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Determination Of Cadmium And Copper In The Blood Of Workers In Goldsmithing Workshops In Najaf Governorate: A Field And Analytical Study

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Abstract: *Najaf Governorate in Iraq is considered one of the areas witnessing intense activity in the goldsmithing industry. Pollution with heavy metals such as Cadmium, Cadmium, Cadmium, Cadmium, Cadmium, and copper is a serious health problem that affects human health and the environment. This research aims to estimate the levels of Cadmium and copper contamination in workers' blood in goldsmithing workshops in Najaf Governorate, especially workers exposed to pollution and smoking. The study was carried out by implementing a field and analytical study, which included a sample of 50 smokers in goldsmithing workshops. Blood samples were analyzed to determine the extent of the impact of workshop work on the levels of Cadmium, Cadmium, Cadmium, and copper contamination in the blood and evaluated in comparison with previous related studies. The results showed that working in goldsmithing workshops exposes workers to high levels of Cadmium and copper contamination, as the levels of Cadmium in the blood were (0-1.7) parts per million compared to previous studies, which were (0-0.7) parts per million and the levels of copper in the blood were (0-1.7) ppm (5-7) ppm compared to previous studies (0-2) ppm.. The results indicate the need to take preventive measures to reduce pollution, improve the work environment in goldsmithing workshops, and educate workers about the dangers of heavy metal pollution and its impact on their health. The study period was from October 2022 to April 2023.*

***Keywords*:** *Heavy metals, blood, goldsmithing workshops, the internal environment on workers.*

1. Introduction

The study was in the holy city of Najaf - the Old City - Souq Al-Kabir. It is considered a strategic location for this type of study, as this area includes many goldsmithing workshops and a large number of smokers working in this profession. Goldsmithing workshops are among the places that expose their workers to many... Environmental pollutants and harmful elements that can directly affect their health[1]. Increased levels of Cadmium and copper in the

blood of workers in goldsmithing workshops can be attributed to specific internal environmental factors associated with the manufacturing processes and handling of metals in these workshops [2]. These factors include workers' exposure to dust and fine particles containing cadmium, Cadmium, and copper during drafting, shaping, and cleaning operations [3] . Melting and heating processes in goldsmithing workshops are among the most prominent sources of cadmium and copper emissions. Metals are heated to high temperatures to melt and shape them, which releases cadmium,releases , Cadmium, Cadmium, and copper into the air[3]. Melting and heating processes in goldsmithing workshops are among the most prominent sources of cadmium and copper emissions. Metals are heated to high temperatures to melt and shape them, which releases cadmium,releases , Cadmium, Cadmium, and copper into the air [4, 5] .

Among these harmful elements that may be present in the work environment in these workshops, Cadmium and copper come at the top of the list, Cadmium and copper are heavy metals known for their ability to accumulate in the body's tissues and cause serious health problems when exposed to high levels of them[6]. Heavy elements are chemical elements with a high atomic mass [7]. Heavy elements have special physical and chemical properties that affect their interactions with the environment and living organisms [8][9]. Heavy metals are considered strong environmental pollutants and cause environmental pollution, as these elements can accumulate in the environment and living organisms over time. [10,11] . Heavy elements are found naturally on the Earth, produced through human activities such as mining and industry, and transmitted to plants, animals, and humans through breathing, feeding, and direct handling [12,13] .Heavy metals interact with some body compounds and affect individuals' health [14]. Heavy elements are exported in the goldsmithing industry through processes such as refining, purifying, forming and welding [14,15,16] .Heavy metals are released into the environment via air emissions, wastewater and solid waste [17]. Excessive exposure to heavy metal concentrations has been linked to a variety of adverse health effects, including poisoning, neurological diseases, respiratory, liver, and kidney dysfunction, skin allergies, and cancerous effects [18]. Many of the heavy elements used in the goldsmithing industry include many elements such as Cadmium (Cd) and copper (Cu) in addition to many others [19].

Cadmium is used in some processes related to the gold industry, such as an aid for melting gold alloys and manufacturing the solder used to weld pieces of gold together [20] .Cadmium may accumulate in land, water, and plants, and when consuming food contaminated with it, it can affect human health and cause problems with the kidneys, bones, and respiratory system [5]. Copper is a heavy element widely used in the goldsmithing industry Copper exposure may occur through inhalation of copper dust from manufacturing processes or through absorption through the skin [21] .Copper is essential to the body in limited amounts, but excessive exposure to copper can be harmful [22] .Excessive accumulations of copper in the body may lead to health problems such as poisoning, allergies, and respiratory and skin infections [23] .Copper exposure may also cause effects on the central nervous system, liver, and kidneys [24]. Sources of heavy elements: Heavy elements may come from multiple sources in the goldsmithing industry, including raw materials used in the manufacturing process, chemicals used in the actual processes, and by-products and discarded waste[25]. Their impact on human health: Heavy metals may negatively affect the health of workers exposed to them [26] .These elements can accumulate in the body and cause health problems such as poisoning, nervous and respiratory system disorders, and liver and kidney problems; chronic exposure to heavy metals can be dangerous and lead to chronic

health problems [23]. Environmentally: Heavy metals are also emitted into the environment surrounding goldsmithing workshops, polluting the air, water and soil [27].

This research paper aims to study the extent of cadmium and copper concentrations in the blood of goldsmithing workshop workers. 50 blood samples were collected from smokers working in this profession and the levels of Cadmium and copper in their blood were examined. We compared these results with the results of previous studies and multiple source data from different regions. The research aims to provide a comprehensive assessment of the impact of these two harmful elements on the health of workers in this industry and to enrich knowledge on how to reduce the potential risks associated with them. This study was conducted during the period October 2022 to April 2023.

2.Methodology:

The period was from October 2022 to April 2023. This study was conducted. Ten sites were selected for goldsmithing workshops, where the average number of workers per workshop was 5 people. This study also aimed to Cdetermine the amounts of both Cadmium, Cadmium, and copper in a blood sample (50) from workers in goldsmithing workshops. To determine the extent of the impact of workshop work on workers by measuring the concentration of Cadmium and copper in the workers' blood, blood samples were examined as follows:

Blood samples (50 samples) with a volume of (1 ml) for each blood sample were collected and placed in a test tube (which does not contain an anticoagulant), where (1 ml) of HNO_3 70% was added and left for 24 hours, after which HNO_3 70% again and hydrogen peroxide in a ratio of 1:2. The compound is heated in a water bath to 70 degrees Celsius for one to two hours to ensure the dissolution of most of the organic materials. After digestion, the volume is reduced to (25 ml) distilled water. Then each sample is filtered through filter paper of the same size. (0.45) microns. After completing the measurement of the concentration of both Cadmium and copper, the sample concentration results are multiplied by the dilution factor to obtain the final result of the concentration of Cadmium and copper in the blood [28].

Measurement of the concentration of Cadmium and copper in digested blood samples was performed using an atomic absorption device.All measurements of heavy metals, including digestion and concentration measurements, were carried out in the Elixir Laboratory - in Najaf Al-Ashraf - Airport Street - Elixir Center for Scientific Research.

3.Results and Discussion:

This study was conducted from October 2022 to April 2023 in Najaf Governorate - Souq Al-Kabeer - goldsmithing workshops, where the study showed the presence of Cadmium and copper contamination in the blood of 50 smoking workers in goldsmithing workshops.the average concentration of Cadmium was (0-1.7) ppm, the median was (1.3), the arithmetic mean was (1.7), and the standard deviation was (1.98), compared with the concentration level of other sources (0.004-0.7) ppm, the median was (0.03) and the arithmetic mean was (0.004-0.7) ppm. (0.16) ppm and standard deviation (0.26).

There were significant differences where the value was less than 0.5, as shown in Figure 1 [30,31] .A cadmium concentration of (1-2.5) parts per million is a risk indicator for human health [32]. A cadmium concentration of (10-100) parts per million is a risk indicator for human health, and anything below this concentration is considered not a risk to human health [32]. The permissible limits for cadmium blood contamination are within the concentration of (0.3-0.5) parts per million [33,].

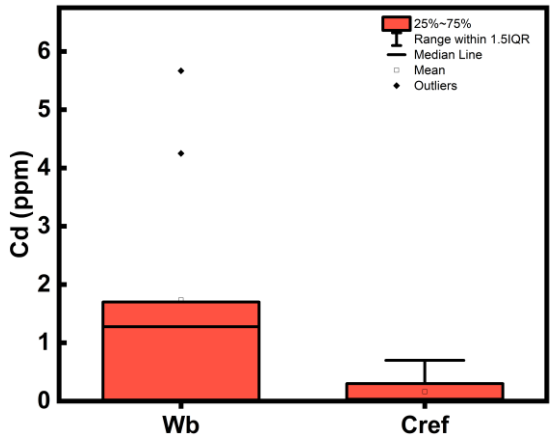

Figure (1) shows the results of the concentration of Cadmium (Cd) in the blood of smoking workers compared to the sources of other studies that also smoked.

While the average copper concentration was (4.1-7.5) ppm, the median was (5.6), the arithmetic mean was (5.8), and the standard deviation was (1.05), while for other sources it was (0.02-2.33). The median was (0.7), the arithmetic mean was (0.95), and Standard deviation (1) [34,35] .There were significant differences (***0.0001) < p, as shown in Figure (2).([34, 35]. An increase in the copper level in smokers' blood above 2.33 parts per million poses a risk to human health [34,35] The Environmental Protection Agency (EPA) states that the permissible level of copper in the blood does not exceed 1.3 parts per million [36].

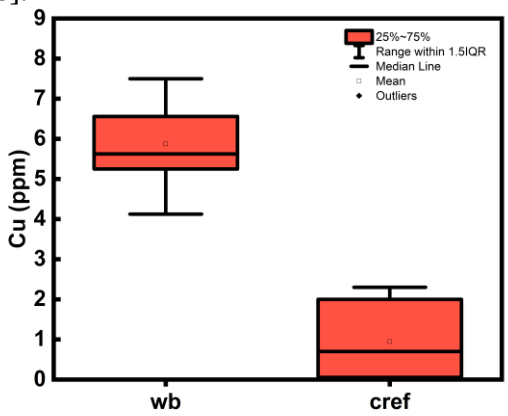

Figure (2) shows the results of the concentration of Cadmium (Cd) in the blood of smoking workers compared to the sources of other studies on smokers.

3.Conclusion

The results indicate the need to take preventive measures to reduce pollution, improve the work environment in goldsmithing workshops, and educate workers about the dangers of heavy metal pollution and its impact on their health.

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