional and three - level discrete wavelet transformation It is a two-dimensional wavelet transform because the frequency subbands are twice in the horizontal directions . and vertically are decomposed that DWT level level provides better image analysis than level 1 and . Beyond . levels , the computational efficiency of the model begins to decrease The DWT method involves dividing the principal component frequency band into four different smaller . bands , known as subbands , which are The list of the following bands is shown in Table 3

$LL$  both horizontal and vertical low - pass filters below the band :

$LH$  low - pass and high - pass filters , respectively , in horizontal and vertical subband : . directions

$HL$  high - pass and low - pass filter , respectively , in the horizontal and vertical : directions of the subband

$HH$  Both horizontal and vertical high - pass filters below the band :



Table sub-bands of DWT method [24]

LL	HL
LH	HH

About the robberies LH and HL are obtained when high - pass filtering occurs in one direction and low - pass filtering occurs in the other direction It is complete, most of the image information is in the image sub - band LL is clustered . The sensitivity of the human eye to changes in the LL band is relatively higher , and the other subbands LH , HL and , HH contain little information , so embedding The hidden image in these tapes rarely changes the quality of the image

### Integer wavelet transform ( IWT )<sup>28</sup>

IWT is a non-linear transformation and as a distortion rate ( shape change) , its performance is similar to DWT and guarantees full recovery. Decimal points are rounded to the nearest correct values, and then, IWT is applied to the vertical band of the cover image and payload to obtain four bands of 1 x 1 houses , each measuring 64 x 64 . It has been applied and then embedded in the IWT coefficients of the cover image. It has been observed in the reviewed articles that the proposed algorithm has a very good PSNR and has achieved a high level of security in data steganography , 19 .

The wavelet transform of the correct number is the result of rounding DWT is obtained . DWT uses different functions from the wavelet family as the mother wavelet for the transform DWT are classified into two orthogonal and bi - orthogonal groups . The analysis and length analysis of orthogonal wavelet filters are similar , while biorthogonal wavelet filters vary in terms of length the length of the base station , symmetry , decay rate of the b , coefficients , double orthogonality and the orthogonality of the slow change function results . Choosing the best wavelet transform to achieve the effective performance of the encoder . Y This is necessary because no filter method is suitable for all problems . However , obtaining the best wavelet transform is usually done through trial and error It can be [24] .

However , the evaluation of each wave feature will facilitate the selection process . The upscaling scheme allows the transformation of the new wavelet from the mother wavelet using the features of the derivative domain . It determines the mother wavelet and the obtained transformation features . All the mentioned properties are performed by the orthogonal wavelet with different functions , which can be experimentally used to choose the most appropriate wavelet . It should be suitable for hiding . Orthogonal wavelet families have no obvious meaning except for the widely used wavelet . The wavelet transform produces two types of coefficients , which The coefficient of the wavelet is proportional . Y. A. D while by subtracting two neighboring samples , A wavelet coefficient is generated to form the parts of the image Scaling and wavelet coefficients are obtained respectively using equations and calculations in articles Calculation of scaling coefficients is obtained according to equation and equation 3 d , where . S is the ratio of D , coefficient of approximation of b i is the signal of the image and n = , n Also , reverse operations are performed to obtain the original image . ] in data steganography . be 20

In other words , it is a valid wavelet transformation It is a frequency domain method that effectively produces lossless compression . In this transformation , if the input is like an array of real numbers , the resulting output is also The numbers are correct . Despite the Discrete Wavelet Transform ( DWT) if the input contains correct numbers like in the picture , the ,

output is a decimal point . Therefore , data loss cannot occur in IWT, and this increases the amount of data exchange in the transmission of information , because it converts the correct \_ number to the correct number at the exit . so it seems that the subband LL in WordIWT is a close copy with a smaller scale of the original resolution , while in the case ofDWT it is , subband . The resultingLL . is slightly distorted

$$2 \quad [23] \quad s_n = \frac{i_{2n-1} + i_{2n}}{\sqrt{2}}$$

\_ Equation 5-2 also for calculation The scale factor is shown in the wavelet transform of the \_ . correct number

$$D_n \quad )3 \quad ([23]$$

$$= \frac{i_{2n-1} - i_{2n}}{\sqrt{2}}$$

UnlikeDWT due to the operation of the compression line in , the images \_ The data is lossless and lossy , which greatly increases the factorization in theIWT method for cryptography and gives better results in blue game images . \_ . It is done in cryptography with a suitable error measure

In the method of converting the wavelet of the correct number , coefficients with decimal points are used in the conversion of the wavelet of the correct number . This is a transformation One is the transformation of a real number into a map of real numbers , and the transformation ofHaar A popular playable mod in this category that the transformation \_ of the original images into hidden images and the reverse transformation in the relationships 4 and5 .are shown

. The inverse transformation is shown below

$$d_{1,n} = s_{0,2n+1} - s_{0,2n}$$

$$s_{1,n} = s_{0,2n} + \left\lfloor \frac{d_{1,n}}{2} \right\rfloor$$

$$s_{0,2n+1} = d_{1,n} + s_{0,2n}$$

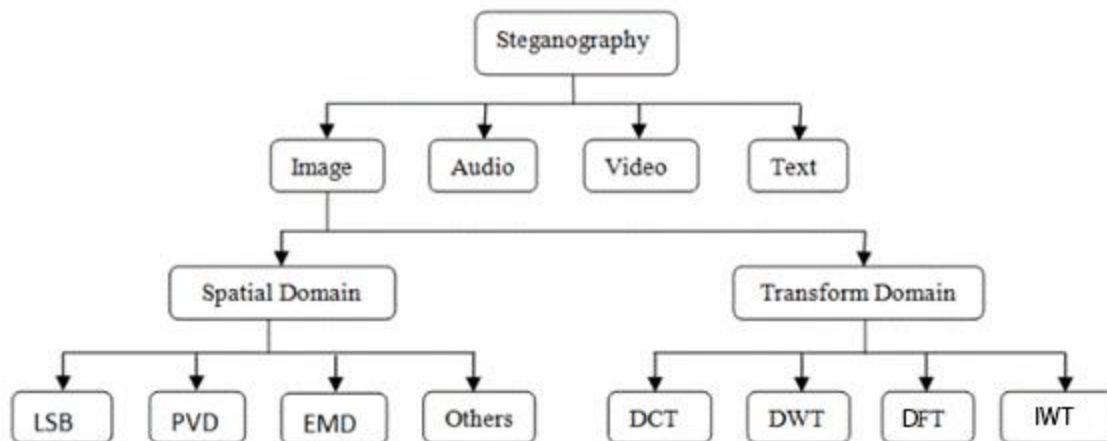
$$s_{0,2n} = s_{1,n} - \left\lfloor \frac{d_{1,n}}{2} \right\rfloor$$

wheresi,n and di,n are the low and high frequency coefficients of the wavelet at leveli When . matrix is approximation , which is a similar but smaller version of the input image . Other matrices are partial . \_ Imagine entering in - directions , In this method HL LH and ,HH are high frequency coefficients of the image

The correct wavelet transform is first performed on the cover image and then . coefficient matrices are obtained matrix \_ HH is the highest frequency detail of the input image , so this matrix is initially chosen for the displacement to achieve the displacement with . low distortion If this matrix is not enough , you can choose another matrix to replace the data . According to the transformation formula above It shows the relationship between the absolute value of the power of the edges . Therefore , when we have high value coefficients , \_ it means that more data can be placed in this coefficient without Pay attention to the \_ sensitivity of the human visual system This fact is due to the fact that the eyes cannot perceive the changes in the edge part of the images . We classify the coefficients based on their size , and each group can carry a certain amount of confidential data based on the group label

The methods performed in the spatial domain and the frequency domain

In Figure 4 , the steganography diagram is shown in different files such as image, text and audio, and video, and then the methods performed in the two domains of space and transformation are shown in In this research , the methods of the field of transformation have been reviewed above .



**Figure (4): Spatial and frequency domain techniques [ 1 , 3 , 25 ]**

Water evaluation parameters for the performance of steganography techniques

#### 1- Bit rate : ( BPP ) \_

The maximum number of compressed bits that can be hidden per pixel is referred to as bits per pixel so that the better the hiding capacity , the better the technique . It will be a better .covert . It is calculated according to equation 6

$$[24] \quad \text{BRI} = (\text{B0rat} - \text{Brate}) / \text{Brate} * 100$$

, In this relation B 0rat is the transfer rate and Brate is the data sequence bit coverage

- Mean square error ( MSE ) : It is calculated according to equation 7.

$$MSE = \left( \frac{1}{M \times N} \right) \sum_{i=1}^M \sum_{j=1}^N (a_{ij} - b_{ij})^2$$

The difference between the squares of the pixel values of the original covering images and the hidden images gives the mean square error of the image The signal is considered as the cover image and the disturbance is considered as the inaccuracy caused by the embedded bits of the hidden image in the hidden image . At Opinion taken Therefore , the obtained value should be . very low MSE it occurs when the hidden image is exactly the same as the , 0 is equal to .original cover image and there is no disturbance M \_ The data rows are the provided \_ coverage and N are the columns of the provided coverage frame[25] .

#### 2- PK ratio \_ \_ Maximum signal - to - noise ratio ( PSNR ) \_

PSNR is described as the ratio of the maximum power of the original signal to the power of the interfering signal that produces an error in its display . he does \_ PSNR . It is a measure

of the difference in the hiding image versus the coverage image caused by the embedding bits . A higher PSNR value indicates a smaller difference . high value PSNR indicates a high - quality embedding , the higher the value of this criterion , the more similar the original image is to the hidden image , and the more invisible people are . The authorized persons cannot understand the nature of the covered data and steal the information, and it will be calculated according to relation 8.

$$PSNR = 10 \log_{10} \frac{255^2}{MSE} \quad 26-8$$

#### - Correlation CR ) \_

The correlation factor is defined as follows Correlation coefficient " r " which is the amount and direction of linear deviation of two random variables . If the two pixel values of the desired frame are close to the encoder , then the correlation coefficient is close to 1 , and on the other hand, if the factor is close to 0 , then two It is boring to think about it The encoders are not close and it is calculated according to equation 9 .

$$r_{xy} = \frac{\sum (y_i - \bar{y})(x_i - \bar{x})}{\sqrt{\sum (y_i - \bar{y})^2 \sum (x_i - \bar{x})^2}}$$

$x_i$  is the frame intensity of the pixel overlay and  $x_m$  is the frame intensity of the mean value ,  $y_i$  is the pixel intensity of the embedded frame and  $y_m$  is the frame intensity of the mean value of the embedding data has been

#### Structural similarity index -(SSIM)<sup>29</sup>

The quality of the image is measured by comparing it with the original image without distortion , considering it as a reference SSIM It is designed to be a better measure of image . quality than conventional PSNR and MSE methods . A better SSIM value is a sign of stronger inter - pixel dependencies It is theirs.. These dependencies have significant structural knowledge in the visual sense . Table -SSIM index maps show hidden images using both . techniques The mean of window x is equal to  $\mu_x$  and the mean of window y is equal to  $\mu_y$  and the mean of window  $xy$  is equal to  $\mu_{xy}$  and it is , equal to  $\sigma$  and it is calculated according to equation

$$SSIM = \frac{(2\mu_y\mu_x + c_1)(2\sigma_{xy} + c_2)}{(\mu_y^2 + \mu_x^2 + c_1)(\sigma_y^2 + \sigma_x^2 + c_2)}$$

It measures the amount of image distortion in terms of three factors Contrast, luminance distortion and loss of stomatal correlation can be defined as relation as follows :

$$QI(x, y) = \frac{4\sigma_{xy} \cdot \mu_x \cdot \mu_y}{(\sigma_x^2 + \sigma_y^2) [\mu_x^2 + \mu_y^2]}$$

With the studies carried out in recent years in the field of data steganography based on wavelet transform , we have noticed that the methods based on The wavelet has replaced . the location domain methods , Like the LSB method which is easy to implement and has a high embedding capacity , but less security and is not resistant to attacks and hackers . Therefore, the authors and researchers in their research of the method presented those that

work in the frequency domain, and we chose the wavelet-based method, which puts the data in the wavelet coefficients, and the security increases. Discrete wavelet and integer wavelet are three types of wavelet transforms that have been reviewed in the articles, and DWT discrete wavelet is the most used. At Figure 5 PSO algorithm (Particle Swarm Optimization) combined with three cryptography methods, which are given under a graph. So that the embedding rate of the PSO-IWT method is higher than the other two methods. Also, the proposed PSO-based IWT approach performs better than PSO-based LSB and PSO-based DWT in terms of standard quality criteria, statistical analysis, security level estimation, load capacity, impermeability, etc[27].

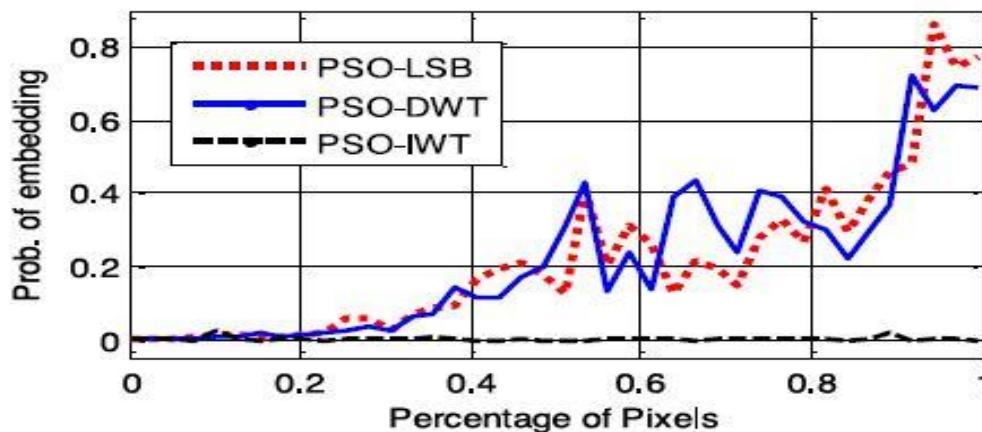


Figure combined with encryption methods embedding rate in three :pso algorithm 27

## Conclusion

The techniques of steganography in the domain, space and transformation are described. And the wavelet transformation, which is one of the methods in the transformation domain in the field of cryptography, is presented. The efficiency of the steganography technique is evaluated with different criteria, which shows that steganography methods based on wavelet transform have higher security, robustness and image quality are in such a way that the standard PSNR is maximized in wavelet transform methods.

Cryptography is defined as the science and art of hiding secret information in such a way that no one except the intended recipient can identify the existence of a secret message. And information security is important when transmitting information in the digital age. The efficiency of image encryption techniques is usually based on perceptual clarity, useful load capacity, security, resistance to heat, and the costs of the calculations are calculated. Better payload and impermeability can be achieved by image encryption. A covert design should have a high embedding capacity and the visual quality of the hidden objects should be excellent.

With reviews It has been done in the field of steganography in the frequency domain based on wavelet transform, because the bits of the original image are not directly placed in the cover images. B-wavelet has been used, which has higher security in hiding data. And because it puts the data in B-wavelet coefficients, there are three wavelet conversion methods (continuous, discrete and number Sahih H). They are used together with other algorithms for encryption. And the discrete wavelet transform is used in most of the methods and due to its discreteness, it usually has more security in data steganography[27].

My dedication and thanks

For example , " I am thankful to the Creator , I am grateful to the Creator" and it is very worthy of Farehakhte and Farzaneh of the friends who , with the dignity of the sun , enlightened the heart of the world . They made science and knowledge fruitful with useful and constructive . guidance . We express our appreciation and gratitude

Also , from my dear, compassionate and kind father, mother and wife, who provided peace of mind and peace of mind , so that with all - round support in a favorable environment , I could . complete my education . Z \_ Thank you for completing this article in a good way

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# Improving energy efficiency in communication networks

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## Abstract

This article examines the importance and solutions to improve energy efficiency in communication networks. Energy efficiency in networks refers to the efficiency in using energy in various equipment and processes related to these networks. This article shows that improving energy efficiency in these networks is of multiple importance, including reducing costs, preserving the environment, increasing network efficiency and sustainability. To achieve these goals, energy management technologies are used in network equipment and techniques such as power consumption management, improvement of cooling systems, use of high energy efficiency equipment and new technologies such as the Internet of Things and sensors. This article fully examines the challenges in the implementation of these technologies and emphasizes the importance of continuing research in the field of improving energy efficiency in communication networks.

**Keywords:** telecommunications, communication networks, efficiency increase, energy reduction, energy management, new technologies, consumption reduction

## 1. Introduction

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In an age where technology and communication have become one of the basic parts of human life, communication networks are very important. From sending text messages to data transfer and video calls, digital communication is one of the great innovations of the 21st century. With the increasing expansion of these equipments and services, the need for more energy is also felt. This need for energy is continuously increasing and at the same time, technological developments are also continuing rapidly . Energy efficiency in communication networks is not only of great economic importance, but also has a direct impact on the environment and climate change. Therefore, efforts to reduce energy consumption and increase efficiency in these networks are of multiple importance . In this article, we review the new technologies that make it possible to improve energy efficiency in communication networks. These technologies are methods and include the use of renewable energy sources including solar and wind to improve energy consumption. New technologies in this field not only reduce costs and reduce greenhouse gas emissions They help , but they also help to develop more stable and high- speed communication networks . This article deals in detail with the positive effects of technologies on communication networks and the environment and provides case studies of their practical applications In the end , we have examined the existing challenges in the implementation of technologies and the future of this field and the importance of continuing research in the field of improving energy efficiency . We emphasize on communication networks

## **The main body of the article .**

### **2-1 The concept of energy efficiency in communication networks**

Energy efficiency in communication networks Efficiency refers to the use of energy in various processes in these networks. This concept is related to the number of network devices and require energy for data transmission and various operations which ,equipment.

Energy efficiency is very important in communication networks because:

- 2.1.1 **reduction in costs:** Improving energy efficiency to reduce costs It leads to network participants, including subscribers and service providers.
- 2.1.2 **Environmental Protection:** Optimum energy consumption helps to reduce greenhouse gas emissions and negative effects on the environment.
- 2.1.3 **Increasing network efficiency:** Reducing energy consumption usually leads to increasing the performance of networks and increasing the speed and efficiency of communication.
- 2.1.4 **Stability:** Energy efficiency ensures sustainability and continuous use of energy for communication networks.

is usually possible through optimization of network equipment, use of renewable energy sources, use of new technologies such as Internet of Things(IoT) . These efforts help to optimally manage energy resources and improve energy efficiency in communication networks .[1]

## 2.2 Energy management technologies in networks

Techniques to reduce energy consumption in network equipment are very important. These techniques are used as different approaches to improve energy efficiency and reduce energy consumption in network equipment. Below, we examine some of these techniques:

- 2.2.1 **Power Management:** This technique deals with the management of energy consumption in network equipment through the power consumption in the determined times. In this way, the equipment in times when the number of network consumers is less , in a less consuming mode becomes. This happens because of \_ the reactive power in the network. [2]
- 2.2.2 **Cooling Systems:** Refining cooling systems helps improve energy efficiency and reduce energy consumption in data centers and network equipment. These improvements can be directly and indirectly related to the configuration and performance of cooling systems, including the use of open cooling, the selection of cooling equipment with high energy efficiency, the optimization of data center thermal management, the use of sensors and artificial intelligence technologies to predict needs. and the use of energy management systems. These reforms lead to reducing energy consumption and improving the performance of cooling systems. [3]
- 2.2.3 **Using high energy efficiency equipment(Energy-Efficient Equipment):** Choosing equipment with high energy efficiency can significantly reduce energy consumption in the network. This includes choosing equipment with modern energy consumption technologies and low.
- 2.2.4 **Using Energy Usage Policies:** Establishing internal policies to manage energy consumption in organizations and networks can help improve energy efficiency. These policies can include equipment scheduling, increasing, improving efficiency in the consumption of energy carriers, turning off equipment that is not used , and low power consumption during peak times.[4]

**2.2.5 Intelligentization, monitoring and management of energy consumption (Energy Monitoring and Management):** The use of energy consumption monitoring and management systems allows managers to observe and accurately control energy consumption in network equipment. These systems are able to accurately monitor the energy consumption of the equipment and by collecting information such as temperature, voltage, current, and power consumption, they inform the managers whether the equipment is working normally or not . This information allows managers to optimize equipment settings and adjust energy consumption against actual needs. With several measures including turning off unnecessary equipment during off-hours, these systems help reduce energy consumption and save money. In general, energy consumption monitoring and management systems provide basic tools for energy efficiency and reducing energy-related costs in network equipment.[5]

**2.2.6 Using new technologies:**

The use of new technologies, including the Internet of Things and modern sensors leads to improved energy efficiency and reduced energy consumption. These , technologies allow managers to optimize processes . They also help managers detect energy waste, defects, and equipment faults , while also using clean energy sources. In general, new technologies contribute to energy efficiency and saving energy costs in systems and devices[6] .

## **2.3 Challenges and the future**

- 2.3.1 Equipment challenge:** Communication networks are composed of various equipments that manage the exchange of data and signals. These equipments usually use different manufacturers with different standards and protocols, which can cause problems in optimizing energy consumption.
- 2.3.2 environmental:** Communication networks consume a lot of energy from oil and gas sources, which causes greenhouse gas emissions and negative environmental impacts. The main challenge here is not to become a clean and destructive energy network.
- 2.3.3 Increase network traffic:** With the growth of new generations of communication networks And the increase in data traffic will require more equipment and the energy consumption will increase accordingly.

- 2.3.4 **security issues:** The increasing connection of devices and equipment to the Internet of Things leads to new security issues. Protecting data and systems against threats and hacker attacks requires advanced and higher quality security capabilities .
- 2.3.5 **Management of energy resources:** Energy management in large communication systems is usually complex and expensive , and ultimately there are challenges in optimizing energy consumption and its optimal distribution.
- 2.3.6 **Courier traffic management:** Traffic changes in communication networks during peak times can lead to more energy consumption during these times. Optimizing traffic in these situations requires intelligent management

## **Conclusion**

Improving energy efficiency in communication networks is very important because it improves the performance of the system from various aspects , including reducing costs, preserving the environment, increasing network efficiency and stability. To achieve energy efficiency improvement, energy management technologies can be used in network equipment as main methods. Some other important techniques for increasing energy efficiency in communication networks include managing power consumption, improving cooling systems, using equipment with high energy efficiency, announcing new policies for energy consumption, intelligentizing and managing energy consumption, and using new technologies. They are like the Internet of Things and sensors. Although great progress has been made in improving energy efficiency, there are still challenges such as equipment diversity, environmental issues, increased network traffic, security issues, energy resource management, and peak traffic management that need to be addressed. In the future, more efforts will be made to develop energy management technologies in order to optimize energy consumption in communication networks, and the implementation of sustainable energy development. In general, improving energy efficiency in . policies in these networks will continue communication networks is of high economic and environmental importance and requires cooperation between industry, government and research to achieve goals related to improving energy efficiency and preserving the environment.

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## Investigating the effect of magnetic cellulose containing silver nanoparticles on reducing the growth of gram-positive bacteria *Staphylococcus aureus*

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### Abstract

Today, the excessive use of antibiotics has caused the creation of antibiotic-resistant bacterial strains, especially in gram-positive bacteria. *Staphylococcus aureus* is a Gram-positive bacterium against many hospital infections, and antibiotic-resistant strains are more common in this bacterium. For this purpose, coping with antibiotic resistance, many studies are conducted to develop new antimicrobial agents. In this study, a new antibacterial compound based on silver nanoparticles was synthesized and its effect on reducing the growth of *Staphylococcus aureus* bacteria was investigated. The results of investigating the bacterial growth halo in nanocomposite concentrations showed that the diameter of the halos increases with the increase in concentration, which indicates the antibacterial effect of this compound. Finally, the results of this compound show that it can be used as an antibacterial agent for *Staphylococcus aureus*.

**Keywords:** *Staphylococcus aureus*, antibiotic, antimicrobial, nanocomposite, silver nanoparticles

## Introduction

Antibiotics have revolutionized medicine in many ways and saved countless lives. Their discovery was a turning point in human history. But unfortunately, the use of this wonderful drug was associated with the rapid emergence of drug-resistant strains (1). Antibacterial resistance is one of the biggest challenges for human health in the 21st century. The mechanisms underlying this evolution of resistance are complex and involve mutations in genes that encode antibiotic targets or factors that control the production of proteins that affect bacterial susceptibility to antibiotics (2). Bacterial antimicrobial resistance It happens when changes in bacteria make drugs used to treat infections less effective (3). Due to the spread of -infectious diseases caused by pathogenic bacteria and the development of antibiotic resistance, pharmaceutical companies and researchers are searching for new antibacterial agents (4).

Silver has many industrial uses and is considered a store of wealth. However, the story of this precious metal begins with ancient civilizations. Silver has many properties that made it very valuable to early people. Today, nanoparticles are one of the important fields of modern research that deal with the design, synthesis and manipulation of particle structures in the range of approximately 1 to 100 nm. Their unique properties, which can be incorporated into biosensing materials, composite fibers, cosmetic products, antimicrobial applications, conductive materials, and electronic components, make them a very important subject for study in chemistry, biology, and medicine. These unique properties depend on the size and shape of silver nanoparticles (5). In addition, silver nanoparticles They show a wide range of bactericidal and fungicidal activity (6). Nanoparticles They are increasingly being used to target bacteria as an alternative to antibiotics. Nanotechnology may be particularly useful in the treatment of bacterial infections. For example, nanoparticles can be used in antibacterial coatings for implantable devices and pharmaceuticals to prevent infection and wound healing, in antibiotic delivery systems to treat disease, in bacterial detection systems to produce microbial diagnostics, and mentioned in antibacterial vaccines to control bacterial infections (7). The antibacterial mechanisms of nanoparticles are not well understood, but the main mechanisms of antibacterial effects of nanoparticles are: (1) mechanical damage to the cell wall through electrostatic interaction (2) oxidative stress through the production of reactive oxygen species (ROS) and (2) 3) disruption of cell and protein structure as a result of the release of metal cations (8). which eventually leads to the death of the bacterial cell

In addition, silver nanoparticles, alone or in combination with antibiotics, against several strains resistant to several drugs such as *Pseudomonas Neonatal aeruginosa*, *Escherichia coli* resistant to ampicillin. *Streptococcus* pathogen resistant to erythromycin and *Streptococcus aureus* resistant to methicillin (MRSA and VRSA) is effective. In particular, the association of silver nanoparticles with conventional antibiotics could represent a new strategy to reduce the required antibiotic concentrations and limit development resistance, because of the synergistic effects between silver nanoparticles And several antibiotics have been shown to significantly lower MIC values. reduces and increases the sensitivity of bacteria (9). However, the synthesis of nanoparticles is done using three different methods, including physical, chemical and biological methods (10). Different methods, protocols or synthetic methods are used to prepare silver nanoparticles. In general, the methods can be divided into two categories, i.e. top-down and bottom-up approaches. The top-down approach is the mechanical conversion of bulk metal into nanostructures using appropriate stabilizing agents. Contrary to this, the bottom-up approach is the transformation or nucleation and

subsequent stabilization of matter at the atomic scale into nanostructures ( 11 ). In the present study, the antimicrobial activities of silver nanoparticles alone and in combination with conventional antibiotics against bacteria *Staphylococcus aureus* was investigated . In addition, we performed experiments to investigate the physicochemical properties of nanoparticles using TEM and XRD analyses .

## materials and methods

*Staphylococcus aureus* bacteria ,In this studyThe PTCC1430 strain was obtained from the Maragheh University . Muller Hinton , of Basic Sciences Department of Microbiology, Faculty Broth(MHB) and Muller Hinton agar(MHA) from Dana and Jabarban sfixim amp Celine and , Hayan Pharmaceutical Company ( Tehran, Iran ) purchased became . For the cultivation and multiplication of bacteria, from Mueller Hinton culture medium (Merck , Germany) was used . Silver nitrate and other materials for the synthesis of silver nanoparticles were obtained from . Maragheh University , of Basic Sciences the chemistry laboratory of the Faculty

## Synthesis of silver nanomaterials

synthesis Nanoparticles in the chemistry laboratory department of the Faculty of Basic Sciences , Maragheh University , In the revival method Chemical Done. In it, all physical parameters were considered fixed and identical. For this purpose , 0.35 grams Magnetic cellulose to 150 cc Distilled water was dissolved . After complete dissolution and homogenization of the solution, 0.17 grams Silver nitrate ( $\text{AgNO}_3$ ) with 5 cc Distilled water is dissolved and added to the solution , and then we allow it to be kept untouched for 24 hours. then sodium tetrahydroborate ( $\text{NaBH}_4$ ) which is a strong regenerating agent in the amount of 0.015 grams Dissolve with a few drops of distilled water and add to the solution , then it remains untouched for 24 hours . Then the desired solution for 5 minutes at a speed of 80 rpm Centrifuged and we separate the zinc solution and do it again for 5 minutes. This work is washed three to four times in a row to remove impurities of silver nanoparticles. And then in different dilutions of 75, 100, 200 and 400 micrograms/ml , it was investigated with serial dilution on the mentioned pathogen . The properties of silver nanoparticles were investigated using TEM and XRD .

## Activity Anti Microbial nanoparticles

test release Chah K : First To prepare a fresh culture of *Staphylococcus aureus* bacteria from Mueller Hinton Agar 34 culture medium grams in one liter of distilled water were used (12). Then, to prepare a microbial suspension, one loop of each microbial strain is added to 10 ml of culture medium Mueller Hinton Broth was added, in the next step, the concentration of bacteria was measured using a spectrometer with an optical density (OD) of 0.08 at a wavelength of 600 nm , to a final concentration of  $10^8$  cells/ml. obtained in each milliliter of each sample (13).

effects Anti bacterial Nanoparticles From through test release the well agar Assessment became . Approximately 20 milli Liter Muller Hinton agar At dishes Petri Sterile done appointment Data became . After that bacteria I see To 24 hours At Nutrient environment At An overnight culture at  $37^\circ\text{C}$  Santi grad incubate became To preparation grass Hi bacterial From Broth Materials Nutritious ( contains CFU/ml  $10^8$  ) Use became . Roy every Page agar, four the well

created and sealed with agar. And Then With Silver nanoparticles alone and in combination with antibiotics (ampicillin and cefixime) the experiment Full became . Distilled water was considered as positive control and silver nanoparticles as negative control . Then plate To Period 24 the watch At The temperature is 37 degrees Celsius They were shaken in the incubator . Then areas Inhibition Around the wells With Use From line rubber band Size get became And To Title the amount of Average ( vs according to Mili m ) for every Page Expression became (14) .

test release Disc : measurement release agar as That before With Use From Muller Hinton agar explanation Data have been do became . anti Biotic Hi Normal To Assessment Effect treatment hybrid With anti Biotic I see And Silver nanoparticles Selection became On Basis CLSI standard , Density anti Biotic Hi item Use Cefsexim ( 5 microgram At Mili liter ) and amp Siline (30 micrograms At Mili liter ) . To preparation grass Hi bacterial From Broth Materials Nutritious ( contains CFU/ml 10 8 ) Use became. when determination effects Treatments hybrid, every disk Paper Standard with silver Nanoparticles smeared was ultrasonicated for 15 minutes from the antibiotics themselves as disks Hi control over Roy plate I see actions became . Then By comparing regions Inhibition With control disc, surround disks With Use From line rubber band Size get became And To Title the amount of Average ( vs according to Mili m ) for every Page Expression ( 14-15 )

## Results

of silver nanoparticles : In this research of silver nanoparticles synthesized using silver nitrate as a precursor . And 100 % sodium chloride was used as reducing and stabilizing agents . The composite solution was  $\rightarrow$ brown in color after preparation  $\rightarrow$ and was absorbed by an external magnet. Morphology of silver nanoparticles using transmission electron microscopy (TEM) It was observed that the resolution of Rebardar TEM It showed that silver nanoparticles are well dispersed and spherical ( Figure 1a ) . The size of silver nanoparticles was recorded in the range of 50 nm and was controlled by optimizing the experimental parameters . respectively , the average size of nanoparticles is 3.567 , 5.045 and 9.572 nm was measured ( Figure 1b ) .

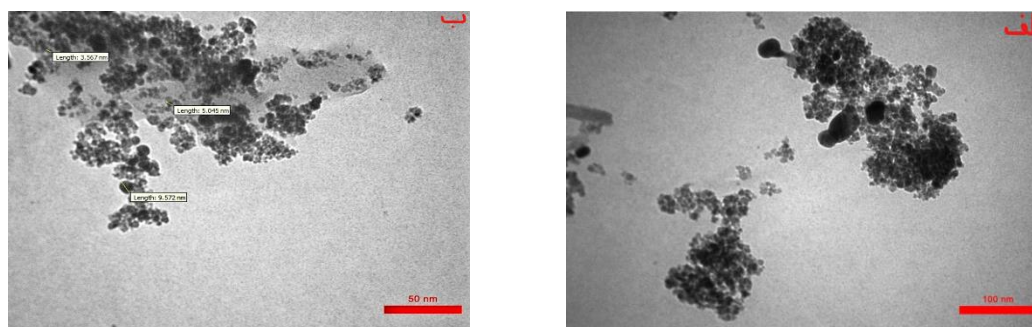


Figure 1 : a) Morphology of silver nanoparticles using transmission electron microscopy b ) The particle size of silver nanoparticles using Transmission electron microscope

In addition , the purity and elemental composition of silver nanoparticles synthesized using analysis XRD Was determined . In terms of XRD , silver nanocrystals have the peaks of the diffraction band  $\theta$  2 at 38.12 degrees, 44.30 degrees and 64.45 degrees . showed that it can be attributed to the reflections of 111, 200 and 220 corresponding to silver, respectively. It can be seen from the graph that the maximum peak with the intensity of 111 and the maximum

angle of 38.12 degrees is observed. to be The maximum peak intensity of 110 was recorded for cellulose and the peak range of 220 to 440 for Fe<sub>3</sub>O<sub>4</sub> (Figure 2).

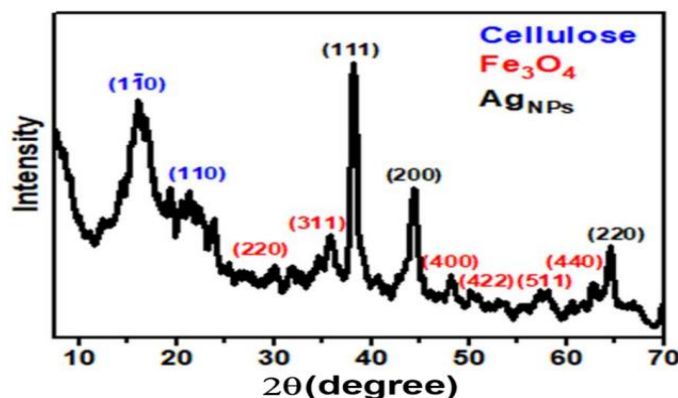
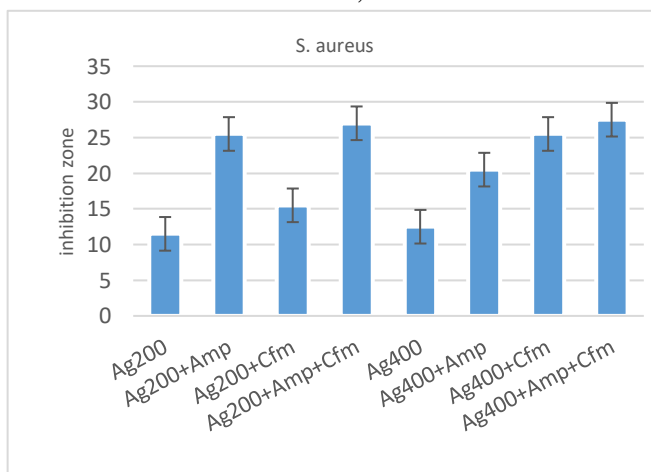


Figure 2 : B element crack of silver nanoparticles synthesized using Z analysis XRD

### nanoparticles Antibacterial activity of silver

We investigated the direct antimicrobial activity of silver nanoparticles We investigated the gram-positive bacteria *Staphylococcus aureus* by the well diffusion method. In the initial investigation, silver nanoparticles at concentrations of 75 and 100 µg/ml did not have any inhibitory effect, however, other concentrations of silver nanoparticles had significant antibacterial effects. showed against gram-positive bacteria, but when antibiotics were combined with silver nanoparticles, a significant increase in the inhibition of activity in combination with silver nanoparticles with concentrations of 200 and 400 µg/ml It was observed for ampicillin and cefixime so that the crack inhibition zone of ampicillin<sup>1</sup>, cefixime and silver nanoparticles on average, respectively In the limits of 25.1 5 ± and 2 ±5.20 mm 1 ± was 15/5 and 2 ± was 25/5. While the combination of both antibiotics with silver nanoparticles received more attention, the inhibition zone was recorded as 1 ±27 and 2



5.2 (Figure 3).±

Figure 3 : Turkish containment zone b Antibiotics with silver nanoparticles

Synergistic effects better To Compounds Silver nanoparticles andampicillin against *Staphylococcus Oreos* view became . At front side, Decrease minor At Activity AntibioticAt equal to *Staphylococcus Oreos* when That Silver nanoparticles with Sephikim Composition



the compn observed that became view became . It was also Antibiotics Silver nanoparticles and in equal to *Staphylococcus aureus* was concentration- dependent , and with increasing It increases the Here are the results concentration, the zone of inhibition also increased . With . antibacterial effects of silver nanoparticles in combination with antibiotics

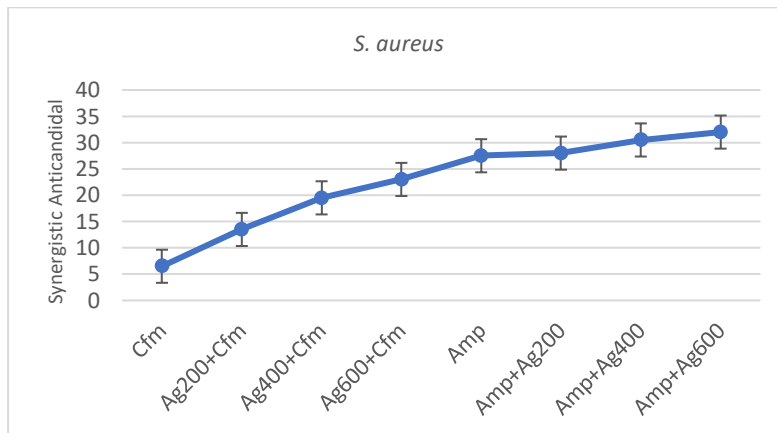


Figure 4 : effects Synergistic combination Different concentrations of silver nanoparticles with antibiotics

## Discuss

Prevalence Sickness Hi infectious caused From types of Different microorganism I see And Creation resistance To anti Biotic is now getting more attention . Applications Anti bacteria Technology Nano To prevent From Outcomes impossible before Nose resistance anti biotic Importance more find has done . Antibiotic clinical trials to evaluate the efficacy of new antibiotics can be difficult and costly , especially when Multidrug - resistant gram - negative bacteria are targeted because there are almost no rapid diagnostic tests for patient recruitment ( 16 ) .. The results of Thomas et al . in 2014 showed the antibacterial potential of synthesized silver nanoparticles with standard antibiotics against coagulase negative strains . *Staphylococcus epidermidis* , *Staphylococcus aureus* , *Salmonella typhi* , *Salmonella paratyphi* , *Vibrio* and cholera with biofilm resistant to several drugs evaluated was placed The result is significant because silver nanoparticles have better antibacterial activity against all The experimental strains showed the most activity against strains 145 and 152 of *Staphylococcus epidermidis* . The results of the study It shows the clarity of the biomedical applications of the synthesized silver nanoparticles ( 17 ) . Sagar study Katva et al showed the effect hybrid Silver nanoparticles With Gentamicin And Chloramphenicol At Comparison With Silver nanoparticles To Loneliness More Was That indicating Effect Both increase this Components is (18) . Various studies and researches on the energetic effects of nanoparticles have been carried out to Title An example is in a study conducted by Bonde and his colleagues in 2012. They showed the antibacterial activity of silver nanoparticles against three human pathogenic bacteria that were used in combination with existing commercial antibiotics . synthesis Nanoparticles silver By extract The leaves of Indian arborvitae were prepared by green synthesis method . The results of their research showed the bactericidal activity of standard antibiotics in the presence of silver nanoparticles against disease - causing bacteria , for example , *Escherichia coli* , *Staphylococci* Aureus and *Pseudomonas aeruginosa* Significantly increased Found . Also , the synergistic results of combining silver nanoparticles with gentamicin show more activity against bacteria . *Escherichia coli* ( increase of inhibition

zone - 4.06 ) followed by *Pseudomonas aeruginosa* with ( 1.11 ) and *Staphylococcus aureus* with ( -0.09 ) , while *Tetraca coli* showed the maximum activity against *Staphylococcus aureus* and after *Pseudomonas aeruginosa* and *Escherichia coli* , the results of their overall research showed better antibacterial activity .They showed three human virulence bacteria ( 19 ) .Results of antibacterial activity of nanoparticles in Kaur 's research et al . in 2019, it was observed that vancoma cyine has an effect on the growth of bacteria Asherishya did not have a  $\neg$ whole ; However , mixing silver nanoparticles with Vancomycin prevents its growth to some extent .From Nero , Bacter Y *Escherichia coli* resistant to vancoma cyanine also became sensitive to the composition of vancoma cyanine nanoparticles .  $\neg$ In addition , the effect of combining silver nanoparticles with the drug Vancomacin on the  $\neg$ sensitivity of bacteria *Staphylococcus aureus* was more than *Escherichia coli* .  $\neg$ Also , the increase of the antibacterial activity of synthetics by silver nanoparticles coated with vancomycin has been shown in this study (20). However, the study of Saeb et al . in 2014 showed the stability of nanoparticles silver Production done Also effects Anti microbial particle for direct object up to 90 days So From Production sign They gave. Their study showed Nanoparticles silver biosynthesized activity Anti microbial more At Comparison With Gentamicin against *Pseudomonas aeruginosa* And Vancomycin against Isolates  $\neg$  *Staphylococcus Oreos* and MRSA in Density Very Low sign They gave (21).

## Conclusion

While there are many reports of antibiotic resistance, studies in the field of nanotechnology, the antibacterial activity of silver nanoparticles, have received more attention from especially researchers. In this study , *an attempt was made to* show some of the antibacterial properties On this, One . of silver nanoparticles on *the* Gram -positive *Staphylococcus aureus* bacteria effect too An increase in the combination of antibiotics ( ampicillin , cefixime ) with silver nanoparticles was observed. in the work the future, we must On Roy mechanisms Potential of nanoparticles and performance Anti their microbial activity on other bacteria and also to focus 's' investigate the genetic toxicity of silver nanoparticles **let**

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## Application of silver nanoparticles in wound treatment

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### Abstract

Wounds are always one of the problems that humans are dealing with. The wound healing process includes 4 stages of homeostasis, inflammation, proliferation and transformation or maturation. A wide variety of substances are being used in the treatment and healing of wounds. Nanotechnology, as a science that has many applications in various fields today, enters this field as well. Silver nanoparticles are one of the products of this science, which have shown antimicrobial effects against a wide range of microorganisms, including gram-negative and gram-positive bacteria, as well as inhibition of biofilm formation. These nanoparticles are synthesized by various methods, including chemical, mechanical and green, which is superior to other methods due to the unique characteristics of green synthesis. Although the accumulation of silver metal in the body causes toxicity, its accumulation is reduced in the nanoscale and does not harm the body. Dressings that contain silver nanoparticles, or plates and nanocomposites that are produced from combinations of different materials with these nanoparticles, have had notable and significant effects in wound treatment. It is expected that silver nanoparticles will be suitable substitutes for antibiotics. Also, the evidence shows that in the future, there is a possibility of treating wounds caused by diabetes with these nanoparticles.

**key words:** Nanoparticles, silver nanoparticles, nano dressing, nanofiber, wound covering, wound treatment

## Introduction

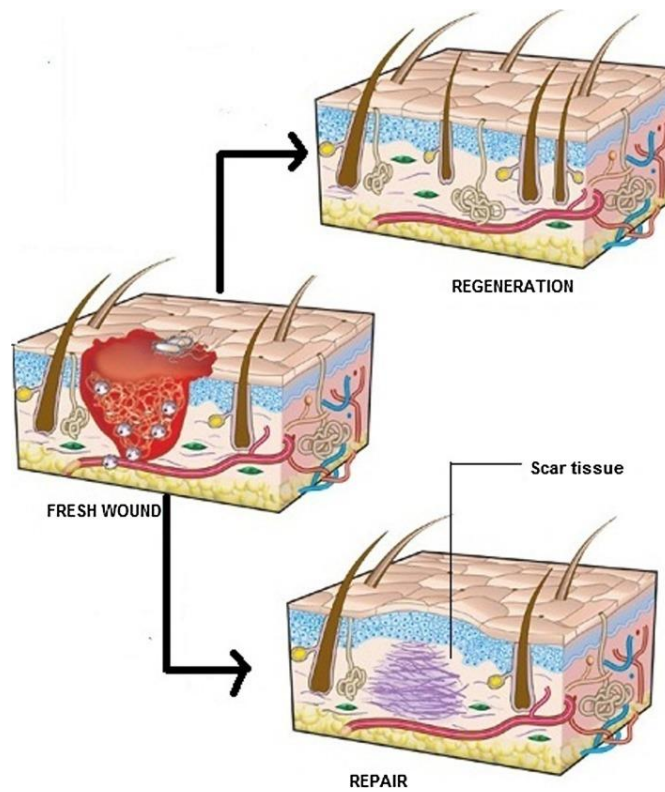
Human skin, as the largest organ of the body, is an adaptable and multipurpose layer that protects the body against chemical, physical, ultraviolet rays, etc. on a daily basis. Also, the human skin, which is the barrier between the body and the external environment, plays a very important role in maintaining temperature, perceiving different senses, maintaining humoral balance, and resisting external pathogens. Dangerous environmental conditions have caused frequent damage to the skin. Naturally, in order to fix these damages, the skin has complex repair processes that allow it to repair quickly and efficiently. The wound is caused by the disruption of the integrity of the skin. In general, we define a wound as any disturbance in the normal structural and functional anatomy. The most common wounds are surgical wounds, burns, cuts, bruises and lacerations. In all these types of wounds, signs of treatment and recovery can be seen for up to three months because the skin has self-healing properties. However, it should be mentioned that sometimes conditions such as severe uncontrolled infections prevent wound healing and turn it into a chronic wound, which instead of three months may take months or years to fully heal. In general, there are different factors that cause problems in the natural process of wound healing. Among these factors, we can point to infection, chronic inflammation, lack of nutrition, improper and low-content nutrition, and .increased local pressure

Recently, excessive prevalence of chronic diseases such as obesity, diabetes and vascular disorders has caused a high percentage of patients to suffer from chronic wounds. For example, about 15 to 25 percent of diabetic patients are at risk of developing a chronic wound caused by diabetes. In addition, some infectious skin diseases such as Hidradenitis suppurativa , swimming pool granuloma , some autoimmune skin diseases such as Behcet 's syndrome , some physical skin diseases such as radioactive dermatitis and some malignant skin tumors can also cause chronic wounds in the patient's body [1].

## wound treatment

First, it is better to get a better understanding of the difference between wound regeneration and repair. If recovery takes place using a tissue that is structurally and functionally indistinguishable from native tissue, regeneration has occurred; But if the integrity of the existing tissue is restored by the repair of fibrotic wound tissue, wound healing has actually occurred. Figure 1 shows the difference between these two phenomena. Wound healing

It includes tissue closure, which may sometimes lead to the production and healing of wounds, but in regeneration, which is very limited in mammals, we see the ability to restore and re-grow organs or tissues after being destroyed or cut off [2] .



**Figure 1: The difference between the two phenomena of regeneration and wound healing [3]**

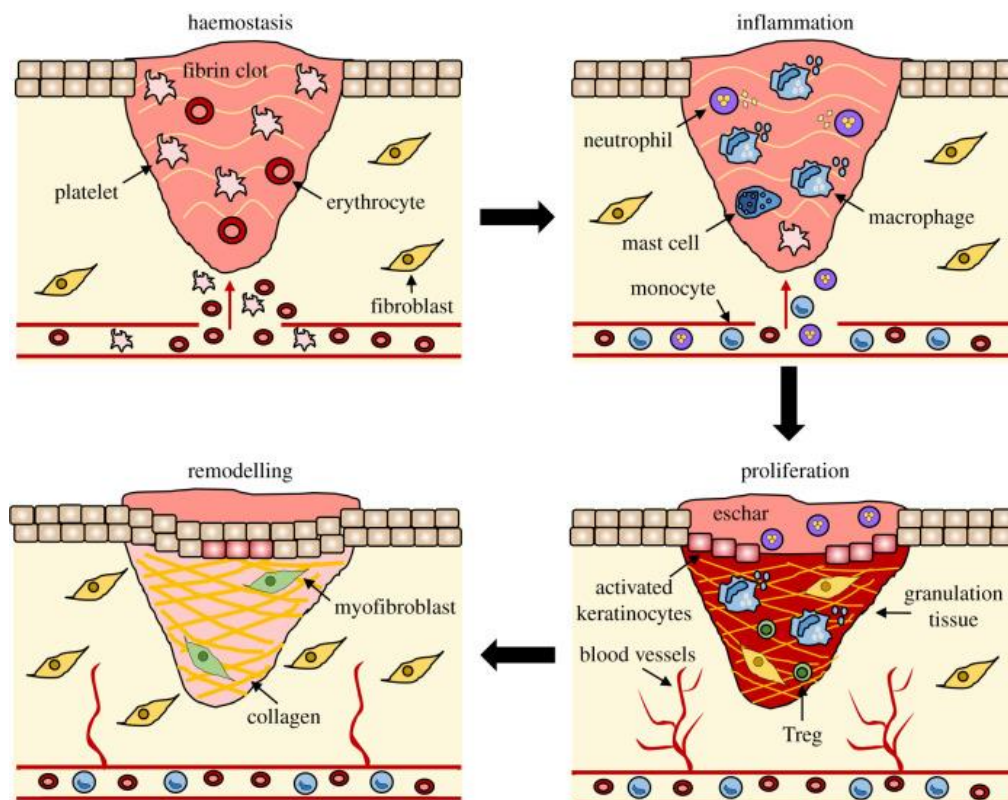
In wound healing, 4 consecutive stages occur naturally. These stages include homeostasis, inflammation, proliferation and finally the stage of maturation or transformation. The homeostasis stage is the bleeding stage in which the main goal is to stop the bleeding. At this stage, during the activation of the blood coagulation system, the blood vessels contract and the scab is closed to stop the blood flow. In this process, platelets come into contact with collagen and cause their condensation and activation.

The second stage is inflammatory or defensive, which leads to pain, swelling and redness. This step is important because of preventing contamination and controlling bleeding. The destruction of bacteria, the removal of damaged tissue remains, and the preparation of the wound bed for the growth of new tissue are among the activities of this stage. In this stage, neutrophils enter the wound site, in addition to destroying bacteria, they secrete growth factors and proteins to attract immune cells. This stage lasts 4 to 6 days.



The third stage begins as soon as the wound is cleaned. This stage consists of three parts: filling the wound, compressing the edges of the wound, and covering the wound or epithelialization. In the first phase, the wound bed is filled with connective tissue and new blood vessels are formed. Fresh tissue contains a combination of extracellular matrix and collagen. In the second phase, the edges of the wound are drawn towards the center of the wound. And in the third phase, epithelial cells migrate from the bed or from the edges of the wound across the wound and cover the wound completely. This stage generally lasts from 4 to 24 days.

The transformation stage is the last stage of wound healing. In this stage, the newly formed tissue gains its strength over time. During this stage, the collagen is changed and the wound is completely closed. That's why this stage of transformation is named. Cells that have been used for repair are no longer functional and are destroyed by cell death or apoptosis and then replaced. This stage usually happens after 21 days and can even last for several years. Figure 2 shows the four stages of wound healing.



**Figure 2: Four stages of wound healing [4]**

In the past, honey, plant fiber and animal fat were known as the most widely used wound dressings. Today, with the presence of polymers and new techniques, it is expected that the dressings used have special characteristics, which become one of the factors of faster and more effective wound healing. To design an effective dressing, the general characteristics of the wound, including dryness or the presence of discharge, superficial or deep, cleanliness or the

presence of infection, etc., must be considered. It should be mentioned that the smart dressings that have the ability to report the wound status during the healing process have not yet reached the industrial level, but the creation of these smart dressings is one of the goals of the researchers in this field. Also, researchers are trying to make dressings with the ability to secrete substances needed by the wound in different stages of healing and healing. Finally, the goal of all dressings used by humans from the past until now and in the future is to find the best formula to help speed up the wound healing process with the least amount of complications [5, 6] .

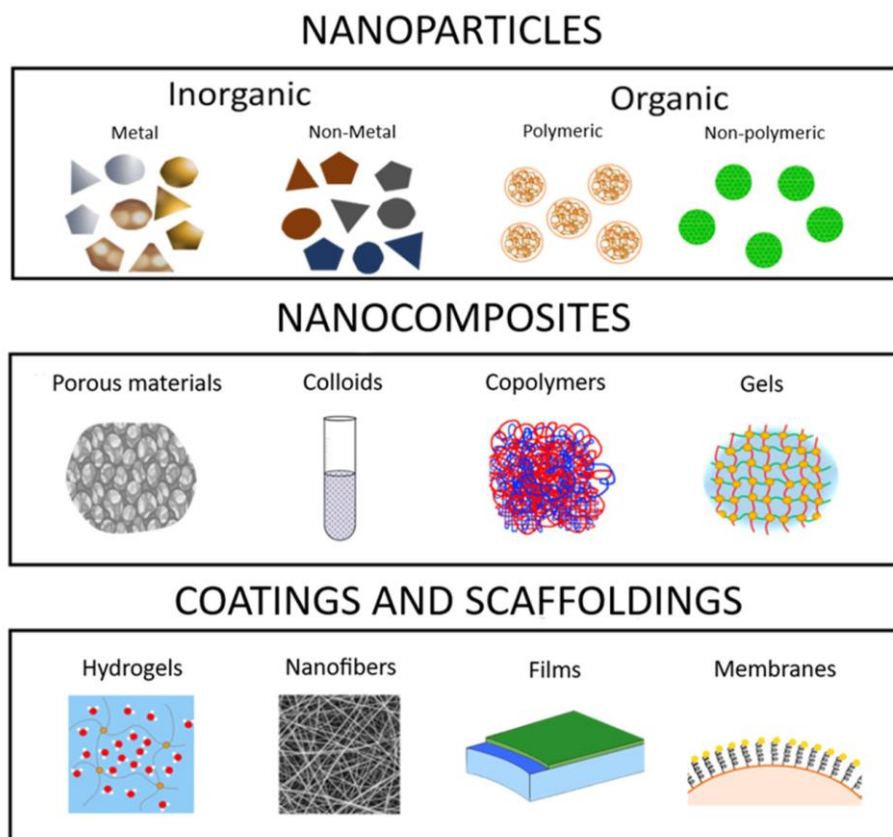
The ideal dressing is to ensure a moist environment while not causing accumulation of wound secretions. Also, the dressing should be able to stimulate proper tissue perfusion through local temperature control. Therefore, the key features of an ideal dressing should include the following: biocompatibility, proper permeability to water and oxygen, hypoallergenic, .reasonable cost, promotion of tissue renewal processes, and non-traumatic removal

For the first time in 1959, Richard Feynman, winner of the Nobel Prize, predicted that in the future, a new science dealing with structures in the range of 1 to 100 nanometers would emerge. Today, the effects of nanotechnology on human life are indescribable. Nanodevices are innovative and offer a wide range of advantages, including the ability of nanoparticles to enter the cytoplasmic space, manipulation and enhancement of biocompatibility and availability, and reduction of side effects of drugs, etc. The manufactured nanoparticles are divided into two parts (Figure 3): inorganic nanoparticles which include metallic elements such as silver, zinc, copper and non-metallic elements such as selenium, and the second category of organic nanoparticles which itself is divided into two polymeric and non-polymeric parts. Nanocomposites are also divided into different groups of porous materials, colloids, copolymers and gels. Finally, the application of nanoparticles and nanocomposites in scaffolding and coating through hydrogels, nanofibers, biofilms and membranes is applicable [7] .

In the meantime, silver nanoparticles have attracted the attention of researchers in different fields despite having suitable chemical, biological and physical properties in relation to their size and volume. These nanoparticles are famous for their antibacterial, antiviral and antifungal properties

Have. Of course, more studies on the properties and toxicity of these nanoparticles should be done. Silver nanoparticles have wide applications and are used in various industries. For example, these nanoparticles have been used to purify water in terms of microorganisms, in

the treatment of diseases that have antimicrobial, anti-cancer, anti-angiogenesis, anti-inflammatory effects, etc., in the cosmetics industry, etc



**Figure 3: Types of nano products including nanoparticles, nanocomposites and coatings and scaffolds [8] .**

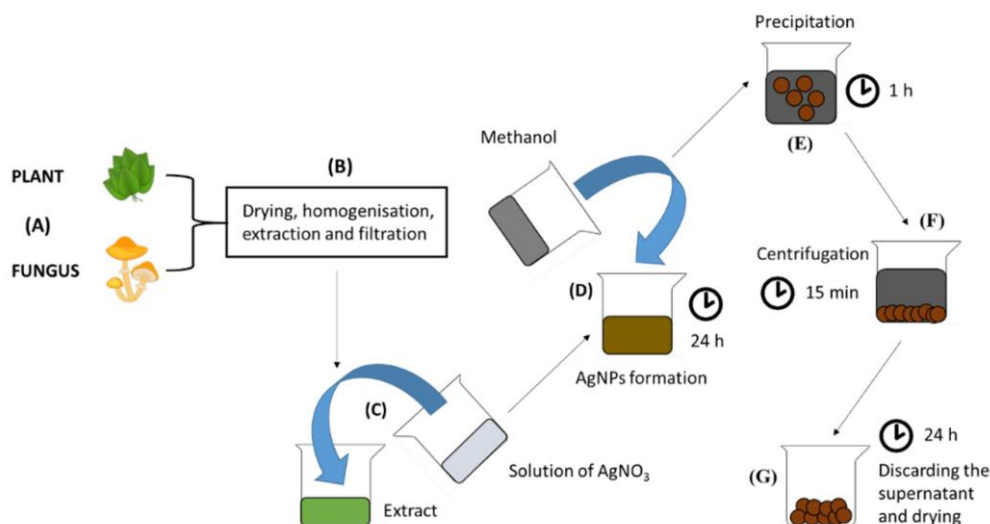
Nano materials can affect wounds in three general ways. The first method is implemented through direct use in the form of silver nanoparticles powder or its solution. The second method is to use non-compressed materials for wound treatment through water-soluble polymers and hydrogels. And the third method is to use polymers such as fibers, membranes and films. In research in this field, it has been shown that these nanomaterials are effective on chronic and acute wounds. Some of these results can be seen in Table 1.

**Table 1: The effects of nanomaterials in different stages of the wound healing process [9]**

chronic wound	acute wound	Wound healing stage
Forming a protective layer Reduction of microbial load	Forming a protective layer Preventing the transformation of the wound into a chronic type through antimicrobial effects	Inflammation stage

Preventing biofilms and bacterial invasion Temperature control at the wound site Stimulation of tissue perfusion The fight against antibiotic resistance	Temperature control at the wound site Stimulation of tissue perfusion Removal of excess moisture and protection	Proliferation stage
Prevention of ulcer formation and unusual effects Accelerate recovery	Prevention of ulcer formation and unusual effects Accelerate recovery	, Maturity stage Remodeling

Silver nanoparticles can be prepared by three methods: chemical, mechanical and green. Each of the methods has its own advantages and disadvantages; But in general, the green method and the use of plants, fungi or bacteria in this method is considered a better method for extracting metal nanoparticles. This method has the characteristics of being environmentally friendly, reducing the use of chemical substances, and as a result of reducing their toxic effect, lower cost, etc., it has a significant advantage over the other two methods. Figure 4 shows one of the stages of producing silver nanoparticles from plants or mushrooms in a green way. According to this form, the desired plant or mushroom goes through the steps of homogenization, extraction, centrifugation and filtering. In the next step, silver ions are added in the form of 0.1 AgNO<sub>3</sub> M with a ratio of one to one. During the next 24 hours, silver nanoparticles are formed. Nanoparticles are precipitated with methanol in a ratio of one to one for one hour. Then the solution of silver nanoparticles is centrifuged for 15 minutes and finally the supernatant or the surface layer formed as a result of centrifugation separated silver nanoparticles are dried by lyophilization.



**Figure 4: Production steps of silver nanoparticles from plants or fungi.**

One of the most important advantages of silver nanoparticles compared to silver metal itself is the reduction of toxicity due to the reduction of accumulation. Silver nanoparticles have the ability to modulate anti-inflammatory cytokines to accelerate wound closure and prevent its effects. Also, these nanoparticles stimulate re-epithelialization of the epidermis through proliferation and re-location of keratinocytes. On the other hand, some studies have shown that higher concentrations of silver nanoparticles decrease keratinocyte survival, metabolism and migration and differentiation of these cells through the activation of caspase 3 and 7 (proteases involved in programmed cell death) and dose-dependent damage to DNA [ 10] . Therefore, in order to reduce side effects and increase beneficial effects, silver nanoparticles should be used in low doses along with antimicrobial drugs. For example, it has been said that silver nanoparticles along with tetracycline significantly reduced the bacterial load in the superficial and deep layers of the tissue in the mouse model and thereby accelerated wound healing [11] . Another example is biocellulose functionalized with silver nanoparticles, used as an antimicrobial coating for open wounds. This nanomaterial has the ability to kill pathogenic Gram-negative bacteria and heal wounds [12] . Also, in another research, a nylon polyester coating of silver nanoparticles has been found to be effective in interfering with the colonization of bacteria as well as biofilm synthesis and maintaining conditions with low toxicity [13] .

The main antimicrobial mechanism of silver nanoparticles is that it leads to apoptosis through establishing sulfuric bonds with bacterial membrane proteins or thiol groups of various enzymes, especially enzymes involved in respiratory chains. In addition, since DNA contains

sulfur and phosphorus bonds, silver nanoparticles can intervene in DNA synthesis during cell division and prevent bacterial proliferation.

In one of the studies on dogs, coatings containing silver nanoparticles accelerated wound healing and prevented the cloning of microbial agents [14]. In addition, nowadays, silver nanoparticles have been used in many laboratory studies, including in the therapy of wounds, especially burns and chronic wounds. Today, several examples of dressings and coatings of silver nanoparticles have been offered. Among these dressings are Acticoat®-wound dressing (Figure 5) which contain silver nanoparticles and the average size is 15 nm. The proven features of this dressing are wound healing, reduction of infection at the wound site, and reduction of pain, which has been observed in consumers. Of course, the effects of these dressings on burns are still under investigation [15].



**Figure 5: Dressing Acticoat®-wound dressing**

### **Factors to improve the quality of silver nanoparticles**

The synthesis of silver nanoparticles by chemical and mechanical methods has disadvantages such as high cost, toxicity, high energy consumption, etc., which limit their application. Therefore, different measures have been taken to improve the quality of these nanoparticles. The first solution is to use plants as a source of these nanoparticles, which is environmentally friendly, low cost and most importantly safe for human health. Plants contain alkaloids, phenols, amino acids and proteins that reduce and stabilize silver ions in silver nanoparticles.



Gelatin is a natural, biodegradable, biocompatible and immunogenic polymer. Also, collagen contains hydroxyproline, which reduces AgNO<sub>3</sub> on site through hydroxyl groups. Also, its non-polar amino acids help to stabilize silver nanoparticles. As a result, researchers in this study have made a new composite containing silver, chitosan and gelatin, which has high density and its dimensions are 100 to 250 micrometers. This compound has wound healing and antibacterial properties, which at the same time reduces toxicity [16]. Chitosan is also a hydrophilic biopolymer that has low toxicity and also has good antibacterial properties. Various forms of chitosan have been tested in the field of wound healing, such as films, sponges, scaffolds, membranes, and hydrogels. In general, the products obtained from chitosan have the ability to stimulate the synthesis of the basic material contents. In some studies, silver nanoparticles have been made from the aldehyde group in chitosan along with silver ion. These compounds have shown antimicrobial and antioxidant properties against both groups of gram-positive and gram-negative bacteria [17].

In general, it can be said that silver nanoparticles are able to spread in all parts of the body, accumulate in many organs and cause significant damage. Knowing this, the effects of these nanoparticles have been reduced in many researches by combining these nanoparticles with other materials (Table 2) [18]. Nanofibers containing silver nanoparticles have two significant advantages, which are high loading capacity of nanoparticles and controllable release mechanism. This mechanism, i.e. regulated release, can improve the topical antibacterial efficacy and at the same time reduce the toxicity effect caused by the nanoparticle dose. In fact, the control of the release causes the long-term effect of the antibacterial properties of nanoparticles. Research has also shown that putting nanoparticles in a dressing and putting a dressing on a wound is much more effective than putting nanoparticles directly on the wound. This layer is able to reduce the toxicity caused by the sudden presence of a large amount of nanoparticles in the wound site [19] [20].

**Table 2: Some compositions containing silver nanoparticles to cover wounds.**

Source	Effects and results	Wound dressing compositions
21	Due to the favorable swelling quality and non-toxic behavior against fibroblasts of the dermis	calcium nanoparticles, - alginate beads in gelatin scaffolds

	layer, they are considered as .suitable wound dressings	
22	The porosity of the nanocomposite (81 to 88%), the swelling rate (from 21 to 24), and the percentage of moisture retention (13 to 14 days), all of which are suitable for wound healing properties.	Silver and zinc oxide ) nanocomposites ZnO (
23	Creatine increases fibroblast cell proliferation and has antibacterial properties. Further research showed that the prepared nanocomposite plates are suitable for wound .dressing	Polyurethane, keratin, silver nanoparticle plates

The possibility of toxicity of silver nanoparticles is widely discussed among researchers. Nanomaterials can easily pass through cell membranes and can easily affect human health. Entering high doses of these nanoparticles into the body causes tissue death. It has also been found to have negative effects on organs such as the brain, liver and stem cells. However, many studies have shown that its use with antimicrobial purposes is useful and effective. Hydrogels containing silver nanoparticles are considered a very effective and suitable wound dressing. As a result, if these nanoparticles are used in appropriate and reasonable amounts, they will not cause any harm to the body

had Research has also proven that nanoparticles can be suitable alternatives to antibiotics; Because their antibacterial properties are effective against a wide range of pathogens and do not cause microbial resistance. Silver nanoparticles, especially by having inhibitory effects on 650 microbial species and even on bacteria that are resistant to antibiotics, have attracted the attention of activists and researchers in this field.

However, there are still concerns regarding the toxicity of silver nanoparticles. It has been reported that the accumulation of silver metal itself in the body can damage different layers of the skin and other parts of the body. Also, its oxidation in the body causes the production of radicals and reactive oxygen species that can damage the organelles inside the cytoplasm such as ribosomes, mitochondria, vesicles, etc. Using nanotechnology, the accumulation of this metal reaches its lowest level, and as a result, its toxicity for human cells is significantly reduced. It should be mentioned that now there are dressings and wound coverings that contain silver nanoparticles and have been accepted by the United States Food and Drug Administration [8].

## Conclusion

Today, nano products are a very suitable solution to reduce and eliminate the harmful effects caused by bacteria, fungi and viruses. One of the interesting applications of silver nanoparticles is the healing and wound healing property, which we discussed in this article. Silver nanoparticles can be synthesized by three methods: chemical, mechanical and green. A wound is a condition in which the integrity of the skin is disturbed. The wound healing process includes 4 stages of homeostasis, inflammation, proliferation and transformation or maturation, which may continue for some time. Wounds can have different origins, the most common of which are surgical wounds, burns, cuts, etc. Chronic wounds are one of the problems of today's human beings, which require more time to heal than ordinary wounds and their effects remain on the body. Due to the unique characteristics of silver nanoparticles, many studies have explored their properties in the field of wound dressings and wound treatment. Dressings containing silver nanoparticles

They have shown antimicrobial effects, biocompatibility, low toxicity, etc. Of course, if these nanoparticles or silver metal itself is used in large quantities, it causes toxicity in the body, especially in organs such as the brain, liver, and testicles. Therefore, the control of the incoming dose through dressings is considered very vital and a suitable solution. It is also worth mentioning that these nanoparticles with other compounds have the ability to form nano sheets or nanocomposites that increase the dressing efficiency in different ways. Despite the research done, many studies still need to be done because, for example, these nanoparticles are expected to be effective in healing wounds caused by diabetes and prevent amputation

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## **The concept of a man's stability at home from the point of view of Rishi and Sunni interpretation sources**

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### **Abstract**

In its various verses, the Holy Qur'an has discussed topics about the family and the relationship between couples. One of the verses on this topic is verse 34 of Surah Nisa, which refers to the consistency of men over women. Regarding this verse, some points have been expressed in the interpretation books of Fariqin and there are different opinions, since the authority of a man over a woman and its various aspects are one of the problems in family life, the discussion about the meaning of this verse and its interpretation is very important. , especially since some men may have a wrong understanding of this verse. The result of this article is that there are three famous interpretations between Shia and Sunni commentators regarding the concept of consistency, some have interpreted consistency as guardianship, some have interpreted it as protection and responsibility of a man, and some have interpreted it as a combination of both, but in each Now the absolute guardianship of man over woman in all affairs is not used in any way. The purpose of this article is to correctly explain the concept of the consistency of a man by using the sources of Shia and Sunni interpretation. In this article, the concept of the consistency of a man is investigated by descriptive method using written sources.

**.Keywords:** house, woman, consistency, man

### **Introduction**

The debate about the guardianship of men over women is one of the most important debates in the issue of family and couple relations today. The religion of Islam stated the principle of this issue in the Holy Quran and addressed it in Surah Nisaa under the title of man's consistency. Regarding the interpretation of the constancy of a man over a woman, there are various theories among Islamic commentators, both Shia and Sunni, and especially in the current era, the commentators have expressed many things in this regard. In this article, we have investigated the meaning of the man's constancy over the woman by using the sources of interpretation of Fariqin, so that we can have a clear interpretation of verse 34 of Surah Nisa Bayan and avoid possible misunderstandings about the meaning of this verse.

By referring to the interpretations of the parties, it becomes clear that there have been detailed discussions in this regard in the books of interpretation, and the commentators have expressed different theories in the interpretation of the consistency of a man. We express the .ideas in the form of three views

By researching and examining the sources, it becomes clear that many works have been written on the subject of men's strength at home, and each of these works has its own characteristics. Some of these works are mentioned in this part of the article

The conceptualization of male-to-female ratio in mystical interpretations, Ansieh Jafari; In this article, the author has discussed the concept of male dominance over female in the home according to mystical interpretations. This article is different from the present article in two ways, firstly, its approach is mystical interpretations, and secondly, the focus of Shia and Sunni interpretations is not on its agenda.

Recognizing the concept of man's superiority over woman, Fatemeh Karimi; In this article, good points have been made about the concept of the superiority of a man over a woman, and good research has been done in this regard using the theory of Islamic scholars. This work also did not consider the interpretive approach of Shiites and Sunnis in its work, therefore it is different from the present writing

A comparative study of the gender of men and women in Tafsir al-Manar and Al-Mizan, Mohammad Fakir; In this article, the concept of a man's superiority over a woman is discussed, and the views of Allameh Tabatabai and Rashid Reza, the author of the Al-Manar book, are compared in this regard. This article is based on two interpretations of Al-Mizan and Al-Manar, so it is very different from the present article

In general, by examining the works that have been written on the topic under discussion, it becomes clear that there has not been a comprehensive research on this topic, especially in Shia and Sunni interpretations

Since some anti-religious people misinterpret the issue of male consistency in the Qur'an and use it against Islam, it is necessary to investigate this issue and explain it correctly

The purpose of this article is to explain about the concept of a man being consistent at home and using Shia and Sunni sources of interpretation to explain different points of view on this issue in order to avoid possible misunderstandings about the meaning of being consistent. to be prevented

## A) Conceptology

In this part of the article, some key concepts of writing are discussed and their meanings are examined from the point of view of words and terms

### Consistency

First, the concept of "consistency" is explained. This concept is used in Arabic and Persian. Its root in the Arabic language is from the word "resurrection". Qiyam in the Arabic language basically means standing up as opposed to sitting down (1) according to Ragheb Esfahani, one of the meanings of Qiyam is to care and protect something (2) and the word Qawam is an exaggeration of the same meaning, Qawam is someone who takes utmost care and It protects one thing. Also, the word Qawam is related to the concept of Qawam in Arabic, Qawam in Arabic means the base and verticality of a thing, which is related to the stability and order of a thing (3). In Persian, the word consistency means someone or something that the existence of something depends on, and it is also used for the essence of something (4).

In terminology, there is a difference of opinion about the concept of consistency among commentators and jurists. According to some theories, the meaning of Qawamit in the term is

that someone is in charge of the responsibility and supervision of another person and is responsible for his affairs (5). In this regard, more explanation will be given in this article.

The concept of constancy is taken from the verse of the Holy Quran, the Qur'an says: "Men are constitutive of women with what Allah has bestowed upon each other and with what they spend from their wealth; Men are the guardians and guardians of women, because of the superiority that God has given (in terms of the social system) for some over others, and because of the spending they do from their property (in the case of women)." (6)

## **Man**

In Persian, this word is used in the meaning of the masculine gender, the male gender of human and in contrast to the female, also this word is used in the case of a human who has reached the age of puberty and has a level of perfection and growth (7). Of course, sometimes this word is used in the Persian language in a descriptive sense and in the sense of brave, courageous and fighter (8), which is not the meaning of this article.

In the term, the word man, as well as the word rajl in Arabic language, is used in the same literal sense, i.e. the male gender as opposed to the female gender (9). Also, it is specified in science terminology books that this term is used for people who have passed the age of puberty and is not used for a male who is in childhood (10).

The word "mard" is equivalent to the word "man" in the Arabic language, this word is used in many cases in the Holy Qur'an, and it means the same literal meaning as mentioned. Each of men and women have their own unique characteristics in terms of physical and mental, as well as social status, which are discussed in different sciences, including Islamic sciences, .about the status of each of these two sexes

## **House**

Another concept related to this article is the concept of home. House in Farsi means a house, a house, a house, a place where a person lives, a room, and similar meanings. Of course, sometimes it is also used in the case of housewives, for example, housewives (11). In the term, the house is used in the same literal sense, and in the discussion in question, the house is the man's place of residence where he lives with his wife and their relationship is formed in the same environment.

## **b) The concept of consistency between man and woman in Shia and Sunni interpretations**

Regarding the interpretation of the concept of qawwamit in the verse: "The men are strong against the women with what Allah has favored some of them and with what they spend from their wealth" (12) among the Shia and Sunni commentators, there are various interpretations that are the most important in this part of the article This is stated.

## **Guardianship, governorship and directorship**

The first interpretation that can be seen about the consistency of a man over a woman in the home is that consistency means the guardianship, guardianship, and leadership that a man has over a woman at home. This matter has been clarified in various interpretation books of Shia and Sunnis . Among the Shia commentators, some have specified the same meaning. As an example, Tabarsi mentions the same meaning in Majmael al-Bayan in his interpretation of the :above verse and writes

"This part of the verse explains the reason for man's guardianship over women, its meaning is that God has given men guardianship over women, because of the virtues that men have in terms of knowledge, wisdom, good opinion, and determination." (13)

His expression is well used that he considered the meaning of Qawam in the above verse to be the guardianship and domination of men over women, for this reason, he explained the reason for this guardianship and the reason for this guardianship is science, good opinion and .other such things. Knows

What this group of commentators mean about the virtues of a man are the points that are mentioned in the teachings of Islam about the virtue of man in reason and prudence. As an :example, Imam Ali (a.s.) says about the intellectual superiority of men over women

"The minds of women in their beauty and the beauty of men in their minds; Women's intelligence depends on their beauty, but men's beauty lies in their rationality. (14)

Among the Shia researchers, Professor Motahari, in the interpretation of the above verse, points out that although the principle of the man's guardianship over the woman is used in some cases, the honorable verse is used, but the meaning of the virtue of a man over a woman is not absolute virtue, but a man is superior to a woman in some ways. , and the woman is also superior to the man in other ways, so the meaning of virtue in the verse is not absolute virtue (15).

Among the other Shia commentators who mentioned the meaning of Wilayat is Mohammad :Javad Mughniyeh in Tafsir Kashif. He writes

"Men are dependent on women, the meaning of men in this verse is the husband and wife, and the meaning of the woman is the wife. The meaning of a man's dependence on a woman is not that a man has absolute authority and can act in a dictatorial manner, so that the woman does not have free will, rather the meaning is that the man has a kind of guardianship in a limited form, such as God has given him the right to divorce the woman, and the woman must obey her husband in bed and not leave the house without his permission " (16)

Their expression is also well used that they have considered the meaning of a man's quality as his wilayat over a woman, with the difference that they do not consider this wilayat as absolute and specify that this wilayat is limited to certain matters that have been stated by the .Sharia

Among the Sunni commentators, some scholars have mentioned the same meaning in the relationship between a man and a woman, as an example of Zoghshari in the commentary of Kashaf, he writes about this: "A man has guardianship over a woman and can command and

forbid a woman, to That's why they are called Qawam... In this verse, there is an indication that the reason for a man's control over a woman is because of the man's virtue, not because the man gained power through force and power, that's why it is said in the virtue of a man that a man has wisdom. It is planning, determination, strength and courage, and some of them are prophets and scholars. (17)

Fakhrazi is one of the other Sunni scholars who considered the meaning of Qawamit to be :the guardianship and sovereignty of a man over a woman. He writes about this

"When the Almighty God has stated the sovereignty of man over the woman, and the influence of the man over the woman, He has stated that this is the result of two things: First, that the Almighty God has given the man a virtue over the woman, and this virtue is It is because of many things, some of them are related to the characteristics of men and some of them are related to Shari'a rulings... The second reason for almsgiving is giving alimony from a man to a woman. (18)

So far, it has become clear that many Shia and Sunni commentators have considered the status of a man to mean the guardianship and dominion of a man over a woman, and their expressions have been expressed. Although according to Islamic teachings, each man and woman have rights towards each other and they are not allowed to violate the rights of others; But at the same time, for the family as a small society, it has made a man the head. He considered the meaning of the headship to be the final decision in family affairs and to observe its interests, some of which are specified by the legislator, such as the choice of the place of residence and cases that are not foreseen by the law, are determined according to custom and rational habit . (19)

So far, the explanation of the Shia and Sunni commentators on the first interpretation of the man's stature has been explained, the rest of the existing interpretations on this issue will be .explained below

### **Protecting and serving the man**

The second interpretation of the concept of Qawamit in Shia and Sunni commentary sources is that a man's Qawamit does not mean a man's guardianship over a woman, but it expresses a kind of duty and service of a man towards a woman. This means that according to verse 34 of Surah Nisa, a man has duties towards a woman that he must protect her, and because of the virtues he has, accept care and service to her in the affairs of life.

Among contemporary commentators, the owner of Tafsir al-Furqan writes in this regard

"The word Qawamun in the verse is an exaggeration of the upliftment and guardianship of the woman's interests, so it means that the woman must protect and take care of the woman in all matters of life, because men are superior to women in terms of intellect, body and thought, and it is necessary Protecting and protecting a woman is three-fold, that is why it is said in the narration of the Holy Prophet that a woman is poor as long as she does not have a husband. He said: Yes. Either it is stated in the hadiths that the one who takes a wife should not waste it, or

it is stated that the woman is a simple woman and not a hero (20), so the management of women's affairs and stability is the responsibility of the man. (21)

His expression is well used that the meaning of the man's quality is not to rule over the woman and dominate her, but it means that the woman is responsible for protecting and taking care of her due to her physical limitations and special conditions, and the man is responsible. He is responsible for serving the woman in life matters and taking care of her

Among the famous commentators of the Sunnis, Tabari has stated in Jami al-Bayan something that is compatible with the second interpretation of Qawamit. , one of the meanings that he emphasizes on, the man's dignity means the man's arrest of the woman, taking care of her affairs and disciplining women. Tabari writes: "Men are people who rise up and take care of women, in disciplining them and arresting women"; To prove this meaning, Tabari cites some famous Sunni commentators. (22)

Ibn Ashur's expression in Tafsir al-Tahreer and Tanweer also has the same meaning, he specifies that the meaning of man's consistency is to protect and defend women's privacy, he writes

"A man's rise over a woman's affairs is actually a rise of protection and defense... Therefore, the preference of a man over a woman is the same inherent need that a woman has for a man in order to defend her and protect her." (23)

It is also clear from Ibn Ashur's statement in this case that he considers the meaning of a man's consistency to be the same as his responsibility to protect a woman, which is related to the second meaning of consistency. In this way, they are also from the second category of commentators who consider the quality of a man to protect a woman and serve her

### **Province attached to service**

The third interpretation that exists in this matter about the man's stature is a combination of the above two interpretations. According to this interpretation, expressed by many contemporary researchers, it is that a man's status is a combination of guardianship and service, in the sense that according to the verse, a man has guardianship over a woman in a series of affairs, but this guardianship is only limited to It does not mean command and prohibition, but the requirement of this province is that a man should be a servant of his wife in a series of affairs

Mohammad Hossein Fazlullah writes in the interpretation of these verses: "In these two verses, some of the prominent features of the Qur'anic design of the legal status of the family can be seen in the relationship between a man and a woman as a couple. The first verse affirms the principle of the man's guardianship over the woman, because they have the right to rule in the management and care matters needed in married life. This is based on two points, one of which obscures the verse and the other of which clarifies it. First: the preference of men over women, through some inherent characteristics in their formation. Second, giving men and



paying for women from their own money. It seems that these two points together are the basis of the verdict, not each one alone. (24)

Carefully in his statements, it is clear that he considered the two elements of guardianship and serving and taking care of women's affairs side by side, in the sense that a man has guardianship over a woman due to a series of inherent characteristics, but in addition to It bears a heavy responsibility, these two points are included together in these verses. This matter can be confirmed with the help of hadiths, in some hadiths the sovereignty of men and women is mentioned next to each other and it is said: "All Bani Adam is the master, the man is the master of the household, and the al-Mar'a is the master of the household; All the people of the people of Adam are Sayyid, a man is the Sayyid of his family, and a woman is a ruler among her family." (25) ; It is well used from this group of narrations that the supremacy of a man does not mean that a man dominates a woman, a man has a relative superiority over a woman due to a set of inherent superiority, but on the other hand, he has the responsibility to take care of women's affairs rather than the causes of happiness. And his server should also be provided in the home environment.

In explaining the meaning of guardianship, he also writes: " Some expand the example of man's headship over woman to include everything, so that the man becomes the head of the woman's various affairs and the woman does not have any headship over her affairs; But in our opinion, the headship is specific to the sphere of marriage and conjugal relationship Islam It is not assumed for a woman to obey her husband absolutely, in such a way that her thinking and will are disturbed in her private and social life . (26)

Among the other contemporary Shiite commentators who have expressed the third meaning .of Qawamit, Makarem Shirazi is an example in his interpretation

"Al-Rajal Qawamun Ali-Nisa: To explain this sentence, it should be noted that the family is a small social unit, and like a large community, it must have a single leader and guardian, because the leadership and guardianship of a group that men and women jointly undertake is a conceptual concept. No, as a result, one man or woman should be the head of the family and the other should be his deputy and under his supervision, the Qur'an states here that the position of guardianship should be given to the man... in addition to his obligation to his wife and children to pay the expenses. life, and paying the dowry and providing a dignified life for his wife and children, gives him the right to be the guardian." (27)

### **c) The extent of the man's consistency at home**

Another important topic that is related to the discussion of the consistency of man over woman and different interpretations in it, is the scope of this concept. The question is, to what extent is the consistency of a man in a woman, and what does its scope include? In this matter, there are two views among Shia and Sunni commentators, which are expressed in this part of .the article

The first point of view is that the extent of man's superiority over women is general, it includes all men, meaning that the male gender has superiority over women because of the

virtue that God Almighty has given to it; In other words, the meaning of man and woman in the discussed verse is not only husband and wife, but all women and men, therefore, the verse of guardianship (according to one interpretation) is used absolutely. According to this point of view, the guardianship of men over women is not limited to husbands towards women; Rather, it is a comprehensive ruling imposed on the type of men on the type of women . Among the Shiite commentators, Allameh Tabataba'i (28) accepts this view, and among the Sunnis, Ibn Ashur also believes in the same matter (29).

Allameh Tabatabai writes in this regard: "From the generality of the cause, it is obtained that the ruling that is based on that cause, i.e. the guardianship of men over women, is also general, and it is not exclusive to the husband in relation to the wife, and it is not the case that men only their wives have guardianship, but the ruling that is forged is for the type of men and for the type of women, of course, in general aspects that are related to the life of both clans, and therefore those general aspects in which the majority of men have guardianship over the majority of women. " (30)

In contrast to this view, some other commentators believe that verse 34 of Surah Nisa, that is, the verse under discussion, only refers to the consistency of the man over the woman in the home environment, in other words, this verse is the consistency of the husband in the home environment and in married life. therefore, it has nothing to do with the consistency of male and female sex, and the verse does not include other social issues. Among the contemporary commentators, Javadi Amoli has adopted this point of view and has raised detailed discussions in this regard in the interpretation of Tasnim and other works. In the explanation of the noble verse, they state that firstly, consistency in this verse is only for the husband, not absolute for the man, secondly, it does not indicate the virtue of the man; In this regard, he writes: " What constitutes the central element of the verse "Al-ar-r-jal-e-qawamun-e-al-n-nisa" which is outside the current discussion, is the process of measuring the husband and wife, not the absolute of man and woman. » (31)

Also, in some of his other works, he writes in this regard: " Guardianship is related to the case where the wife is against the husband and the husband is against the wife." Consistency in this position is not a sign of perfection and closeness to God, as in ministries, assemblies, societies, there are people who are other constituencies, i.e. managers, officials, and the like, but this management is not spiritual pride, but an executive responsibility. and it is possible that someone who is not the head of that institution works more sincerely than the guardian and is closer to God. "Consistency is related to executive management ." (32)

Some other contemporary commentators have also expressed the same meaning in the interpretation of the discussed verse (33). The result is that according to the second interpretation, the consistency of a man is only related to the husband, in household affairs and in relation to his wife, and never includes other social affairs. In other words, what the Holy Qur'an has stated in this regard is related to the discussion of the family, and it is not intended to express the relationship of other men and women in society, the purpose of the consistency of people in this verse is to express the relationship between a man and his wife. It has been in the field of family issues.

From what has been stated, it is clear that in the verse in question, there is a difference of opinion both about consistency and its correct meaning, and on the other hand, whether consistency is a meaning that is related to the Islamic society or is exclusive to affairs. It is .family, there is discussion and discussion among commentators

## Conclusion

This research was carried out under the title of the concept of the consistency of a man at home in Shia and Sunni sources. The purpose of this article was to carefully examine the meaning of a man's consistency at home using Shia and Sunni sources and the opinions of foreign commentators in this regard. The hypothesis of this article was based on the fact that in Shia and Sunni interpretations about the meaning of consistency, different meanings have been expressed that need to be examined and explained. According to this hypothesis, in this article, there are three main approaches in interpreting the meaning of consistency, with The .use of Shia and Sunni interpretative sources was stated

The main purpose of the discussions of this article was to explain the common interpretations that exist about the meaning of a man being consistent at home in order to clarify different views on this issue. The main question of this article was, what is the meaning of a man's consistency at home according to Shia and Sunni sources of interpretation? With the contents expressed in this article, it became clear that there are three famous views among .Shia and Sunni commentators in this regard

The result of this article is that there are three famous views about the concept of consistency between man and woman among Shia and Sunni commentators. The first point of view expressed by some commentators, such as Tabarsi and Tabari, is that it means the man's control over the woman. The second point of view expressed by some commentators such as Ibn Ashur is the protection of the man from the woman and his responsibility towards the woman, and it never states the guardianship of the man over the woman. The third point of view explained by some contemporary commentators such as Makarem Shirazi is a combination of guardianship and responsibility, that is, it is the connection of the first two .points of view

It was also clarified that there is a difference of opinion among the commentators regarding the scope of the concept of constancy, some consider the scope of constancy to be exclusive to the husband towards his wife, while some consider it to include the male sex as compared .to the female sex

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## **Economic development during the advent period from the perspective of verses and traditions**

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### **Abstract**

One of the blessings of the existence of Imam Zaman (peace be upon him) in the society and the formation of the Mahdavi government is the economic development that occurs during the advent of the Prophet. This development has different dimensions, the knowledge of which based on verses and traditions, increases knowledge and increases human desire to pray for Faraj. In this article, by using verses and narrations, the various aspects of economic development during the advent of Islam are expressed, and this issue is investigated in two parts of public life of people and natural resources, with a descriptive analytical method. The result of this article is that in the general life of the people, poverty has been eradicated, public property is divided between people fairly, and relations between believers are improved in economic matters. In terms of natural resources, during that time, the blessings of the sky and the earth descended on the people, and development and prosperity spread throughout the earth. According to the verses of the Holy Qur'an and hadiths, the main factor of this development is people's relationship with God, avoiding sins and the existence of the Imam of .Time (peace be upon him) among people

**Keywords :** Economy, development, wealth, Mahdavi rule, era of emergence.

### **Introduction**

One of the important topics that should be researched based on verses and traditions in the current era is the characteristics of the Mahdavi regime. Knowing these characteristics makes the believers desire for that era, pray for hastening the end of the world and try to reach that era and can bring about many changes in people's lives. One of the dimensions of this topic is the examination of economic development that is realized during the emergence. On the other hand, the discussion on the subject of Mahdism in every aspect of it increases the human knowledge of the Imam of the Time (peace be upon him), which according to traditions, is one .of the most valuable things that every Shiite should pay attention to



In this article, by using verses and narrations, the concept of economic development during the advent period is examined, and this issue is explained and explained in different dimensions by using verses and narrations

The main question of this article is, what is the form of economic development in the era of advent from the point of view of verses and traditions

In order to answer this question, the concept of economic development during the emergence period is examined in two dimensions, public relations of people and natural resources, and it is clarified that in both areas, economic development is realized during the emergence period. This development is achieved thanks to the existence of Imam Zaman (peace be upon him) and by the spread of justice in the society

The discussion of economic development during the Mahdavi period goes back to the beginning of Islam and the contents expressed in the verses and traditions; At the same time, there have been good works on this topic in the present era, some of which are mentioned in this section

A research on the economic narratives of Imam Zaman's rule, Mojtaba Rezaei; In this article, the author has discussed the narratives related to the economy in the era of emergence and examined its various dimensions, although the focus of his discussion was not economic development

The government system of Imam Mahdi, Nowroz Amini, in this article, the author has examined the various aspects of the government system of Imam Mahdi and has also expressed good points in the economic aspect. The focus of this article was the statements of Imam Baqir (peace be upon him). The topics of this article are general and it has not discussed in particular the issue of economic development

Modeling the appearance of Mahdavi's government, Mohsen Salmani; In this article, the author has discussed the different dimensions of the Mahdavi government and has expressed the prominent features of this government from the economic, cultural and... perspectives. The difference between this article and the current one is that the focus of this article is on economic development.

Economic development based on verses and traditions, Mohammadi Ray Shahri; In this .4 book, the author has discussed the concept of economic development and the statements of verses and traditions on this issue in detail, but the focus of this book is not the era of Imam Zaman and the Mahdavi government

## A) Conceptology

In this section, some key concepts related to this article are discussed and its meaning is examined in words and terms

## Development .

One of the practical concepts in this article is the concept of development, which is explained in this section. Development is a word that is used in Arabic and Farsi, but its main root is derived from the word "expansion" in Arabic. This article basically means wideness, openness, and expansion (1), whether it is in wealth, or in human condition, or in property and wealth or something else. Also, the word vastness is used to mean human power and wealth.

The development of the second infinitive of the verb is tafeel (weight of tafeel), it has a transitive meaning and means to create wideness and opening (2). In the dictionaries of the Persian language, meanings such as: widening, expanding, expanding, and improving the economy have been mentioned for development, which shows that the meaning of this word is the same in Arabic and Persian languages (3).

But in the term of science, this word is used in various sciences including economics and social sciences, political sciences. The meaning of the term "development" is also the same meaning as mentioned in the word. According to the explanation that was given, it is clear that the meaning of economic development is progress and openness that is created in the field of .economy, which is the meaning of this article

### **Economy .**

Another concept that is widely used in this article is the concept of economy. This word is also used in both Arabic and Persian languages. In the Arabic language, this word is the infinitive of Bab al-Iftaal, which is derived from the root "qasd" which means moderation, mediocrity, and middle ground. Economy in any matter means observing moderation and moderation in that work (4). The root "intention" is used in the Qur'an in the same sense, i.e. the meaning of moderation; The Qur'an says, Observe moderation while walking" (5).

He also says: "And by God's will is the way, and among them is the unjust; And it is up to God to show (the servants) the right path; But some of the ways are wrong" (6).

In the Persian language, meanings such as: moderation in every work, moderation, and financial and material issues have been expressed for this word (7). But in the term of science, whenever the meaning of economy is used, it means things that are related to property and wealth and material issues. For example, economics is a science that discusses finance and planning in this field, or economic policy is the things that every government applies in the field of finance.

1. Economic development during the emergence period, overseeing the public life of the people Economic development has various dimensions, some of its dimensions refer to people's lives, some refer to natural resources, and also other dimensions that this concept has. In this .section, economic development is discussed regarding people's lives

### **eradication of poverty**

One of the dimensions of economic development is eliminating poverty, which is very important in economics. In the monotheistic system, everything that happens in the world, be it poverty, destitution, or prosperity, is all in the hands of God, and spiritual factors are very :effective in this regard. The Qur'an says in this regard

"Whoever wants the rewards of this world, Allah will find the rewards of this world and the Hereafter; Those who want worldly rewards, (and are not aware of spiritual and hereafter results, are wrong, because) the rewards of this world and the hereafter are with God" (8).

In this verse, it is clear that the reward of the hereafter is meant, but the meaning of the reward of this world is the benefit that comes to a person in this world, one of the examples of which is wealth and property. It is obtained from him (9).

:The Qur'an says about the role of piety in abundance of blessings

"And if the people of the villages had believed and feared, we would have opened for them blessings from the heavens and the earth; And if the people of the cities and settlements believed and practiced piety, We would open the blessings of heaven and earth for them" (10).

Considering the above point, there is no doubt that when Imam Mahdi's rule of justice spreads throughout the world, and piety becomes the center of affairs, poverty and poverty will be eradicated from the society; In addition, Mahdavi's justice also has a great impact on .economic development during the era of emergence

This matter is mentioned in many narrations; Imam Baqir (peace be upon him) says in this regard: " When the Qaim appears ... he distributes among the people so equally that you do not see anyone in need of zakat, and those who pay zakat bring their zakat to the needy Shiites, but they say: We We don't need your money ... and the property of all the people of the world from the heart of the earth and on it will be gathered to him and it will be said to the people: Come to something for which you cut off your womb and shed forbidden blood and committed forbidden things. , and he bestows in such a way that no one has given before him " (11).

In another narration describing the time of advent, Imam Sadiq (peace be upon him) said: " The earth reveals its treasures, to the extent that people see those treasures on the earth, and some of you are looking for someone who to deliver money to him, pay the right of his relatives and accept his zakat from him; But he does not find anyone to accept him. People have become free from other things with what God has provided them with from His bounty " (12).

Eradication of poverty during the advent is such a well-known matter that the Sunnis have also narrated numerous hadiths in this regard in their narrative sources, as the sum of the hadiths is used, which is from Shia and Sunni Muslims in the doctrine of Mahdism. (13).

### **Fair distribution of public property**

Another factor that is very important in economic development is the fair development of property among people, which causes prosperity in people's lives and shortens the hands of capitalists from public property. According to the Qur'an, the purpose of legislating many financial rules in Islam is to prevent public property from being transferred to the rich so that :the general public is deprived of it. Quran says

"May God forgive the Messenger of the people of the villages, for God's sake, and for those who are near, and for the orphans, and for the poor, and for those who are not in the way." Aghniyya Menkum; What God returned to His Messenger from the people of these settlements belongs to God, the Messenger, his relatives, and the orphans, the poor, and those on the way, so that (this great property) does not change hands among your rich people" (14).

In the books of interpretation of the meaning of Doleh in this verse, the same Tadawul and Surah are mentioned; The meaning of the verse is that the Almighty God has legislated the rule of Anfal and assigned it to the Messenger of God so that the property does not circulate among the rich, because if the guardianship of the property is not in the hands of the Messenger of God (or his successors), the rich of this property They take it out of people's hands and make it theirs (15).

Certainly, the legalization of the mentioned ruling expresses one of the lines of economics in Islam. With the establishment of the Mahdavi government, the hands of the rich are cut off from public property and this property is shared fairly. Imam Ali (peace be upon him) says in this regard: "When our ruler rises and destroys our enemies, he will not accept jizya and will break the cross and idols, and when the war is over and he calls to take the property, those properties divides it equally among the people and does justice among the people " (16).

Imam Baqir (peace be upon him) also says in this case: " There is a time when our Qaim rises , He divides public property equally and observes justice among God's creatures , both good and bad " ( 17 ).

### **Reforming economic relations between believers**

One of the achievements of economic development in Mahdavi's rule is that with the eradication of poverty and development, the believers in their economic transactions with each other have given up profit and their goal from business will no longer be profit and income (18). Undoubtedly, the realization of this matter is only possible if the society is at the highest level in terms of social welfare and economic development, which will happen at the time of emergence.

Although in some hadiths, it is prohibited for believers to take profit from each other, and in this regard it is stated: "Ribahu al-mu'min-e ali al-mu'min-e riba; It is usury (forbidden) for a believer to take interest from a believer" (19).

But this is only possible when the economic needs of the people are met and economic development is realized, that is why in some other narrations, this is assigned to the time of emergence (20); Ali bin Salem, from his father from Imam Sadiq ( peace be upon him ) He narrates that I asked the Prophet about a narration in which it has been narrated that whoever trusts the mortgage he takes from his religious brother more than his trust in himself, I dislike him . Hazrat said: "This hadith is for when the truth is revealed and our Qaim Ahl al-Bayt rises." I said: What is the narration that has been narrated that: the interest of a believer is usury from a believer? He said: "That hadith is also for the time when the truth is revealed and our

Qaim rises. But today, there is no problem for a believer to sell something to a believer and take profit from him " (21).

### **Economic development during the emergence of natural resources .**

In the previous section, some points were made about economic development, in the dimension of people's public life, in this section, it is discussed about economic development, in the dimension of natural resources, which plays an important role in the economic .development of a society

#### **Revealing the treasures of the earth**

The belief of a Muslim is that the treasure of the blessings of heaven and earth is in the hands of God, but according to his interest, and according to the actions and behavior of his :servants, he benefits them from his blessings; The Holy Quran says

"And if there is a thing, we have its treasures and we do not send it down except with a known amount; And the treasures of everything are only with us; But we do not reveal it except to a certain extent" (22).

Also, avoiding sins, repentance and communication with God play an important role in the :downfall of blessings; Quran says

"So ask forgiveness of your Lord, for He is always forgiving, and sends you the Heavens, and extends you with wealth and sons, and makes you Paradise." He will make you angry; I said to them: "Ask forgiveness from your Lord, for He is very forgiving... so that He may send you the blessed rains of the sky one after another, and help you with wealth and many children, and provide you with green gardens and flowing streams." (23).

During the advent period, with the perfection of people's intellect and the strengthening of their relationship with God, as well as with the blessing of the presence of the Imam of the Time, who is the source of blessings, divine blessings will be expanded in heaven and earth, and the doors of the treasure of divine mercy will be opened for people (24). . Imam Sadiq (peace be upon him) says in this regard: " When our Qaim rises, the earth will be illuminated by the light of its Lord... and the earth will reveal its treasures until people see those treasures on the earth. " .

In another narration of Imam Kazim (peace be upon him), it is stated in this matter: " The obvious blessing (in the Quran) of the Imam is the apparent and the hidden blessing is the absent Imam, whose existence is hidden from the eyes of the people, and the hidden treasures

of the earth are revealed to him , and everything The distance and the unattainable become close to him " (25).

### **Cultivating the land (2-2)**

According to the verses and narrations, in addition to spiritual factors such as piety, prayer, asking for forgiveness and such things, a series of material things such as knowledge, work, planning, type of consumption, people's culture, etc. play an important role in the development of the earth and have economic development (26). As an example, Imam Ali (peace be upon him) said about the role of science and knowledge in the progress of material life: "Ignorance is a rock from which water does not boil; It is a tree whose wood does not grow green; And it is a land whose plants do not grow " (27).

On the other hand, during the Mahdawi rule, science and knowledge reached their highest level and people's minds were perfected, therefore the means of economic development were provided and the land experienced a type of prosperity that has never been seen before. In describing his son and his rule, Imam Ali (peace be upon him) says: " The earth will be prosperous and rich through the Mahdi, and the fountains will flow through him " (28).

Imam Sadiq (peace be upon him) says in the prayer of the oath of Imam Zaman (peace be upon him) which is recited during the occultation : To Baladak, and alive To Ebadak So you Qolt Waqauluk Al-Haq : " Zahar al-Fas Ed." Price Al-Barr And The sea Bema gain Aydei Al-Nannas"; Lord! Settle your lands by his hand and revive your servants through him, as you have truly said: "Destruction on land and sea has appeared because of the achievements [sins] of people " (29).

From the phrase that was quoted from this prayer, it is clear that the cause of the destruction of the earth is sin and corruption, and in the era of advent, with the spread of justice, the earth .will be inhabited

In some other narrations that are mentioned in the Sunni sources, some points have been made in detail about the blessings of the land and its development at the time of the advent. The people of the earth and the living wish that the dead will be resurrected and enjoy the blessings of the world alongside them. Undoubtedly, what is realized in this era is all of the blessings of the existence of Imam Zaman (peace be upon him) (30), as stated in the prayer: " The third Al-Hujjah Al-Khalaf The righteous Al-Qa'eem The expected Mahdi Al-Murji Al-Dhi Remaining The rest Al-Duniya And Beyumneh sustenance Al-Wari And Existence stability The earth And The sky ; Then, may God bless Imam Saleh Qaim, who is waiting for the Mahdi, whom we hope for, the one for whom the earth remains, and because of whom the servants are provided with sustenance, and the heavens and the earth are standing because of his existence" (31).



## Conclusion

This article titled economic development in the era of the advent from the point of view of verses and traditions, was made with the aim of expressing the various aspects of economic development in this era and explaining it with the focus of verses and traditions. Knowing the benefits and blessings of the presence of Imam Mahdi and the Mahdavi government is one of the important points that increases people's knowledge of Imam of the Time (peace be upon him) and increases his desire to understand the days of his appearance and pray for the hastening of his death.

The result of this article is that economic development takes place in two important dimensions during the emergence period. The first dimension is related to the public life of people and the relationships between them. In that era, poverty will be eradicated, property and public assets will be fairly distributed among the people, and the relations of the believers in economic affairs, which had limitations and problems before, will be properly carried out and corrected.

In another dimension, economic development is also formed in the case of natural resources, in the sense that by increasing the relationship with God and also with the blessing of the existence of Imam Zaman (peace be upon him), the blessings from the sky and the earth include the condition of the people and the earth to Imran. And Abadi arrives. These contents have been stated in several narrations and verses of the Holy Qur'an, which show the economic development at the time of the advent. All in all, what was stated in this article was an important step to understand the economic situation at the time of the advent, which, based on the Qur'an and traditions, increases human knowledge compared to that era.

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# A Novel Federated Earliest Deadline First Real-time Task Scheduler for Multiprocessors

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## ABSTRACT

This research paper focuses on the development of scheduling algorithms for real-time systems, with a specific emphasis on multiprocessor environments. The primary objective is to ensure the timely execution of hard real-time tasks to avoid any detrimental consequences caused by missed deadlines. To achieve this goal, Federated Earliest Deadline First (fEDF) scheduler is proposed, which exhibits promising capabilities in meeting the desired objective. The fEDF algorithm incorporates shared and dedicated modes, enhancing flexibility and minimizing idle time and overhead through the utilization of shared tasks. Experimental results validate the effectiveness of the proposed algorithm, demonstrating its ability to significantly improve utilization and maximize processor efficiency while maintaining comparable overhead to the single-processor mode. This research contributes to the advancement of scheduling algorithms for multiprocessor systems, effectively addressing the challenges associated with reliable and efficient real-time task execution.

**Keywords:** Federated EDF, Semi-partitioned scheduler, Hard real-time scheduler, Real-time periodic tasks, Multiprocessors

## 14. INTRODUCTION

Numerous critical applications, such as factory automation, self-driving cars, autopilot airplanes, and space missions, rely on the timely execution of periodic real-time tasks. Efficient scheduling of these tasks is crucial for optimal resource utilization. Inefficient scheduling leads to increased costs, higher energy consumption, and elevated heat dissipation [1], [2]. Hence, optimizing resource utilization is essential, particularly for long-running systems.

Two key findings emerge when scheduling periodic real-time tasks in uniprocessor systems. Firstly, the Rate Monotonic (RM) scheduler is highly efficient among static schedulers. Secondly, the Earliest Deadline First (EDF) scheduler is effective in managing a set of periodic real-time tasks if their combined utilizations do not exceed one [3]. EDF is considered an optimal scheduler for handling hard real-time periodic tasks in single-processor systems. Unfortunately, this optimality does not extend to multiprocessor systems. This limitation becomes evident when considering an example of a set of real-time periodic tasks whose sum of utilizations is below two, yet EDF cannot safely schedule them on two processors.

To illustrate this limitation, let's consider three periodic real-time tasks denoted as  $\tau_1, \tau_2$ , and  $\tau_3$ , with attributes (T, D, C) representing the request period, deadline, and execution time, respectively. Even though the sum of their utilizations is 1.7, which is less than 2, a dual processor system cannot safely execute them. If all three tasks start simultaneously, processors 1 and 2 begin executing tasks 1 and 2, completing their execution by time 4. However, at time 4, one of the processors initiates the execution of the third task, but it cannot finish it by its deadline at time 7.

Task set = {(8, 8, 4), (8, 8, 4), (10, 10, 7)}

The pursuit of faster processors and the use of optimal EDF schedulers may appear to be a straightforward solution. However, limitations arise as processor speeds reach a threshold where significant increases become challenging, while energy consumption and heat generation escalate. Additionally, accelerating processor speeds requires denser electronic component placement on chips, presenting complex challenges. The introduction of

dual-core processors by IBM in 1996 marked a shift towards multicore systems, driven by the need for parallel programming and improved cache memory utilization [4]. Asymmetric multicores have emerged as a prevailing trend [5]. Consequently, designing algorithms that maximize utilizations in multiprocessor environments becomes crucial for enhanced multicore scheduling algorithms.

Despite EDF not being universally optimal for multiprocessor environments, there is a strong inclination to utilize it among researchers and practitioners. This preference stems from EDF's exceptional performance in scheduling periodic hard real-time tasks on single processors, its intuitive concept of prioritizing tasks based on nearest deadlines, and its superiority over competitors like Rate Monotonic and Least Laxity First schedulers in multiprocessor scenarios [6], [7]. Efforts persist in improving EDF's performance for multiprocessor systems, including partitioning and semi-partitioning approaches. The partitioning method divides periodic real-time tasks into subsets, ensuring that the sum of utilizations in each subset does not exceed 1. The semi-partitioning approach assigns some tasks exclusively to one processor while distributing others among multiple processors.

This research introduces a novel approach, the Federated Earliest Deadline First (*fEDF*) scheduler, for scheduling periodic hard real-time tasks in multiprocessor environments. The *fEDF* scheduler utilizes an EDF-based algorithm with distinctive features. It assigns certain tasks exclusively to a single processor while placing others in a shared pool accessible to all processors for systematic execution. However, processors with fully assigned tasks totaling a cumulative utilization of one are exempted from executing shared tasks.

## 15. RELATED WORK

Real-time systems require both accurate logical results and adherence to timing constraints [8], [9]. Real-time scheduling algorithms allocate tasks to processors to ensure resource availability and meet specified constraints. The Rate Monotonic (RM) algorithm is a widely studied preemptive fixed-priority scheduling algorithm for uniprocessors [3].

Real-time task scheduling can be categorized as hard real-time or soft real-time. In hard real-time systems, all task deadlines must be met, while in soft real-time systems, missing deadlines has less severe consequences. Various scheduling algorithms have been proposed, such as one by Ahmed and Anderson [10] that clusters tasks based on utilization and schedules them using the global Earliest Deadline First (EDF) approach. The present research focuses on task scheduling in hard real-time systems.

Real-time task scheduling can be done using global or partitioned approaches. Global scheduling allows task migration between CPUs/cores, while partitioned scheduling assigns tasks to specific processors. Semi-partitioned scheduling extends partitioned methods, allowing tasks to be split between multiple processors. Anderson et al. [11] introduced semi-partitioned scheduling, which has gained attention from researchers [12]–[14]. Partitioned and semi-partitioned methods are considered superior to global scheduling [15], although combining task splitting and intelligent partitioning can lead to near-optimal solutions [16]. Static and dynamic environments are also important considerations, with dynamic environments presenting more complex scheduling challenges due to changing tasks over time.

Considerable research has been conducted on static and dynamic scheduling of real-time tasks on multiprocessor systems [15], [17]. Some studies have focused on the semi-partitioned approach, where the number and specifications of tasks can change over time [18]. Other researchers have explored a combination of static and dynamic environments.

Abeni and Cucinotta [19] introduced the *apEDF* and *a<sup>2</sup>pEDF* task scheduling algorithms based on adaptively partitioned EDF scheduling. These algorithms distribute tasks between CPUs or processing cores using heuristics and minimize the number of required migrations. They provide bounded tardiness and revert to a global EDF partitioning approach if the partitioning heuristic results in CPU/core overloading. Experimental results show that *a<sup>2</sup>pEDF* outperforms *gEDF*, while *apEDF* performs slightly lower.

Voronov and Anderson [20] presented the semi-partitioned AM-Red scheduling algorithm for implicit-deadline sporadic tasks with arbitrary affinity masks. This algorithm provides an optimal schedule for soft real-time task systems and, in some cases, for hard real-time systems. It also reduces the edges of the affinity graph, leading to reasonable tardiness and task migration rate with low computational overhead. The algorithm is designed for homogeneous multiprocessor systems, with future work focusing on extending it to heterogeneous systems.

Previous research has shown the theoretical feasibility of achieving 100% utilization through global scheduling methods, but their substantial overhead makes them impractical. Partitioning approaches have faced challenges in achieving adequate utilization due to the inability of tasks to migrate between processors. Semi-partitioning scheduling methods have been successful, with Rate Monotonic-based methods achieving over 69% utilization and EDF-based methods reaching a maximum of 65% utilization. However, there is a strong motivation to propose a suitable method based on the EDF approach to surpass the existing limit and achieve improved utilization.

## 16. PROPOSED METHOD

The research assumes a homogenous single-core multiprocessor environment, accounts for identical memory access time across processors, and considers the impact of cache memory in task execution time. It introduces an innovative semi-partitioning approach inspired by Earliest Deadline First (EDF). Instead of restricting shared tasks to two processors, a shared pool is introduced where each processor can select an appropriate task at the designated time. The algorithm consists of two phases: assignment and scheduling. In the assignment phase, two policies are considered: selecting the task with the smallest period and applying the best-fit policy when the smallest period task cannot be selected. The assignment phase also includes a load balancing mechanism to fill processors as much as possible, considering the processor with the lowest utilization.

The scheduling algorithm operates in two modes: shared mode for executing shared tasks and dedicated mode acting as a single processor. In the shared mode, the processor executes shared tasks according to the EDF policy within the feasible time period. If no shared task exists, the processor temporarily executes its own task with the smallest period until a shared task arrives. In the dedicated mode, the processor remains idle if there is no shared task and its own tasks are not ready to be executed. The algorithm allows for disabling interrupts for task switching depending on the mode, reducing scheduling overhead and improving performance. Interrupts for new dedicated task arrivals can be safely disabled in the shared mode, while the arrival interrupt for shared tasks can be disabled in the dedicated mode.

By implementing these strategies, the proposed scheduling algorithm aims to achieve higher utilization, minimize overhead, and improve the performance of task scheduling.

In the assignment phase, tasks are assigned to specific processors, while the remaining tasks are considered shared tasks to be executed by all processors. In the scheduling stage, the EDF policy is used to determine which task each processor should execute at any given time.

### 1.1 Assignment phase

The proposed algorithm aims to divide tasks among processors to maximize system utilization with the fewest number of required processors. As denoted in Algorithm 1, the algorithm starts with initial assignments and calculates the utilization rate  $U_r$  that processors can allocate to shared tasks. Thereafter,  $U_r$  which represents the utilization of the whole task set computed using Equation 1 (lines 2 to 5):

$$U_r = \sum_{i=1}^N \frac{C_i}{T_i} \quad (1)$$

Here, the set  $C_s = \{C_{s_1}, C_{s_2}, \dots, C_{s_M}\}$ , represents the time allocated to shared tasks in which  $C_{s_i}$ , represents the time that processor  $i$  can allocate to the shared tasks' queue, which initially is assumed as zero at the start of the algorithm. Thus, the value of  $C_{s_i}$  for each processor is computed, which is briefly discussed as follows (lines 6 to 8):

The algorithm starts by assigning tasks to processors in order of increasing period, with  $m$  representing the current processor being considered. At each stage, the task with the smallest period is assigned to the current processor. The assigned task is then removed from the task set ( $\Gamma$ ) and added to the dedicated task set of that processor ( $\Gamma_{p_m}$ ). The utilization of the assigned task is subtracted from the remaining utilization  $U_r$ , and this process is repeated for all other tasks in the dedicated task set.



**Algorithm1- Task assignment to processors pseudo-code**

<p>Inputs:</p> <ul style="list-style-type: none"> <li>Task set: <math>\Gamma = \{\tau_1, \tau_2, \dots, \tau_N\}</math></li> <li>Multiprocessor: <math>\rho = \{P_1, P_2, \dots, P_M\}</math></li> </ul> <ol style="list-style-type: none"> <li>1. <math>U_r \leftarrow 0;</math></li> <li>2. <math>U_s \leftarrow 0;</math></li> <li>3. for <math>i \leftarrow 1</math> to <math>N</math> do</li> <li>4.     <math>U_r \leftarrow U_r + u_i;</math></li> <li>5. end for</li> <li>6. for <math>i \leftarrow 1</math> to <math>M</math> do</li> <li>7.     <math>C_{s_i} \leftarrow 0;</math></li> <li>8. end for</li> <li>9. <math>m \leftarrow 1;</math></li> <li>10. <math>\tau_t \leftarrow \text{get\_minimum\_period}(\Gamma);</math></li> <li>11. while <math>U_r &gt; U_s</math> do</li> <li>12.     if <math>m &gt; M</math> then</li> <li>13.         return failure;</li> <li>14.     end if</li> <li>15.     if <math>U(\Gamma_{P_m}) + u_t &gt; 1</math> then</li> <li>16.         <math>\Gamma_R \leftarrow \text{all tasks with } u \leq U(\Gamma_{P_m});</math></li> <li>17.         while <math>\Gamma_R \neq \emptyset</math> do</li> <li>18.             <math>\tau_t \leftarrow \text{get\_maximum\_utilization}(\Gamma_R);</math></li> <li>19.             remove <math>\tau_t</math> from <math>\Gamma;</math></li> <li>20.             <math>\Gamma_{P_m} \leftarrow \Gamma_{P_m} \cup \tau_t;</math></li> <li>21.             <math>U_r \leftarrow U_r - u_t;</math></li> <li>22.             <math>\Gamma_R \leftarrow \text{all tasks with } u \leq U(\Gamma_{P_m});</math></li> <li>23.         end while</li> <li>24.         <math>u_s \leftarrow 1 - U(\Gamma_{P_m});</math></li> <li>25.         <math>U_s \leftarrow U_s + u_s;</math></li> <li>26.         <math>\Delta_m \leftarrow \text{get\_minimum\_period}(P_m);</math></li> <li>27.         <math>C_{s_m} \leftarrow u_s \times \Delta_m;</math></li> </ol>	<ol style="list-style-type: none"> <li>28.         <math>m \leftarrow m + 1;</math></li> <li>29.     else</li> <li>30.         remove <math>\tau_t</math> from <math>\Gamma;</math></li> <li>31.         <math>\Gamma_{P_m} \leftarrow \Gamma_{P_m} \cup \tau_t;</math></li> <li>32.         <math>U_r \leftarrow U_r - u_t;</math></li> <li>33.     end if</li> <li>34.     <math>\tau_t \leftarrow \text{get\_minimum\_period}(\Gamma);</math></li> <li>35. end while</li> <li>36. if <math>\Gamma_{P_m}</math> was not empty then</li> <li>37.     while <math>U(\Gamma_{P_m}) + u_t \leq 1</math> and <math>\Gamma \neq \emptyset</math> do</li> <li>38.         remove <math>\tau_t</math> from <math>\Gamma;</math></li> <li>39.         <math>\Gamma_{P_m} \leftarrow \Gamma_{P_m} \cup \tau_t;</math></li> <li>40.         <math>U_r \leftarrow U_r - u_t;</math></li> <li>41.         <math>\tau_t \leftarrow \text{get\_minimum\_period}(\Gamma);</math></li> <li>42.     end while</li> <li>43.     <math>\Gamma_R \leftarrow \text{all tasks with } u \leq U(\Gamma_{P_m});</math></li> <li>44.     while <math>\Gamma_R \neq \emptyset</math> do</li> <li>45.         <math>\tau_t \leftarrow \text{get\_maximum\_utilization}(\Gamma_R);</math></li> <li>46.         remove <math>\tau_t</math> from <math>\Gamma;</math></li> <li>47.         <math>\Gamma_{P_m} \leftarrow \Gamma_{P_m} \cup \tau_t;</math></li> <li>48.         <math>U_r \leftarrow U_r - u_t;</math></li> <li>49.         <math>\Gamma_R \leftarrow \text{all tasks with } u \leq U(\Gamma_{P_m});</math></li> <li>50.     end while</li> <li>51.     <math>u_s \leftarrow 1 - U(\Gamma_{P_m});</math></li> <li>52.     <math>U_s \leftarrow U_s + u_s;</math></li> <li>53.     <math>\Delta_m \leftarrow \text{get\_minimum\_period}(P_m);</math></li> <li>54.     <math>C_{s_m} \leftarrow u_s \times \Delta_m;</math></li> <li>55.     <math>m \leftarrow m + 1;</math></li> <li>56. end if</li> <li>57. <math>\Gamma_C \leftarrow \Gamma;</math></li> </ol>
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If it is not possible to assign the next task with the minimum period, the algorithm will then utilize the second policy for task assignment. When there are no more tasks left to assign to the current processor, the algorithm progresses to the subsequent processor. It adds all tasks that can be scheduled on the processor based on their utilization to the set  $\Gamma_R$ . The task with the highest utilization in  $\Gamma_R$  is then assigned to the processor, updating the CPU's utilization and filling the  $\Gamma_R$  set based on the new utilization. This process continues until the  $\Gamma_R$  set is empty and no more tasks can be assigned to a processor.

For example, if this procedure is applied to the first processor and the utilization of the processor is 0.75, while the next task with the smallest period has a utilization of 0.28, the task cannot be scheduled on this processor. The algorithm then attempts to find a task with the maximum utilization among the remaining tasks that is less than or equal to the remaining utilization of 0.25. Once all tasks have been assigned and none remain, the remaining utilization is added to the shared utilization  $U_s$ , which is allocated to the shared tasks. The algorithm calculates the time that the CPU can be assigned to shared tasks by converting the utilization to a shared period. This process is repeated for the other processors, and the algorithm continues until the remaining utilization  $U_r$  is less equal than the shared utilization  $U_s$ , indicating that the current processors can handle the remaining shared tasks without requiring additional processors. If the number of available processors is insufficient for the execution of the task set, the assignment step fails. The algorithm also checks if the current processor still has capacity to allocate more tasks and assigns shared tasks to it if possible. Finally, the remaining tasks are considered as the shared tasks' set and added to the set  $\Gamma_C$ .

### 1.1 Scheduling phase

In the scheduling phase, the main goal is to schedule tasks based on the EDF policy. Algorithm 2 represents the pseudo-code of the scheduling procedure. When it is time to execute a task with the smallest period on an individual processor  $x$ , it is first allocated to shared tasks set for the amount of time defined by  $C_{s_x}$ , and then to the task which is completely allocated to the considered processor (i.e., CPU's dedicated task). If the desired shared task is not completed, it is returned to the shared tasks' queue to be completed by other available processors. It should be noted that the selection of tasks from the shared tasks queue is also based on the EDF policy.

Accordingly, whenever a new task arrives, or a scheduled task is completed, or the time allocated for the

#### Algorithm 2- Scheduling pseudo-code of processor $X_m$

```

1.  $e_r \leftarrow C_{s_x}$ ;
2. when task  $\tau_n$  is arrived or is released on shared tasks or  $P_x$  do
3.    $\tau_x \leftarrow$  currently running task on  $P_x$ ;
4.   if  $\tau_x \in \Gamma_C$  then
5.      $e_r \leftarrow e_r + \text{execution time of } \tau_x$ ;
6.   else if  $P_x$  is idle then
7.      $e_r \leftarrow e_r + \text{idle time}$ ;
8.   end if
9.   if  $e_r < C_{s_x}$  then
10.    if shared ready set is not empty then
11.       $\tau_s \leftarrow$  get the task with earliest deadline from shared ready set;
12.      execute  $\tau_s$  for  $C_{s_x} - e_r$ ;
13.    else if  $\tau_x \notin \Gamma_C$  or  $\tau_x$  then
14.       $\tau_t \leftarrow$  get the task with earliest deadline from  $\Gamma_{P_x}$ ;
15.      if  $\tau_t$  has finished then
16.        make  $P_x$  idle for  $C_{s_x} - e_r$ ;
17.      else
18.        execute  $\tau_t$ ;
19.      end if
20.    end if
21.  else if  $\tau_n \in P_x$ 
22.     $\tau_t \leftarrow$  get the task with earliest deadline from ready set of  $P_x$ ;
23.    if  $\tau_t$  has least period in  $\Gamma_{P_x}$  and  $\tau_t$  hasn't execute then
24.      mark  $\tau_t$  as executed;
25.       $e_r \leftarrow 0$ ;
26.      if shared ready set is not empty then
27.         $\tau_s \leftarrow$  get the task with earliest deadline from shared ready set;
28.        execute  $\tau_s$  for  $C_{s_x} - e_r$ ;
29.      else
30.        execute  $\tau_t$ ;
31.      end if
32.    else
33.      execute  $\tau_t$ ;
34.    end if
35.  end if

```

execution of a shared task expires, the scheduling algorithm will be executed again. It is assumed that  $e_r$  is the execution time of the dedicated tasks in a processor and its initial value is assumed to be equal to  $C_{s_x}$ . Therefore, the CPU's dedicated tasks are checked first, and if the task with the smallest period is selected,  $e_r$  is set to zero so that the shared tasks can be checked and executed. This means that at the beginning, the shared tasks are not considered for execution (line 1). Therefore, the scheduling algorithm is executed when a new task arrives, or a scheduled task is released (line 2). The executing task is selected and named  $\tau_x$ , respectively. If this task belongs to the set of shared tasks  $\Gamma_C$ , the time executed by this processor is added to  $e_r$  (lines 3 to 6), and if the processor was idle during this period, the idle time is added to  $e_r$  (lines 6 to 8). In this stage, it is checked whether there is any time left from  $C_{s_x}$ . Therefore, based on the EDF policy, a task is selected from the ready shared tasks set and executed according to the remaining time  $C_{s_x}$ . Obviously, a shared task should not be executed by two processors

simultaneously. Therefore, the shared tasks set can be considered a critical section, and two processors do not have the right to simultaneously select a task from a set of ready-to-run tasks (Lines 9 to 13).

*Lemma 1:* The proposed assignment method ensures timely completion of all requests for dedicated tasks and the tasks with the smallest period for each partition, guaranteeing no overrun pertaining to partition tasks.

Proof: Earliest Deadline First (EDF) is implemented in each partition, ensuring that no request will be overlooked, provided that the cumulative utilization of all tasks remains below 1. The task with the smallest period of each partition is considered in terms of its effective execution time, which includes both its own execution time and the execution time it shares with the shared tasks. This approach ensures that the overall utilization of the partition remains within 1, thereby preventing any overruns in relation to the tasks within the partitions.

Also, if there is no shared task to be executed and the CPU's task with the shortest period is completed, the processor is considered idle. However, in this stage, another scenario can be considered as well. Accordingly, the condition in line 15 checks that the processor is considered idle if a ready task for execution does not exist. Therefore, the time consumed by the shared task is checked instantly, and when this time is over, an interrupt is issued to start a new task (lines 14 to 17).

If the execution of the processor's task has not been completed, the execution of the task will continue. Otherwise, if there is no time left to execute shared tasks, the processor will consider a task from the ready dedicated tasks' set for execution. If the selected task has the shortest period between the tasks of the desired processor and has not yet been executed (i.e., it is the first time it has been selected for execution), this task is marked as executed so that its execution time is not re-assigned to shared tasks (i.e., the executed task may not be necessarily completed). In other words, this task may have been selected for execution once before and wants to continue running again after the shared tasks time expires. In this case, because it has been the second time it has been selected, this condition is false. Therefore, the remaining  $C_{s_x}$  is considered for the execution of the shared tasks. However, if this task did not have the smallest period or there is no available task in the shared tasks set (line 29), the desired task is considered for execution. Moreover, suppose the shared time period is over and the execution of the task with the smallest period is continued; it is automatically selected in line 22 and the task's execution is continued in line 33 (lines 22 to 34).

It should be noted that if there are multiple tasks in a processor with equal smallest periods, the  $C_{s_x}$  time period should be allocated from only one of them. The main reason is that the risk of deadline violation becomes apparent if the  $C_{s_x}$  time is dedicated to shared tasks from more than one period. As a result, one of the tasks with the shortest period must be considered and checked to ensure that the selected task is indeed the task with the smallest period (i.e., the condition in line 23).

## 17. EVALUATION

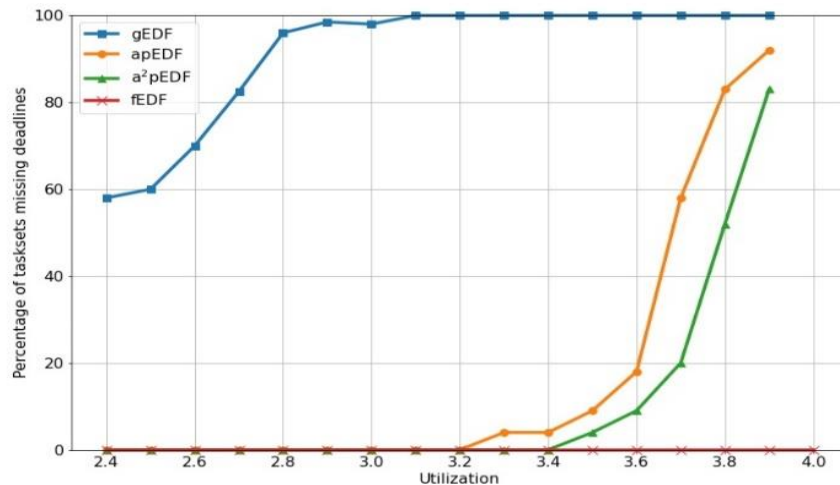
This section presents the experimental results and the evaluation of the proposed scheduling algorithm. The performance parameters are compared with similar scheduling algorithms in the same context. To evaluate the presented algorithm, the performance of the proposed method has been compared with *apEDF* and *a<sup>2</sup>pEDF* task scheduling algorithms proposed by Abeni and Cucinotta [19] and the *global-EDF* method [21].

Consistent with previous research in this field, three different evaluation parameters are considered in the experiments: the number of completed tasks, and the utilization of the entire task set. Each configuration involves 30 distinct random task sets, and the success rate is meticulously analyzed. Specifically, when the missing rate reaches 100%, the success rate is zero. These two parameters can be easily converted to one another.

To ensure consistent experimental conditions, the task generation scheme employed in this study follows the approach used by Abeni and Cucinotta [19]. This scheme aims to minimize the likelihood of selecting tasks with inappropriate utilizations by sampling randomly from a normal distribution. However, if an inappropriate task is generated, it is replaced to ensure a suitable task set. For instance, if we need to generate 16 random tasks with a total utilization of 3, the total utilization value is divided by the total number of tasks, resulting in an average value. This average value is then used as the mean for the normal distribution.

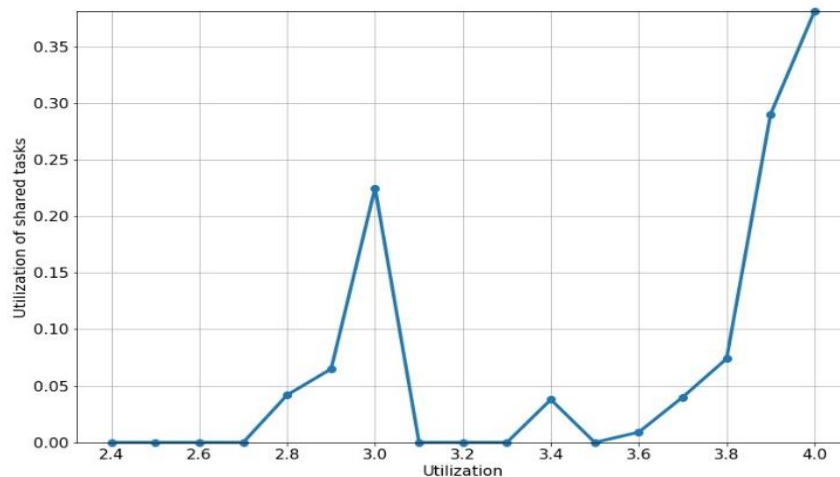
The successful completion of the assignment implies that scheduling will be carried out without any deadline violations. Conversely, an unsuccessful assignment indicates that scheduling cannot be achieved, resulting in system failure. Consequently, the assignment step is the focal point of the experiments due to its significance.

In figure 1, four processors are employed to schedule 16 tasks. The total utilization varies from 2.4 to 4.1, with a step size of 0.1. Each test has been repeated 30 times using the assumed task set, and the average results have been considered.



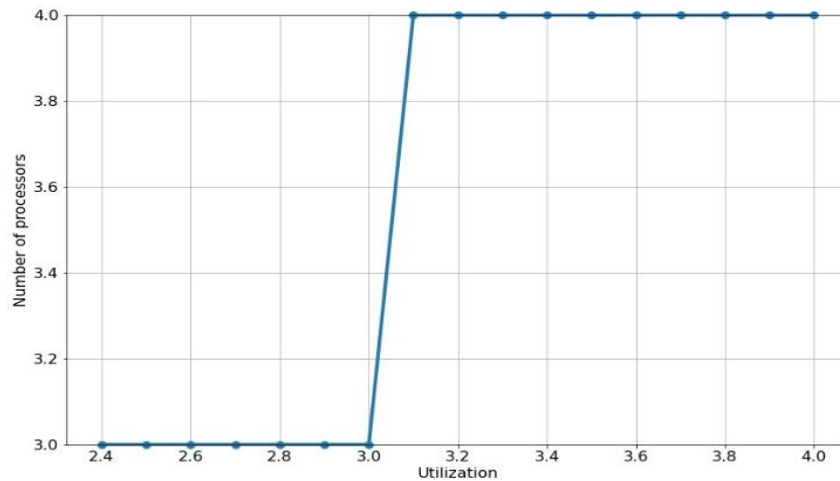
**Fig. 1.** The taskset missing rate in the 4-processor configuration

A meticulous examination of the results obtained from the proposed scheduling algorithm reveals that when four processors are considered, the success rate is 100% across all total utilization values, which is a highly significant achievement. To ensure the credibility of the experimental results, total utilization of 4.1 is examined in this scenario involving four processors. As expected, the success rate was zero, indicating that no success is anticipated when the total utilization exceeds the capacity of the system. This additional test was conducted solely to validate that the assignment functions as expected in practical scenarios.



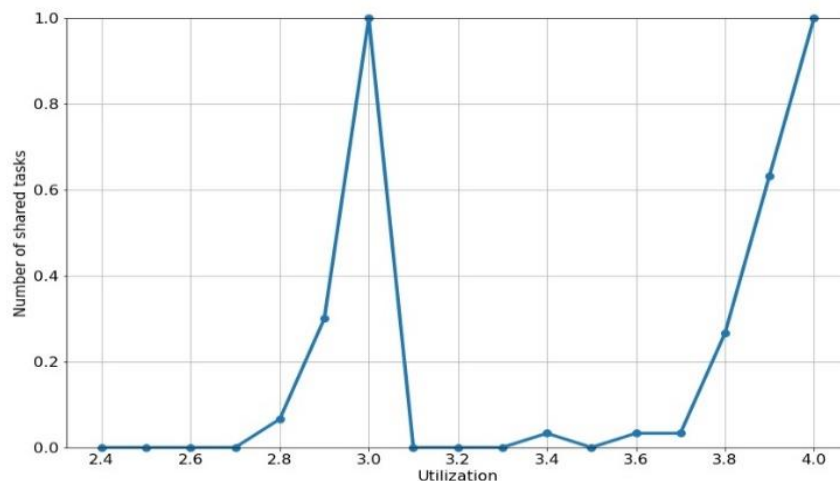
**Fig. 2.** Shared tasks' utilization in the 4-processor configuration

Figure 2 presents the shared utilization, which represents the average utilization of tasks assigned to the shared section. Accordingly, the highest shared utilization is observed at 4, reaching approximately 0.37.



**Fig. 3.** Number of required processors considering different utilizations

Analyzing the results clearly demonstrates that the *fEDF* algorithm ensures maximum processing efficiency, regardless of the number of available processors. In other words, the required number of processors is determined based on the utilization of the entire system, regardless of the available processor count. For example, as depicted in Figure 3, in a 4-processor scenario with utilization ranging between 2 and 3, three processors are considered the optimal choice. Once the utilization exceeds 3, three processors are no longer sufficient, and four processors are employed up to a utilization of 4. Such a policy ensures that the proposed algorithm maximizes the system's processing capacity.



**Fig. 4.** Number of shared tasks considering different utilizations

An interesting aspect regarding the number of shared tasks is that the scheduling algorithm is sensitive to these threshold values and attempts to adapt while using the fewest possible resources. For instance, as depicted in Figure 4, in the 4-processor mode, there are initially no shared tasks. However, this value gradually increases as the utilization approaches 3 and eventually reaches its maximum value, precisely corresponding to the limit of utilizing three processors. With a slight adjustment, it transitions to four processors. In other words, once it surpasses 3, the number of shared tasks decreases (i.e., returns to zero) and then begins to increase again until reaching the maximum value at 4.

The experimental results, encompassing diverse scenarios, provide evidence that the proposed scheduling algorithm effectively addresses limitations in multiprocessor environments and achieves optimal utilization. Furthermore, the algorithm demonstrates excellent adaptability to the system's conditions, utilizing only the necessary number of processors and thereby enhancing overall system utilization. Additionally, the algorithm intelligently selects the most appropriate tasks as shared tasks, with the objective of minimizing the required number of shared tasks. The results obtained from the conducted experiments validate this claim.

## 18. CONCLUSION

This research introduces a novel real-time scheduling algorithm that revolutionizes task division and management within a system. Unlike traditional approaches that distribute tasks between two processors, this algorithm considers multiple tasks as shared tasks among all available processors. This innovative approach significantly improves task utilization compared to existing algorithms with similar objectives.

The algorithm incorporates a flexible policy that optimizes resource utilization by never exceeding the minimum required resources and strives to minimize the number of shared tasks. However, if the tasks were partitioned between pairs of processors, the algorithm would face more limitations, necessitating the consideration of two-part tasks equal to the number of available processors minus one. To minimize overhead, the algorithm introduces two modes: shared and dedicated, successfully reducing overhead in this aspect. Enhancements in the shared mode have the potential to significantly enhance the efficiency of the scheduling algorithm. By addressing the challenges of a multiprocessor environment and acknowledging its limitations, this research aims to lay the groundwork for future research directions in extending the study of multicore environments.

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## Explanation of the comprehensive and balanced model of education Proportion of Alevi worship and justice

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<sup>34</sup>Sadegh Salmani

### Abstract

In Islam, the infallible imams ( peace be upon them) are presented as the best example and model of humanity , and the Commander of the Faithful (peace be upon them) is presented as a comprehensive and balanced model , a standard and criterion for measuring others , and it is necessary. His lifestyle should be checked and reviewed . This research is a library approach with a qualitative approach and a descriptive-analytical method ; After examining and , measuring the relationship between justice and worship in thought, The performance, behavior and speech of the Commander of the Faithful, peace be upon him . This article has tried to address the importance of how the balance of worship and justice has shaped the comprehensive model and character of Shakool Alavi to become a measure of humanity. In this regard, he is responsible for investigation Some questions were asked , including : What is the relation of worship as a behavior in the field of servitude ethics to justice? How can worship bring justice to man? Or how does the existential aspect of worship affect the existential aspect of justice in humans? In order to answer these questions from an analytical and narrative point of view , with the aim of establishing a model , an attempt has been made to present examples of Alawite practice as concrete and practical examples that show the bond between worship and justice. Therefore, after defining education, worship and justice, this research seeks to explain the relationship between worship and justice . Is worship effective in creating justice and justice in promoting worship? Isn't the plurality of worship an obstacle to justice or limiting justice? What is the ratio of worship and justice in the life of Amirul Momineen (AS)? What is the relationship between the extent of the actions of Amirul Momineen (AS) for the believers and this discussion? What has distinguished his performance and worship and made his character equal and equal to justice? In the hope of Tasi, this article . has made a model within the scope of scientific materials and limited opportunity

. **Key words :** education, educational model, justice, worship, life of Imam Ali (AS), worship

## Understanding Recommender Algorithms: Exploring The Role Of Data Mining And User Behavior Analysis

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### ABSTRACT

Recommender algorithms play a vital role in various domains by providing users with personalized content suggestions. This article explores the intersection of data mining and user behavior analysis in enhancing recommender algorithms. By leveraging data mining techniques, such as clustering, classification, and pattern recognition, valuable insights are extracted from extensive datasets, including user interactions and preferences. The incorporation of big data analytics, machine learning, and predictive modeling further refines recommender systems, allowing for real-time adaptation to evolving user tastes. The article emphasizes the significance of data mining in uncovering hidden patterns, improving the accuracy of recommendations, and enhancing the overall user experience. It discusses how data mining enhances recommender algorithms by unleashing hidden insights, analyzing user behavior, and optimizing decision-making processes, ultimately maximizing recommendation accuracy and improving user satisfaction.

**Keywords:** Data Mining, Recommender Algorithms, User Behavior Analysis, Big Data Analytics, Machine Learning

### 19. INTRODUCTION

Recommender algorithms have become indispensable in various domains, providing relevant content suggestions to users. These algorithms rely on data mining and machine learning techniques to analyze user behavior and preferences. By examining user interactions, such as ratings and purchase history, valuable insights can be extracted from vast amounts of data. This analysis enables the identification of patterns and the generation of personalized recommendations for users with similar tastes.

Data mining is a valuable tool that enhances recommender algorithms by providing organizations with a deeper understanding of customer behavior, preferences, and needs. By analyzing user interactions, such as click-through rates and time spent on different items,

recommender algorithms can continuously adapt their recommendations in real-time. This iterative approach ensures that the user experience remains personalized and effective by delivering timely suggestions that align with evolving tastes and preferences.[0, 1, 2, 3, 4, 5, 6, 7]

## **20. Leveraging Big Data Analytics: Unleashing Hidden Insights Through Data Mining Techniques**

The utilization of big data analytics techniques, including data mining, predictive modeling, and machine learning, allows organizations to uncover hidden patterns and gain valuable insights. These techniques enhance recommender algorithms by enabling them to extract meaningful information from large datasets, resulting in more accurate predictions and personalized recommendations. The utilization of big data analytics is particularly crucial in handling vast amounts of user-generated data, such as ratings, purchase histories, click-through rates, and demographic information. By employing data mining techniques, organizations can navigate through this wealth of information to identify patterns, correlations, and trends. This exploration is not merely about processing large volumes of data; rather, it's about extracting actionable intelligence that can inform and improve the recommendations provided to users.

Data mining acts as a key enabler in this process, allowing organizations to unveil intricate relationships within the data. Techniques like pattern recognition and predictive modeling play a pivotal role in discerning meaningful patterns from raw data. These patterns, once identified, contribute to a more nuanced understanding of user behavior and preferences, ultimately leading to more accurate and personalized recommendations.

Moreover, the article discusses the iterative nature of big data analytics and its continuous adaptation to evolving user preferences. As recommender algorithms receive more data and user feedback, the insights gained from data mining enable these algorithms to adjust and fine-tune their recommendations in real-time. This dynamic approach ensures that the recommendations stay relevant and align with the changing tastes and preferences of users. [8, 9]

## **21. Enhancing Recommender Systems With Machine Learning And Data Mining Approaches**

By employing machine learning algorithms, businesses can extract valuable insights from their extensive datasets. Analyzing user preferences and behavior patterns allows recommendation systems to provide personalized suggestions. Machine learning leverages data mining and computational intelligence algorithms to enhance decision-making models, optimizing accuracy and effectiveness in recommender systems. Machine learning, as a key component, plays a pivotal role in extracting valuable insights from extensive datasets. By analyzing user preferences and behavior patterns, ML algorithms contribute to the generation of personalized recommendations. The iterative nature of ML allows recommender systems to continually learn and adapt, ensuring that the recommendations align closely with evolving user preferences.

Data mining, on the other hand, acts as a complementary tool, providing deeper insights into user behavior, preferences, and needs. The article emphasizes that by analyzing user

interactions, such as click-through rates and time spent on different items, recommender algorithms can dynamically adjust their recommendations in real-time. This real-time adaptation ensures that the user experience remains personalized and effective, delivering timely suggestions based on the most recent interactions.

Furthermore, the article discusses the symbiotic relationship between ML and data mining, wherein the fusion of these approaches enhances the overall capabilities of recommender systems. ML algorithms leverage data mining and computational intelligence to uncover intricate patterns and correlations within vast datasets. This, in turn, refines the decision-making models, optimizing the accuracy of recommendations and, consequently, improving user satisfaction. [10, 11, 12]

## **22. Unleashing The Power Of Data Mining: How It Improves Recommender Algorithms**

The article "Unleashing the Hidden Insights: How Data Mining Enhances Recommender Algorithms" discusses the utilization of data mining in intelligent recommendation systems. By applying advanced analytics techniques, such as pattern recognition and predictive modeling, data mining uncovers valuable patterns and correlations from large datasets, improving the accuracy and effectiveness of recommendation algorithms. At the core of this discussion is the idea that data mining techniques, such as pattern recognition and predictive modeling, play a transformative role in the intelligent enhancement of recommender algorithms. By applying these advanced analytics methods, organizations can extract valuable patterns and correlations from raw data, offering a deeper understanding of user behavior and preferences.

This nuanced understanding, in turn, forms the foundation for refining and optimizing recommendation algorithms.

The article delves into the process by which data mining contributes to improving recommender algorithms. Through the application of clustering, classification, and recommendation algorithms, data mining allows for the identification of intricate relationships and patterns within extensive datasets. This enables recommender systems to move beyond basic user interactions, considering complex correlations and user preferences that may not be immediately apparent.

Moreover, the iterative and adaptive nature of recommender algorithms is highlighted. Data mining facilitates continuous learning by enabling these algorithms to evolve based on new data inputs. This iterative approach ensures that the recommendations stay relevant and aligned with the dynamic nature of user preferences and behaviors. [13, 14]

## **23. Uncovering User Preferences: The Role Of Data Mining In Recommender Algorithms**

Data mining is essential for enhancing customer experience by uncovering valuable insights and patterns. By analyzing extensive customer data, including purchase history, browsing behavior, and demographics, businesses can gain valuable insights into consumer preferences

and market trends. Recommender systems use this information to provide personalized recommendations based on individual tastes and preferences. One key aspect discussed in the article is the comprehensive analysis of customer data facilitated by data mining. By employing techniques like clustering and pattern recognition, data mining allows organizations to identify distinct user segments and preferences within their user base. This granular understanding forms the basis for tailoring recommendations to individual tastes, creating a more personalized and satisfying user experience.

The iterative nature of recommender algorithms is highlighted, emphasizing the continuous adaptation to changing user preferences. Through data mining, recommender systems can analyze evolving patterns and trends, ensuring that recommendations remain relevant over time. This adaptability is crucial in catering to the dynamic nature of user preferences in various domains, such as e-commerce, entertainment, or content streaming services.

Furthermore, the article delves into the role of data mining in uncovering implicit preferences. Beyond explicit user actions like ratings or clicks, data mining allows recommender systems to infer preferences based on subtle cues within user interactions. This nuanced understanding enables algorithms to provide recommendations that align more closely with users' latent preferences, contributing to a more accurate and satisfying user experience. [15, 16, 17]

#### **24. Harnessing The Potential Of User Behavior Analysis In Data Mining For Enhanced Recommender Algorithms**

Leveraging machine learning algorithms for data mining allows for the analysis of user behavior and preferences, uncovering patterns that can enhance recommender algorithms. By identifying correlations and trends within extensive datasets, these algorithms can provide accurate recommendations, ultimately improving user satisfaction and engagement with personalized content.

The core theme revolves around the integration of user behavior analysis into the data mining process. By employing machine learning algorithms for data mining, organizations can delve into user behaviors and preferences, extracting valuable patterns that contribute to the enhancement of recommender algorithms. This approach involves identifying correlations and trends within extensive datasets, ultimately leading to more accurate and personalized recommendations.

The article discusses the iterative and adaptive nature of recommender algorithms, a characteristic crucially influenced by user behavior analysis. As user preferences evolve, data mining enables these algorithms to adapt in real-time, ensuring that recommendations stay relevant and aligned with the dynamic nature of user tastes. This adaptability is a key factor in fostering user satisfaction and engagement.

Moreover, the article delves into the various dimensions of user behavior that data mining can illuminate, including not only explicit actions like clicks and purchases but also implicit indicators such as browsing time and content dwell time. These subtle cues provide rich insights into user preferences, allowing recommender systems to make more informed and nuanced recommendations.



The potential for improving the user experience is highlighted, as the insights gained from user behavior analysis contribute to a more personalized and tailored recommendation process. By understanding how users engage with content, recommender algorithms can go beyond mere content relevance and consider the context of user interactions, ultimately delivering a more satisfying and enjoyable user experience. [4, 18]

## **25. Exploring The Intersection Of Big Data Analytics And Recommender Systems: Leveraging Data Mining Techniques**

Unleashing the hidden insights: how data mining enhances recommender algorithms. By applying machine learning and data mining techniques, recommender systems can extract valuable insights from vast amounts of user data. This enables personalized recommendations that cater to individual preferences, optimizing decision-making processes and enhancing the overall user experience.

Unleashing the hidden insights: how data mining enhances recommender algorithms by extracting valuable patterns from raw data.

Unleashing the hidden insights within recommender algorithms is achieved through the application of data mining techniques. By utilizing clustering, classification, and recommendation algorithms, valuable patterns and relationships are revealed in large datasets. This process enhances knowledge discovery and allows for more accurate and effective recommendations to be made.[19, 20, 21, 22, 23, 24]

## **26. Advancing Personalization Efforts: How Machine Learning Enhances Recommender Algorithms Through Data Mining**

Machine learning algorithms are essential for enhancing predictive capabilities in datasets. These algorithms mine and analyze data to uncover patterns, opinions, and emotions expressed by users. By leveraging these insights, recommender systems can provide personalized content that improves the user experience.

At the heart of the discussion is the idea that ML serves as a driving force for enhancing the predictive capabilities of recommender systems. By leveraging ML algorithms, organizations can analyze user preferences, behavior patterns, and explicit and implicit interactions with content. This deep analysis enables recommender algorithms to generate more accurate and personalized suggestions, aligning closely with individual user tastes.

The article emphasizes the collaborative nature of machine learning and data mining in the context of recommender systems. Data mining, through techniques like clustering and pattern recognition, augments the capabilities of ML by providing a comprehensive understanding of user behavior. By discerning patterns and correlations within vast datasets, data mining refines the decision-making models of recommender algorithms, resulting in more nuanced and effective recommendations.

The iterative learning aspect of recommender algorithms is highlighted, emphasizing their ability to adapt to changing user preferences over time. The integration of data mining ensures that these adaptations are grounded in meaningful insights derived from user behavior analysis.

This dynamic adaptability is crucial for maintaining the relevance and effectiveness of recommendations as user preferences evolve.

Furthermore, the article discusses how this collaborative approach contributes to knowledge discovery within recommender systems. By combining ML's predictive modeling with data mining's pattern recognition, organizations gain deeper insights into user preferences, allowing for a more fine-tuned personalization of recommendations. This knowledge discovery aspect is central to the continuous improvement of recommender algorithms, ultimately enhancing the user experience.[25, 26, 27]

## **27. Maximizing Recommendations Accuracy: The Impact Of Data Mining On Improving Recommender Algorithm Performance**

Unleashing the hidden insights through data mining is crucial for enhancing the accuracy of recommender algorithms. By utilizing data mining techniques, such as assessing implicit ratings and analyzing large datasets, recommender systems can uncover valuable information about user behavior patterns and preferences. This enables them to make more accurate and personalized recommendations, ultimately improving user satisfaction.

Central to the discussion is the recognition that data mining acts as a powerful catalyst for uncovering hidden patterns within extensive datasets. By applying advanced analytics techniques, such as clustering, classification, and recommendation algorithms, organizations can extract valuable insights from user interactions, preferences, and behaviors. This in-depth analysis allows recommender algorithms to move beyond superficial observations, considering intricate correlations and user nuances that significantly contribute to maximizing the accuracy of recommendations.

The iterative nature of recommender algorithms is emphasized, underscoring the continuous learning and adaptation facilitated by data mining. As user preferences evolve, recommender systems leveraging data mining techniques can dynamically adjust their algorithms in real-time. This adaptability ensures that recommendations remain relevant and aligned with the dynamic nature of user tastes, ultimately contributing to higher accuracy in content suggestions.

Furthermore, the article discusses how data mining enables the assessment of implicit ratings and the analysis of large datasets. By considering not only explicit user actions but also subtle indicators such as browsing behavior and content engagement, recommender algorithms gain a more holistic understanding of user preferences. This comprehensive analysis contributes to improved accuracy by capturing the multifaceted nature of user interactions with content.

The transformative impact of data mining on recommender algorithm performance is positioned as a strategic approach to enhance user satisfaction. By maximizing recommendations accuracy, organizations can offer users content that aligns closely with their preferences, leading to a more engaging and satisfying user experience. This, in turn, has the potential to increase user trust and loyalty, emphasizing the broader implications of accurate and personalized recommendations.[15, 28, 29]

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## **Explanation of the comprehensive and balanced model in the ratiometric measurement of Alevi worship and justice**

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**Sadegh salmani**

### **Abstract**

In Islam, the infallible imams (peace be upon them) are introduced as the best example and model of humanity, and the Commander of the Faithful (peace be upon them) is presented as a comprehensive and balanced model, a standard and criterion for measuring others, and it is necessary to check and review his lifestyle. be placed This research is in a library style, with a qualitative approach and a descriptive-analytical method; It seeks to investigate and measure the relationship between justice and worship in the thought, performance, behavior and speech of Amir al- Mu'minin (peace be upon him). This article has tried to address the importance of how the balance of worship and justice has shaped the comprehensive model and character of balanced personality and measure Alawi to become a measure of humanity. In this regard, some questions have been examined, such as: What is the relation of worship as a behavior in the field of servant ethics to justice? How can worship bring justice to man? Or how does the existential aspect of worship affect the existential aspect of justice in humans? In order to answer these questions from an analytical and narrative point of view, with the aim of establishing a model, an attempt has been made to present examples of Alevi's practice as concrete and practical examples that show the bond between worship and justice. Therefore, after defining education, worship and justice, this research aims to explain

The relationship between worship and justice is whether worship is effective in creating justice and justice in promoting worship. Isn't the multiplicity of worship an obstacle to justice or restrictive justice? What is the ratio of worship and justice in the life of Amir al- Mu'minin (AS)? What is the relationship between the extent of the actions of Amir al- Mu'minin (AS) for the believers and this discussion? What has distinguished his performance and worship and made his character equal and equal to justice? In the hope of modeling, this article has taken a model within the scope of scientific knowledge and limited opportunity.

**Keywords :** Justice, worship, life of Imam Ali ( pbuh ), worship, education, educational model

## 1. Conceptology

### education

is related to weight  $\neg$ . It is possible to obtain the meaning of Ziyadah, Nama and Alu from it. The word education in Persian language is used in the following meanings: to raise, to teach someone manners and morals, to raise a child until he becomes an adult[ 1 ] .

The equivalent of the word "education" in English is the word " Education " , which comes from two roots, Educar, which means feeding and food, and the other is Educere , which means to draw out (educate) and lead to something, and in short, it is education, so together, two meanings of feeding and education can be deduced from this word. It can  $\neg$ [ 2 ] .

The basis and principles of Islamic moral and education are innate, the prophets remove the dust from the divine nature  $\neg$ so that educational and moral truths (moral conscience) are awakened and people recognize good and bad with their intellect and wisdom [ 3 ] . An education that is only scientific is the product of nothing but a tool, even though "Will Durant" admits that the existing vacuum is primarily an "ideal vacuum", it is a vacuum in the area of goals, goals and ideals, it is a vacuum that leads to emptiness. The orientation has ended, although it confirms that this void is a kind of thinking and a kind of faith in human purposes and goals, with all this, it thinks that with any kind of spirituality - even if it does not exceed the limits of the imagination - He thinks that entertainment in history, art, beauty, poetry and music is able to fill such a void that arises from the depth of idealistic nature and the desire for perfection of man [ 4 ] .

While from the point of view of Islam, it is obligatory for Muslims to know the perfect human being who has the rule of being a model and role model. That is, if we want to be a perfect Muslim - because Islam wants to make a perfect human being. To reach our human perfection under Islamic education and training, we must know what a perfect human is like, what the spiritual and spiritual face of a perfect human is like, and how the characteristics of a perfect human are, so that we can make ourselves and our society like that. If we don't know the "perfect human being" of Islam, we definitely cannot be a complete or complete Muslim, and in other words, we cannot be a relatively perfect human being from the point of view of Islam [ 5 ] .

A perfect man means a man who is a hero of all human values, a hero in all fields of humanity. Do not make the mistake of taking only one value and forgetting other values. We cannot be heroes in all values, but to the extent that we can, we have all values with each other; If we are not a perfect human being, let us finally be a balanced human being. That's when we become a real Muslim in all fields [5]. If we consider Ali as our role model and imam, we see a perfect human being, a balanced human being, and a human being in whom all human values have grown harmoniously [5].

Knowing Ali (AS) means knowing the character of Ali (AS), not the person of Ali (AS). To the extent that  $\neg$ we know the comprehensive personality of Ali (a.s.), we have known the perfect human being of Islam, and to the extent that we make the perfect human being our imam and leader in practice - not in name and words - we follow his path, subordinate and follower. Let us be him and try to make ourselves according to this example, [to the same extent] we are the Shia of this perfect man, because the Shia of the Shi'a, the [first] martyr says this on occasion in Lamea, and others also say this. They have said: Shia means one who follows Ali. That is, a person does not become a Shiite with "words", he does not become a



Shiite with "words", he does not become a Shiite with "only love"; So what does one become a Shiite? with respect Companionship means companionship. When someone goes and you go behind and with him, this is called "accompanying" [5].

## worship

Worship in the word: It is stated in the vocabulary: worship is an expression of humiliation and worship is the end of humiliation. He said in the assembly: "The worship in the language is the dazzle." In the Sahih it is said: "The origin of servitude is submission and humiliation... and the worship of obedience." And the end of the glorification of God Almighty" [ 6 ] [Abd]: He worshiped and served [ 7 ].

According to the above definitions, two types of worship can be counted: one is obeying His commands and following the commands of God and His religion in daily life regarding what is halal and forbidden, etc., this kind of worship means obedience. due to the strength of the verses: "I will worship you and we will not help you" ; "And of the people who worship Allah to the letter" ; "And we created the jinn and the human beings except for worship" ; "Fa'abdni wa aqem al-salata lidhikri" include this type of worship. Worshiping God is a value that is always and absolutely desirable and acceptable and never takes exception. It is on this basis that we say : the true and real way of human development is worshipping God [ 8 ]. The other is humiliation combined with sanctification, that is, the servant declares the ultimate submission and humiliation before the truth, and at the same time, he considers him pure from all defects and possessing all perfections. The body bows and prostrates. That is, my god is even greater than description, he is pure and beautiful, all praises belong to him, and we seek help from him [6]. In this position, –it can be said that worship is the result of man's existential poverty towards God; In this way, man is the same as poverty to God, and –this existential poverty can be acknowledged by fulfilling worship in many forms. Therefore, the formative effect of worship brings perfection to man's existence and closeness to God.

By considering the second meaning of worship, it is developed and includes all areas –of life –[ 9 ] . "Say that my prayer, prayer, life, and death are for the Lord of the worlds: Say: My prayer and absolute worship, my life, and my death are for God, the Lord of the worlds." Therefore, work and practical effort to provide the necessities of –life in Islam is not only worship, but also considered the most valuable worship. According to this developed concept –of worship , "the most important need of man is self-improvement and conforming to the morals of God, learning and gaining more abilities, and creating areas of skill and initiative in meeting political needs and It is the society of the society and participation in the leadership of the country and presence in the community scenes and the strongholds of Jihad" [9].

With this definition, it is expanded from worship that the meaning of God's address to the Prophet (PBUH): And to your Lord Farghab . It becomes brighter –. Because worship encompasses all aspects of life, –in order to finish one worship, the next worship must be resumed. As –Zamakhshari says about the verse in Kashaf: "It means that the honorable person should perform worships one after the other and not leave his time empty of worship" [ 11 ]. Therefore, the true believers are constantly in worship: "Wa Laho Al-Dinno Wasibah". The word religion here means worship, obedience, and servitude, and the meaning is "permanent and continuous". Therefore, the right of man is to worship God Almighty in all his situations and be obedient [ 12 ]. As he describes the angels as follows: "They do not disobey Allah's command and they do what they command . " It should be noted that a person who has reached the position of governorship has passed this position and attained it because he is the highest. The position of freedom is to free oneself from the bondage of one's soul, that is, one should not follow what one's soul dictates, rather, one should become the owner of one's own soul,

and one's soul should be obedient and submissive to it, and the burden and hardship of worship and the hardship of worship should be removed from it, and in worship, there will be joy and happiness. He knows himself quietly and worships with joy [ 13 ]. If these efforts are for the sake of God Almighty, all of them are acts of worship; Whether it is working in the factory or farming in the field or studying in school or striving in the front field or experimenting in the laboratory. Any kind of scientific, practical, industrial work, etc., if it is for the sake of God and earning a living, or not depending on others, or the elevation of the Islamic society, is worship, and many of these may be obligatory. The things that are done for the sake of fulfilling duties and tasks and for the pleasure of God Almighty. Of course, the physical form of actions may not be different, but the motivation to do them is different. When Amir al-Mu'minin (a.s.) was digging wells in the deserts of Madinah and extracting water, the work of that Prophet, peace be upon him, is physically no different from the work of someone who does the same for material purposes. And like one is seeking the pleasure of God and the other is seeking the pleasure of the heart and worldly use. Or when the Prophet (peace be upon him) carried date seeds on his back and planted them in the desert and created palm trees, their work was not different from other farmers, but there is a difference between these two works, from the earth to the sky. They did these things to gain material benefit, while Ali (a.s.) did those things to gain the pleasure of God Almighty. Therefore, the water of the aqueduct has not yet appeared, so they ordered to bring pen and paper to dedicate it. But when our factory becomes productive or our farm bears fruit and its trees bear fruit, we become greedy and think to earn more income for ourselves. Now, judge for yourself how much the difference between these two types of work is? [ 14 ].

Imam Ali (AS) is a cylinder and embodiment of worship. He is the example of a perfect human being and the Prophet (PBUH) who is an example of the highest worship  $\neg$ . The person who opened his eyes to the world in the Kaaba, and in the house of God and in the altar of worship, his blessed difference, is the greatest wonder of history. His life is full of honor, his heterogeneous qualities and great capacity of existence, boundless knowledge, comprehensive vision [ 15 ]. All of Ali's art was servitude to God and obedience to Him; That's it. Didn't that server himself say that he is divine! Enough without pride, let me be your servant, and enough without pride, let me be a slave, that is, a god! My greatest honor is to be your servant, and my greatest honor is that I have a "Lord" (owner) like you [ 16 ]. All positions are the product of God's service and reaching those positions is possible for every human [17] . This is why the Prophet (pbuh) said: "If it were not for me and Ali, God would not be known, and if it were not for me and Ali, God would not be worshiped, and if it were not for me and Ali, there would be no reward and punishment" [ 18 ] ]. Imam Sadiq (a.s.) said: In Ali (a.s.) there were a thousand Prophets. [ 19 ] As the Prophet (PBUH) explained: "Whoever wants the knowledge of Adam; Noah's worship Khalat Ibrahim; Consider the fall of Moses and the asceticism of Jesus to Ali ibn Abi Talib " . And he put it all around and his speech and behavior is like the sun so that people can actualize their talents in the path of God's service and not get caught in any darkness and darkness.

## justice

Qest: (baksr-q) justice. And it is one of the sources that describe it, like Adl, they say: "Rajal Qast" [ 20 ] . If we consider justice in the sense of absolute equality in the distribution of benefits, regardless of individual merit and character, it is against justice. But justice is not this kind of equality, this kind of equality is injustice [ 21 ] . Justice means to give everyone their right. The right is taken from the text of creation. Every being in the context of creation has a merit and a right. Man creates entitlements by his work and activity. With these

definitions, a person –has behaved righteously if he worships sincerely and perfectly in every position [21]. Giving all the rights. Every thing and every person in the text of creation is born with a special merit [ 22 ] . Aristotle also considers morality and, in fact, the way to achieve happiness to observe moderation and the middle ground. He says: Virtue or morality is the middle ground between extremes and extremes. He believes that every state of mind has a certain limit, which is less or more than it is a vice, and that certain limit is a virtue [2 3 ]. In the case of lusts, the amount that is outside the obedience of reason and Sharia should be suppressed. Therefore, not every lust is followed, nor all lusts are completely abandoned, but moderation and justice are followed, and not everything in the world should be abandoned, nor should everything desirable happen, but rather Man should know the purpose of all that has been created in the world and preserve it to the same extent. Therefore, he should use food to the extent that his body is able to worship[2 4 ].

Plato has placed the foundation of morality on justice, that is, he considers morality equal to justice and justice equal to beauty. He says: Although humans know justice, beauty and truth, none of them can be defined. But again, he tried to give an incomplete definition for justice; Said: Justice is the harmony of parts with the whole [23]. Plato has defined social justice as follows: justice is that someone gets what is his right and undertakes a job for which he has talent and merit. He says about individual justice: In the individual, the justice of the system and order is effective and productive, it is the coordination of the powers of a human person, in the sense that each of the powers is placed in its place and each of them participates in the behavior and actions of the human being. Let's see that he defined justice (whether individual justice or social justice) as balance and proportionality [23].

Socrates –says: "Justice" means knowing the principles and rules that must be observed in relations with people [23]. In terms of social value concepts, justice is always good and this ruling never takes exception , and in contrast, oppression is always and everywhere bad and unpleasant. So we can have absolute values. [25 ] .

In the definition of justice, ancient scholars said: Justice is the queen of piety and piety [23]. From the moderation of these powers in human existence, another virtue called justice occurs [26 ] . If these three powers are in balance and harmony, they are called justice, and in fact, justice is the harmony of the three powers, so that the active power in the body is subordinate to the rational power in all its actions, and in other words, justice, government Intellect is about the movements that come from the active power in the realm of the body. Some have given another interpretation for justice, which is the coincidence of all the powers of the body in obeying and obeying the power of wisdom so that no mistake is made by man [27 ] . This is why the definition of justice says: "O avoiding the big ones and not insisting on the small ones or not being the majority" [28 ] .

"Justice is a psychological condition that causes piety to be followed by piety and prevents the committing of great and small things : Justice is the state and psychological state of a person that causes continuous observance of piety and prevents the commission of major sins and crimes" [29]. Therefore, a righteous person is one who has the queen of justice, practices piety and refrains from committing major sins and insisting on minor crimes[ 30 ].

The concept of justice was clarified in terms of vocabulary and terminology. Justice in the field of existence is achieved when –each of the powers of anger, lust and reason act in such a way that the average behavior directed to each of the powers, i.e. courage, chastity and wisdom, is achieved. In this case, the human soul achieves its true perfection. Justice is a queen that is the source of performing virtuous deeds, and when the queen of justice penetrates into a person's soul, he continuously performs worthy and good deeds and refrains from ugly deeds [

25 ]. Therefore, even though justice is a carnal queen, it has such a position that with its presence in man, his soul is perfected and a true and perfect man is realized  $\neg$ .

Ali (a.s.) was the epitome of universal justice. Besides Ali, who is known as the symbol of justice? This attribute of Ali does not need arguments and historical documents and these words, the name of Ali (AS) is associated with justice [ 31 ]. This justice has made Imam Ali (a.s.) who brings together the attributes of asceticism, knowledge, worship, courage and faith in the most complete form [ 32 ]. Hazrat Ali (AS) is the embodiment of justice and the symbol of all human virtues, and his name is a reminder of them. The Muslims who made that deal with Ali (a.s.) at the beginning of Islam were those who had been with the Holy Prophet (s.a.w.) for many years and had heard the Prophet's ( p.a. ) commands about Ali (a.s.) and the sacrifices, bravery, They had seen with their own eyes the sacrifices, affections, heartaches and benevolences of Hazrat Amir (AS) [ 33 ]. According to what was mentioned, Imam Ali (a.s.) is the most reliable , the best and the most perfect model that all people  $\neg$ can achieve their perfection and train their abilities in the best way by imitating him . $\neg$

## 2. The relationship between worship and justice

One of the important things that is necessary in explaining the comprehensive and balanced model is the relationship between worship and justice, so that in this back and forth, all the dimensions of human existence grow and provide meritorious excellence and flourishing capabilities. If we consider worship as a result of admitting the existential poverty of man to God, and if we consider the formative effects of worship in existential perfection and closeness to God, it becomes clear  $\neg$ that there is a reciprocal relationship between worship and the truth of justice. Because on the one hand, worship leads to the perfection of the soul, and on the other hand, the realization of the perfection of justice is the perfection of the human soul. Therefore, the truth of worship and justice meet at the turning point of the perfection of the soul. "If the Almighty God was not worshipped, man would not be perfect, the names and attributes of God would not be manifested, and in short, the purpose of creation would not be fulfilled" [ 34 ]. Performing worship, praying, and telling secrets with him makes people fascinated and enthralled with the memory of the truth, and makes him popular in the assembly of human beings with the profound truth of observation. These losers take their attention from Masavi and only pay attention to him. Just as the apparent preoccupation with the world and business does not preoccupy them and does not reduce their attention to God . Although they are apparently busy with worldly affairs, their hearts are elsewhere; They are among people, but their heart is with someone else. When they talk to people, people think that they are paying attention to them ; While their attention is on God and they spend their time remembering God . But as we said, they are not only thinking about themselves, but they are also thinking about saving and guiding others, and with their reminders and warnings, they scare the heedless from committing forbidden things and God's punishments . First, they adorn themselves with justice and then they invite others to justice as well . They themselves avoid evil and ugliness and prevent others from evil [ 35 ].

Imam Ali (a.s.) is the most devout people after the Prophet (s.a.w.) in the field of worship, and the most ascetic in the field of asceticism, and the bravest in the battle, and the purest in sincerity, and the most pious in piety, and the most learned in knowledge, and He was one of the first and last among the people of the time , the most devoted in tahjud and nightly worship, and the most just in justice, and the most generous in charity and charity, and in all perfections and virtues . Imam Ali (a.s.) was more devout than the people of his time, and his night prayers, prayers and supplications in honorable times and blessed places have been

preserved from him, and people have learned these works from his virtuous and spiritual school. In worship, he had reached such a point that when he paid attention to God with his whole being, he realized the essence of truth and put his whole being in accordance with sincerity and presented himself before God. Seeing the truth, his vision was cut off from the world and what is in it, and he distanced himself, and in the state of annihilation in God, he was so unaware of himself that he did not understand pain and suffering. When an arrow hit his pure body in one of the wars, and due to the great pain, no one was able to remove the arrow from his body, the surgeons unanimously decided to postpone the removal of the arrow until the time of prayer, because They knew that at that time his great soul would be somewhat distant from the body and would not feel the pain [ 37 ]. The worship of Imam Ali (a.s.) was of such quantity and quality that Imam Seyyed al-Sajdeen (a.s.) wept profusely while studying his prayers –. Because they saw their acts of worship as insignificant in front of him and were sad and said: Who can worship Ali (a.s.) with his feet [ 15 ]. Hazrat Ali ( AS ) is a sincere worshiper –of God; They have spoken so much about the worship of Ali (AS) that it is difficult for us to imagine. You know that Hazrat Imam Sajjad (AS) spends most of his time in worship due to the severe pressure of the Umayyad government, but when they said to him, "Sir, why do you bother yourself so much in worship?" He said: Where is my worship and where is the worship of my ancestor Ali (pbuh)? Ali (pbuh) is a clear example of godliness; Those supplications, those prayers, those prayers, those cries, sometimes he became so faint from the intensity of crying that people thought he had passed away [ 31 ].

Now we have to check that with this abundance of worship did Amir al-Mu'minin ( pbuh ) manage family, social, governance, –etc. –, and did not that amount of worship hinder his other duties? Here it is appropriate to mention: A man from Tabiin heard from Anas bin Malik that the 9th verse of Surah al-Zamr was revealed about Ali bin Abi Talib. The man says, I went to Ali (a.s.) to see his worship, God is witness, I was with him at Maghrib and I saw him praying Maghrib with his companions, and when he finished, he was busy chasing him until he got up and prayed Isha and came to his house, I was with him. I entered the house and he was praying and reciting the Qur'an all night until dawn and renewed his ablutions and came to the mosque and prayed with the people and was busy chasing them until the sun rose and the people came to him and two men were sitting near him in court –and when When they finished, two other men would take their place until he wanted to stand up for noon prayer and performed ablution and prayed the noon prayer with his companions and was busy chasing them until he prayed the evening prayer with them. And when they stood up, two other men would take their place, and he would judge between them and give fatwas until the sun set, and I said, "I bear God as my witness that this verse was revealed about him" [ 38 ]. This historical evidence indicates that the worship of Ali (A.S.) had turned him into a strong mountain, which neutralized fatigue, –and besides worship, he paid sufficient and full attention to social matters and the establishment of justice and justice. They have paid enough attention –not only to the social affairs but also to the political issues of the society , and their worship has not hindered their political appearances to the extent that Umar said in 70 places: Lo La Ali Lahlak Umar [39] .

The peak of justice occurs in the worship of Amir al-Mu'minin (a.s.) where –he did not sacrifice any duty for another, but performed everything in the best way. In this regard, we will suffice to mention a narration that was given: Ali (a.s.) never left the night prayer, even "Lailat al-Harir" in the battle of Safin [and in the heart of that night and the tumult of the battle, the call for forgiveness echoed [37]. Not only does he not neglect or fail –in performing his duties because of the abundance of worship, –but he uses worship as a way to strengthen his spirit and renew his strength, and he does better in other duties. According to a narration, Imam Ali (a.s.) before moving to the side of the enemy in the Battle of Safin, called his companions to a



lot of worship and recitation of the Qur'an. Because worshiping and reciting the Qur'an has a great role in mental peace and improving fighting power and maintaining motivation [ 40 ].

Hazrat Amir al-Momineen (AS) has not only paid attention to social, political and security affairs in addition to personal worship and many rituals, –but also paid full attention to family affairs. Ali (pbuh) says: "One day Fatima (pbuh) was sitting near the stove and I was cleaning lentils. Meanwhile, the Holy Prophet ( PBUH ) came to us and said: O Abul Hasan! I answered: Your lips! O Messenger of God (pbuh)! The Prophet (pbuh) said: Listen to me - and I do not speak except by the command of my Lord - no man helps his wife in the house except that one year of worship for every hair of his body - fasting his days and staying awake at night - is for him and God He will receive a reward similar to the reward of the patient ones - Prophet David, Jacob and Jesus [ 41 ]. The Prophet of Islam (PBUH) considered any kind of attention to life as a means of worship and worshiping God, and he –said: "Al-Kad is upon the families of the great mujahid in the cause of Allah " [ 10 ]. The one who works hard in the way of managing his family is like the one who strikes a sword in the way of God [ 22 ].

It is clear that worship is part of the educational program of Islam. Worship is for a person to remember God as soon as possible, and the more a person remembers God, the more he adheres to ethics, justice, and rights, and this is a very clear account [ 42 ]. In Islamic logic, worship does not mean that purity and piety occupy the center of a person's heart while performing the duties, but as soon as his duty is over, the impurities and vices dominate his soul, and all the good things to be taken away from him and to avoid the implementation of truth and justice, the heart never has a connection with God in such worship; In fact, he is a wandering traveler who cannot progress towards his destination and goal and use the light that illuminates the way for him like a bright torch in the dark night of life [ 43 ]. Worshiping and obeying the truth establishes order and discipline, security, justice, health and mercy in human society. A person who is in the atmosphere of real servitude is free from cruelty and oppression; Because when God - who is the source of justice and justice - is the center of human life, the servant also receives color from him and Islamic mystics and respects the rights of the right holders [4 4 ]. This is why the Prophet (pbuh) –says: "Ali is with the truth and the truth is with the truth around us" [ 15 ]. Because Amir al-Mu'minin (AS) is the foundation of faith and the criterion and standard and measure and indicator of righteous action. The justice of Amir al-Mu'minin (AS) made –him act very precisely and decisively in fulfilling his religious rights and duties. The tradition of Hazrat Amir (AS) in dealing with his political opponents - such as Companions of Jamal, Safin and Khawarij - was to secure their rights. Not cutting off the rights of the Khawarij from Bait al-Mal, and prohibiting them from confronting Mu'awiya's soldiers in cutting off water from them, like the Companions of the Prophet, are two obvious examples [ 45 ]. At the time of calculating the treasury, he was precise and decisive and without tolerance, and at the time of giving and honoring, –he was the most generous person, who lived –simply in the fullness of his benefit –and was low-income, and was at the height of generosity and spent in the way of God

Imam Ali (a.s.) –was a clear example of the contented people of his time, he had placed his life at the level of the deprived people of the society and he was satisfied with bread, if he wanted, he could make food for himself from refined honey and make clothes from pure silk. [43 ] . While the generosity of Imam Ali (a.s.) is enough that he spent everything he had in the way of God: the verse "Yotā'imun al-Taamaa ali Hubbih Miskināh, orphans, and captives" is in his dignity. Ibn Abi al-Hadid writes: "The commentators say that he had only four dirhams, he gave one at night and one in the morning, one secretly and one openly, and then this verse was revealed about him: Al-Nahar sarra and al-Aniya.. until his enemy Muawiya who was always trying to find fault with him, when he asked Mokhin bin Abi Mokhin Dhabī: Where do



you come from, and he said from among the greediest people and he meant Ali, and he answered : Woe to you, how can you say that and the fact that if Ali has a house made of gold and a house made of straw, he will first spend that house of gold in the way of God." [ 46 ] By identifying and extracting thought and behavioral codes –Imam Ali (AS) , a comprehensive and balanced model of Islam, can –introduce the best educational and growth-creating methods to humanity, which is a lot of work for thinkers.–

### 3. The relationship between justice and worship

Now, for a better and –more appropriate explanation of the comprehensiveness of the balanced and sublime model of the Alevi way of life, we should discuss the relationship between justice and worship –. Worship can –be effective in realizing justice. This method –guides people to the most effective and successful way of growth and education –. Worship, which is a kind of existential relationship with God, makes –a person benefit from divine grace and, in addition to material blessings, also benefits from hidden divine grace, such as the power to abandon sin and control the powers of anger, lust, and reason. Therefore, the function of worship is to guide human powers towards moderation and to bring people to the virtue of justice. Therefore, the deeper a person's worship –is , in addition to getting closer to God, the queen of justice also -becomes more perfect so that the perfection of the soul is realized. We have heard the impact of worshipping Imam Ali (AS) on his justice in the form of narrations and stories –. When it comes to the worship of Amir al-Mu'minin (a.s.), its scope is so wide that it even includes his judgments and governance behaviors. In fact, Imam's whole life has been worship. This complete worship has caused us to consider the Imam as an example of a perfect human being who is the Caliph of God on earth. The realization of a perfect human being is equal to the realization of a human being, which is the same as justice. "Whenever Ali (a.s.) is mentioned, his justice and worship come to mind. Ali (AS) was known as one of the most pious and just people . –Ali (a.s.) was doing the Nafila prayer while shoveling in the field. He prays 500 or 1000 rakats every day and night" [ 47 ]. Ali (a.s.) is the embodiment of justice and a perfect example of righteousness and fairness. He is a great example of a Quranic human being and a martyr of the way of justice, as they have said about him: "Killing in the mihrabah for the sake of justice: He was killed in the mihrab of his worship because of the severity of his justice [48 ] . Ali's (pbuh) steadfastness in justice and his not deviating from the standards of installment caused the opposition of justice opponents, autocrats and goldsmiths to him, because he was not willing to violate justice for worldly interests and to preserve his government. Justice was mixed with Ali's flesh and blood, in such a way that justice is synonymous with his name and his memory [49 ] .

Worship is the best factor for establishing order and justice in people's lives [ 44 ]. Imam Baqir (a.s.) said: By God, Ali's (a.s.) way was that when he was feeding his servants, he would sit on the ground and buy two shirts with spikes, –and his servant would take them off at his own discretion –and put the other one on himself. He wore it, and if his sleeves were longer than his fingers, he would cut it off, and if his skirt passed the Ka'b, he would cut it off. He was the caliph for five years, and he did not lay brick upon brick, nor brick upon brick, nor did he own tithes, nor did he leave silver or gold money. He let the people eat wheat bread and meat, and he would return home and eat barley bread with oil and vinegar, and whenever he was faced with two things pleasing to God, he would choose the harder one, and he freed a thousand slaves from his bondage, in which he He was dusty and sweaty on his face, and he couldn't bear to work for anyone. He prayed a thousand rakats day and night, and he was the most like Ali ibn al-Hussein (a.s.) and no one after him was able to do his work [ 38] . ]. During the five-year tenure of the Islamic government, except justice and service to God's servants, and

worshipping and obeying God, no wrongful act has been issued from him, and Shia and Sunni agree on this [ 40 ]. Amir al-Mu'minin (a.s.) –attach great importance to the rights of people and do not listen to anyone's life or death, there is no bias and consideration and the right comes to the rightful. The candle they used to light when dealing with the account of Bait-ul-Mal was extinguished immediately after personal matters were finished and postponed, Amir al-Mu'minin (a.s.) when Talha and Zubair were discussing their personal matters. They refused to allow the Muslim candle to burn, and finally, the enemies of justice, because of the severity of Imam's (a.s.) justice, ignited the Battle of Jamal and after that they prepared the battle of Safin, and Imam (a.s.) stood his ground so that no right of the people would be lost, and with They fought until he was martyred in the altar of worship for the sake of justice [ 51 ].

Religion in the hands of Ali (a.s.) has been a message of justice and equality, installments and abolition of aristocratic privileges and human dignity, etc.[5 2 ]. Amir al-Mu'minin Ali (a.s.) used to say: "It is proper for a ruler to turn his attention from one enemy to another, and to divide his gaze between the two of them with justice, and not to allow one enemy to oppress his friend." 4 1 ]. This noble vision of Imam Ali (a.s.) caused justice to rule in his kingdom, that when he sees his armor with a Jew and says to him: This is my armor, that Jew who lives in the conditions of dhimma dares to say: Armor. It is mine and it is in my hand, between me and you, the Muslim judge. Even though he knows that a Jew has betrayed him and stole his armor, he goes with him to the judge, and when the judge shows respect for that Prophet, he impeaches him for this privilege and says: If he was a Muslim, I would have sat in front of you with him. And in the end, the Jew confesses in front of this absolute justice and converts to Islam, and the Imam gives him the armor with his vehicle. A Jew converted to Islam does not separate from that Prophet until he is martyred in the Battle of Safin [53] . In another narration, it is stated that during the caliphate of Ali (a.s.), when he found his lost armor in front of a Christian man, because in court, the judge wanted evidence and witnesses, the judge ruled against the Caliph and in favor of the Christian man, and it was this justice that made the Christian man a Muslim. Kurd [ 9 ]. This shows the depth of justice in the faith of Amir al-Mu'minin (AS), which leads to the guidance and excellence of people –and brings them closer to the valley of worship.

Amirul Momineen (AS) was decisive and determined in the field of social justice. He divided the wealth –equally and treated the people fairly, the weak person was not afraid of his oppression, and the capable person was not greedy to win his opinion [54] . It is up to the governor and the ruler of Islam to consider justice in dividing the spoils and observe it. As it is mentioned in the narration that Imam Ali (a.s.) distributed even a loaf of dry bread with justice [ 40 ] Ali (a.s.) in Nahj –al-Balaghah - about returning Uthman's forgiveness - said: "By God! Even if I find those [properties] in a state where women have been married and slave-girls have been acquired by means of them, I will return them; Because in justice there is expansion and peace, and whoever puts his justice in a strait, oppression is harder and narrower for him." [ 41 ]

Imam Ali (a.s.): Whoever finds Jihad unpleasant and abandons it, God will clothe him with a garment of humiliation and disgrace, and he will suffer calamities and become small and humiliated. His heart remains in the veil of error and the truth turns away from him, because of abandoning Jihad, he is condemned to humiliation and deprived of justice [ 55 ] . According to this statement of Amir al-Mu'minin (a.s.) –it is the spirit of seeking justice that opens many fields of worship and fulfillment of duties in the path of worship for people, among which Jihad can be mentioned. It is the height of justice that Hazrat reaches the limit of claiming rights and defending the oppressed. Therefore, when they found out that the anklet had been removed from the feet of a woman who is under the responsibility of Islam, they could not tolerate this

violation of the law and said: "If this is the case, then I will surely die after this. We are sorry that it was not to blame, but to someone else." [ 53 ] .

Ali (a.s.) said: "Whoever observes justice in his will is like a person who has given charity in his life. And whoever does wrong will meet God on the Day of Resurrection, while God, the Most High, will turn away from him" [ 56 ]. Therefore, in the last moments of their precious lives, they did not neglect the last alms and justice in their wills, and in their wills, they used such gentleness towards their murderer that it is surprising to the world, and this is nothing but the justice of Ali (a.s.) and the compassion and kindness of His Holiness. which is mentioned in the narratives of Ibn Muljam's arrest [ 57 ]. This justice, because –it originated from the pure piety and unquestionable worship of Amir al-Mu'minin, peace be upon him, has reached this level of growth and elevation in all fields. If a person –takes Imam Ali (a.s.) as his model, he will not remain in any two paths, but based on his methodical and clerical criteria, he can –follow the path of growth and education. Society should be examined by thinkers.

#### 4. \_ Conclusion

In the pure school of Islam, which is the best school of education and human development . It has always been emphasized to provide an example and remind of gaining experiences and benefiting from the traditions of religious elders in the Quran and hadiths. Amir al-Mu'minin (AS) has been introduced as the leader of the believers, the best example and standard of worshipers, and it is recommended that we keep our eyes on our behavior, our ears on our words, and our steps ready to follow his footsteps in order not to deviate from the truth. Therefore, with the aim of modeling Alavi's way of life, the two turning points of his life, worship and justice, were examined. It was stated that worship has a development that includes all the pillars of life and Amirul Momineen (AS) has brought all dimensions of worship to the highest level of perfection, as far as the symbol of sincere worship and the standard of measurement of other believers are introduced, and it is necessary in the dimension of thought, He taught them their traits and behavior and trained their physical and mental talents and abilities based on this noble model. In the conducted study, we found the reason for the level and verticality of his exemplary performance to be influenced by the existence of Amir al-Mu'minin (a.s.) with justice, which represents the peak of his worship. On the other hand , we have seen in the following that justice has been increasingly effective in increasing the degree of their closeness to the essence of excellence and performing their family, social, political, cultural, economic and military duties in the best way . The result of this is that Amirul Momineen (AS) is the most comprehensive educational model to bring people to the key of education and to the peak of moderation and balance of obedience and worship. There is a bond between the worship of each person and his righteousness and the realization of righteous behavior. Therefore, if a person's intentions become divine and act according to the standards and criteria that God has ordered, the person will reach the highest state of prosperity, growth .and education

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