University of Thi-Qar Journal of Science (UTJsci)
E-ISSN: 2709-0256, P-ISSN: 1991-8690, Vol. 11, No. 2, Dec. 2024

Assessment of Some Trace Elements in Workers' Blood in Fuel Stations in Al-Nasiriyah City

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Received: 2024-06-02, Revised: 2024-06-26, Accepted: 2024-07-03, Published: 2024-12-05

Abstract- **Environmental pollution has become a major problem in the world, especially due to the rapid development of industries related to hydrocarbons such as fuels and polluting products. This situation is considered a serious threat to the environment and people due to its impact on human health and other living things. This study aimed to assess the trace element levels (Lead, Cadmium, Nickel, Arsenic) in the serum of workers in the fuel stations in central region of Thi-Qar Province. 60 people were selected from a group of workers in the age category (19 to 50 years), with work experience (1 to 5 years), some of whom were smokers and others were non-smokers. The study involved workers from three stations: (Al-Raya, Al-Noor, and Thi-Qar). Control group incorporated from university students who were working remotely. The measurements were conducted at the laboratories of the Southern Technical College at Thi-Qar University. The statistical analysis revealed that the levels of the four metals (Pd >Ni > As > Cd) in individuals working at fuel stations are higher compared to the control group. In addition, the concentration of these metals in the blood of smokers is higher than that of non-smokers. The study also confirmed that all trace elements increase in the autumn season. Compared to the winter season, the concentration of trace elements in the autumn season was (20.3, 2.425, 2.068, 0.2.7) µg/dl, while their concentration in the winter was (14.4, 1.339, 1.218, 0.129) µg/dl. This increase is due to weather changes, such as higher temperatures and lower humidity.**

Keywords— Pollution, trace element, gas stations, fuel workers.

I. INTRODUCTION

Environmental contamination is a severe issue, particularly in developing nations, especially in third world countries, due to hydrocarbon emissions from industries such as oil and fuel stations [1]. Pollution is the result of disruption of balance or activity caused by changes in all components of the environment [2,3]. Pollution is the sudden or gradual change of the environment in the chemical, physical, and biological properties [4,5]. Pollutants can have immediate visible effects on the environment or invisible ones that have long-term effects on the delicate balance of the food chain [6]. Trace elements are transition metals characterized, especially those with values greater than 5 gcm3, that have a negative impact on the environment and organisms [7]. However, their accumulation in organisms can be dangerous. Trace elements can be classified into two different categories. The first group of basic elements, consisting of (iron, copper, zinc, and manganese, are called basic elements. It plays an important role in many bioprocesses that would be difficult without it [8]. The second group is called non-basic elements [9]. This group consists of highly significant environmental pollutants, substances that are not necessary for biological and chemical processes, such as (methane, cadmium, nickel, mercury, arsenic, and other similar substances) [10]. Exposure to trace elements can occur in many ways, such as inhaling dust or consuming it through smoking, food, and beverages [11]. Long-term exposure to high concentrations of these substances can lead to negative effects on soil and air as well as human health [12]. Unlike biodegradable pollutants, these substances do not decompose naturally and remain in the environment for a long time. This occurs especially when these substances are abundant [13]. Identifying trace elements sources is important for effective pollution management and reduction of them [14]. Improper disposal of motor oil and gasoline near fuel stations is recognized as a cause of toxic trace elements transport [15,16]. This study aims to investigate the effects of trace element exposure on different employee groups at a fuel station.

https://doi.org/10.32792/utq/utjsci/v11i2.1263

II. MATERIALS AND METHOD

A. Study Area

This study was done on fuel stations that located in the city center, where traffic and air pollution are intense, making the pollution visible. Three stations were selected for the research: S1, S2 and S3. All stations were far enough to cover the city of Al-Nasiriyah. Governor of Thi-Qar.

B. Sample Collection

In this study, the data was collected in the city of Al-Nasiriyah.,120 male participants in the study. The people were divided into two different groups: There were 60 samples from the workers and 60 from the University students samples as (control group). The research collects personal information from people, such as smoking status and age, through surveys conducted for this purpose.

C. Method

The antiseptic solution was applied on the cloud area before taking a 5 ml blood sample. The collected sample was placed in a centrifuge (Universal/Germany) and subjected to separation at 4000 rpm for 20 minutes. It is important to separate blood serum for accurate measurement of the mineral being tested.

D. Serum Digestion

Serum was prepared using a standard method [17]. 2 ml 70% nitric acid and 1 ml 70% perocritic acid was added to 0.5 ml serum in Pyrex tubes. After that, the solution underwent heating on a hot plate at a temperature of 160°C for a period of one hour. The solution was then diluted to 10 mL using 30% hydrochloric acid; This ensured good digestion of the serum.

III. RESULTS

A. Trace Element Concentration in Serum of Worker

The current results recorded a significant difference in the levels of trace elements between workers of the oil station and the control group, was noted all trace elements increased in the oil stations workers compared to the control group, and there was also a noticeable increase in the levels of trace elements in fuel workers in the autumn season(2.425, 2.068, 20.3, 0.207) μg/dl, compared to the winter season(1.339, 1.318, 14.4, 0.129) μg/dl, and the control group(0.130, 0.035, 5.529, 0.020)ppm, at p-value < 0.05,as in the Table (1).

Table 1: Trace elements concentrations in workers and control group μg/dl.

Groups	Ni	As	Pb	Cd
	Mean ± S. D / μg/dl			
Control	$0.130^{c} \pm 0.068$	$0.035^{c} \pm 0.017$	$5.529^{c} \pm 1.04$	$0.020^{c} \pm 0.007$
Autumn	$2.425^{a} \pm 0.733$	$2.068^{a} \pm 0.701$	$20.3^{a} \pm 4.32$	$0.207^{a} \pm 0.045$
Winter	$1.339^{b} \pm 0.272$	$1.318^{b} \pm 0.308$	$14.4^{b} \pm 3.13$	$0.129^{b} \pm 0.032$
p. value	< 0.001	< 0.001	< 0.001	< 0.001
LSD	0.23	0.22	1.70	0.016

B. The Relashionship between Trace Element Concentration and Smoking

The current results recorded a non-significant difference according to the seasons within the same group, except the level of As and Cd increased significantly in winter workers smokers than in winter non-smokers worker, in contrast, the results noted all trace elements increased significantly in autumn collected worker of both smokes and non-smoker than winter collected workers at p- value < 0.05, as in the Table (2).

Table 2: Evaluation of trace elements according to the smoking and seasons μg/dl.

Parameters Seasons		Smoker	Non-smoker	p. value
		Mean ± S. D/ μg/dl		
Ni	Autumn	2.435 ± 0.789	2.392 ± 0.560	0.895
	Winter	1.355 ± 0.261	1.275 ± 0.329	0.527
p. value		< 0.001	0.001	
As	Autumn	2.172 ± 0.729	1.725 ± 0.496	0.085
	Winter	1.354 ± 0.330	1.171 ± 0.125	0.042
p. value		< 0.001	0.023	
Pb	Autumn	20.23 ± 4.902	20.61 ± 1.442	0.841
	Winter	14.79 ± 3.202	13.20 ± 2.750	0.276
p. value		< 0.001	< 0.001	
Cd	Autumn	0.209 ± 0.038	0.201 ± 0.066	0.679
	Winter	0.134 ± 0.033	0.108 ± 0.010	0.004
p. value		< 0.001	0.006	

IV. DISCUSSION

A. Lead (Pb)

The lead concentration recorded the highest levels among the trace elements, followed by Ni, and cadmium had the lowest concentration (Pd > Ni > As > Cd) in fuel workers' samples. The highest concentration of lead was during the autumn season (20.3 μg/dl) compared to the winter season (14.4 μg/dl), when the concentration of lead decreased. The results were consistent with [18]. It showed that people working at gas stations had higher lead levels than those working outside the station. The increased levels of lead among workers are also attributed to the residues generated from fuel stations from combustion processes that generate large quantities of lead that enter the human body through inhalation. Also, note that lead levels are lower in non-smokers. This is because most cigarettes do not contain the first ingredient tobacco.

B. Cadimium (Cd)

Cadmium was the least concentrated element in fuel station samples. The highest concentration of cadmium was during the autumn season (0.207 μg/dl) among fuel workers compared to the winter season (0.129 µg/dl), where the percentage decreased. This result was consistent with almost all studies that indicated a relationship between fuel and cadmium stations [19]. The reason for this increase is due to multiple factors, such as more intense combustion in cold seasons because of increased use for heating, which may increase cadmium emissions [20]. Weather factors such as wind and humidity can also play a role in exacerbating (Cd) emissions. Studies have shown that cadmium increases in smokers compared to non-smokers, because cigarettes contain more cadmium, and a smoker is exposed to more cadmium when he smokes.

C. Nickel (Ni)

The amount of (Ni) shown in the blood of fuel station workers increased compared to the control group. This search is consistent with the search conducted by [21]. To determine trace elements concentration in blood and iron in Pakistan. The highest concentration of nickel was during the autumn season (2.425 µg/g) compared to the winter season (1.339 µg/g) when the lead concentration decreased. The reason for this increase is due to changes in fuel composition and weather conditions. Also, noticed an increase in the percentage of (Ni) in smokers compared to non-smokers. This is due to smokers being exposed to larger amounts of nickel found in tobacco smoke [22].

D. Arsenic (As)

Results of the study showed that the percentage of arsenic in fuel station workers was high in the autumn (2.068 µg/dl) while it decreased in the winter (1.318 µg/dl). There is a convergence between the results of the current study, and the results of the study conducted by [23] in Pakistan to measure concentrations in biological samples of steel mill workers. Also, the arsenic has a higher concentration than cadmium, which is the lowest concentration (As>Cd), in the study samples. Increased arsenic levels may be due to multiple factors, such as temperature differences and increased exposure to certain environmental pollutants [24]. In addition, it was noted that the percentage of arsenic in smokers is higher than in non-smokers because of tobacco smoke containing arsenic compounds.

V. CONCLUSION

The concentration of trace elements (Pd, Cd, Ni, As) in the serum of fuel station employees was higher than the serum of the control group. In addition, the concentration of trace elements is increased in the autumn compared to the winter because of the increased use of fossil fuels to operate air conditioners and cooling systems in the autumn, as well as weather changes such as high temperatures.

Also, the results obtained show that smoking significantly affects the concentration of trace elements because cigarettes contain a group of trace elements. When smoking cigarettes, these substances are inhaled and enter the body.

CONFLICT OF INTEREST

Authors declare that they have no conflict of interest.

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