ARTICLE / INVESTIGACIÓN

Assessing Heavy Metals Emission and Workers' Health Risks at the Eastern Industrial Region, Mosul, Iraq

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Abstract: This study was executed to investigate the heavy metal (Ni, Cu, Zn) pollution of the Eastern Industrial Region in Mosul city in Nineveh province of Iraq. Heavy metals are measured In the blood serum of 40 workers and compared with the control group of (40) people from Mosul university. Elements were measured by using an atomic absorption (flame) spectrometer. The statistical analysis results revealed that investigated Blood serum samples are seriously polluted with toxic heavy metals.

Key words: Heavy Metals Emission, Workers' Health Risks, Blood Serum, Eastern industrial Region, Pollution.

Introduction

The pollution of air, soil, ground, and surface waters with toxic heavy metals and other pollutants is a growing threat to human and aquatic life, even in small doses[1]. Heavy metal pollution has detrimental effects on humans and other ecosystems. Therefore, heavy metal pollution is the main problem in Iraq as in many developing countries[2].

The knowledge of heavy metal concentrations in the environment is fundamental to evaluating the potential impacts of industrial activities on the environment and human health. Recent studies have focused on investigating heavy metal pollution of accumulation in the human body[3,4].

Many workers in industrial areas exposed to the risks of heavy metals. The level of the concentration and other elements reflects the chemical condition of the body[5].

Heavy metals are frequently and regularly produced in different industries, like paint and ceramics, metallurgy, electroplating, heavy manufacturing industries, civil construction, etc., which are discharged through industrial wastewater. These metals are non-biodegradable, stable, toxic and carcinogenic to living organisms[6,7].

Despite the high toxicity of heavy metals, they enter into many industrial processes, either directly or as a by-product, causing many environmental problems that are difficult to solve and thus affect the ecosystem and what it contains for humans, plants, etc. animals[8-11].

Nickel absorption is considered weak by the digestive system. The daily intake should be 50 - 100 micrograms and not more than 500 micrograms. In children, the amount must not exceed 200 micrograms between 1-3 years and 300 micrograms between 4-8 years of age[12].

Exposure to the high concentration of Copper causes Wilson's disease (bloody dyes) and Alzheimer's disease[13].

The risk of zinc infection is often associated with symptoms of leg pain. Zinc concentration in serum can detect poisoning by it (14) .(15) concluded in their study about the toxicity of heavy metals and their effect on industrial workers. The results showed statistical differences when comparing the concentrations of heavy metals in the workers' blood compared to a group far from industrial activity.

In addition (16) to a study on heavy metals in the industrial scale, and the results that industrial workers are exposed to the dangers of these elements directly through inhalation or skin.

Materials and methods

Study Area

The study area is the city of Mosul, which is located in the Eastern part of Iraq.

Sampling and Analysis

The study was conducted on 40 workers in industrial areas, and they were randomly collected representing the region. In contrast, 40 blood samples were drawn from people far from industrial activity. The quantity withdrawn for both groups was 5 ml and was transferred to the laboratory and isolated, and the flame spectrometer measured heavy metals.

Statistical analysis

Processing was carried out on the data obtained for the concentrations of heavy metals by the statistical program spss and the use of many tools to express the statistical differences.

Results

The results show that there is a significant of ($P<0.001$) for elements (Ni, Cu, Zn) element. (Table 1).

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Conclusions

Industrial areas today pose a significant danger to their workers and visitors, as the results showed that there is a cumulative increase in the blood of industrial workers as a result of their direct exposure to the danger of these elements either through skin or inhalation and that these areas are in dire need of treatment as they are an economical and vital resource that cannot be dispensed with.

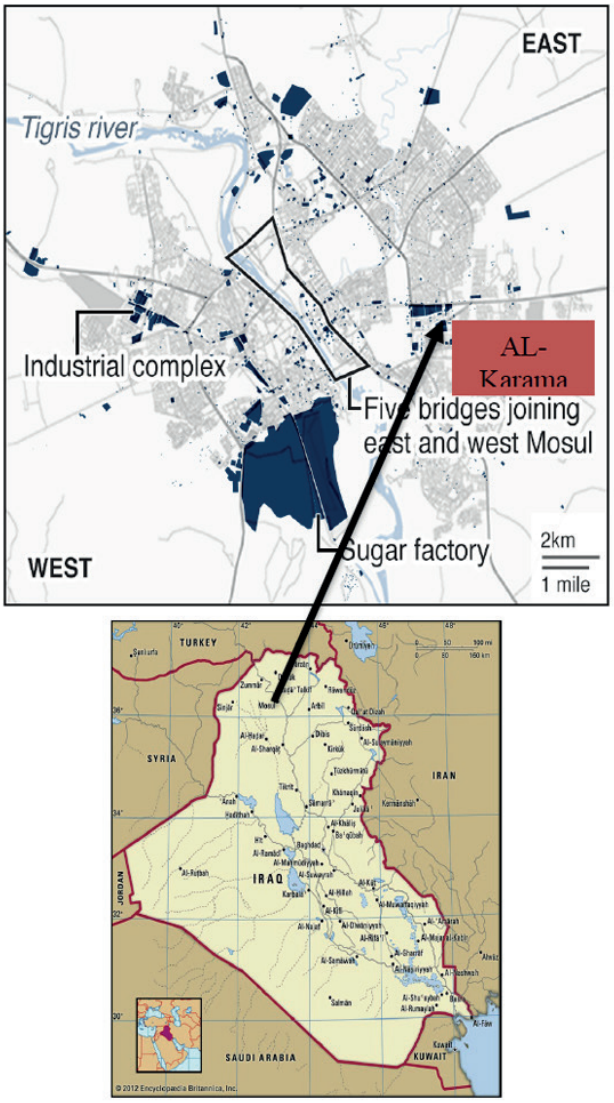

Figure 1. Location of Study Area.

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Conflicts of Interest

There is no conflict

Bibliographic references

1. C. Verma, S. Madan and A. Hussain, Cogent. Eng. 3, 1 (2016). doi:10.1080/23311916.2016.1179243.
2. M.M. Ali, M.L. Ali, M.S. Islam and M.Z. Rahman, Environ. Nanotechnol. Monit. Manag. 5, 27 (2016).
3. K. Khan, Y. Lu, H. Khan, S. Zakir, Ihsanullah, S. Khan, A.A. Khan, L. Wei and T. Wang, J. Environ. Sci. 25, 2003 (2013). doi:10.1016/S1001-0742(12)60275-7.
4. A. Chaturvedi, S. Bhattacharjee, A.K. Singh and V. Kumar, Ecol. Indic. 87, 323 (2018). doi:10.1016/j.ecolind.2017.12.052.
5. Brewer, G. J. . Iron and copper toxicity in disease of aging, particularly atherosclerosis and Alzheimer's disease. Exp. Biol. Med.2007; (Maywood) 232 (2), 323–35.
6. Eck, P. and Wilson, L., . Toxic Metal In Human Health And Disease. Applied Nutrition and Bioenergetics,1989; Ltd., 8650 N.
7. Fergusson JE. The heavy elements: chemistry, environmental impact and health effects. Oxford, Pergamon Press, 1990.
8. Finch LE, Hillyer MM, Leopold MC. Quantitative analysis of heavy metals in children's toys and jewelry: a multi-instrument multitechnique exercise in analytical chemistry and public health. J Chem Educ 2015; 92:849-54.
9. Casarette and Doull's Toxicology. The basic science of poison, 5th ed. New York: McGrow Hill, pp 634-736.
10. Kim, H.S., Kim, Y.J., Seo, Y.R., . An overview of carcinogenic heavy metal: molecular toxicity mechanism and prevention. J. Cancer Prev.2015; 20, 232–240.
11. Landolph J.R. Nickel Carcinogenesis. In: Schwab M. (eds) Encyclopedia of Cancer. Springer, Berlin,2017; Heidelberg.
12. Medical Arts Group. From the website http://www.ibismedical.com/ (1998-2000).
13. Tchounwou PB, Yedjou CG, Patlolla AK, Sutton DJ. Heavy metal toxicity and the environment.2012 ; EXS 2012; 101:133-64.
14. Tower, S. S.,. Cobalt Toxicity in Two Hip Replacement Patients. Bulletin.2010; No. (14): 28.
15. Znad, Salim Rabee. and Al-Sinjary, MazinNazar. The vital accumulation of some Heavy metals in the blood serum of industrial zone workers in Mosul city. Plant Archive journal volume 20. Supplement 1 , 2020 .pp 3194- 3200 .
16. Znad, Salim Rabeea, Fadhel, Mazin Nazar, ÜNŞAR, Ayça ERDEM. Investigate workers' health in the western industrial region, Mosul, Iraq. Revista Bionatura journal., ISSN 1390-9347, 2021, Pages.1983-1985, Received: 18 May 2021, Accepted: 11 July 2021. DOI. 10.21931/RB/2021.06.03.16

Elements	Grouping	N	Mean ± SD (ppm)	p-Value
Ni	Workers	40	2.8050 ± 2.0100	p<0.001
	Control	40	0.8095 ± 0.81500	
Cu	Workers	40	1.5890 ± 1.12871	p<0.001
	Control	40	0.6545 ± 0.60351	
Zn	Workers	40	0.7590 ± 0.61120	p<0.001
	Control	40	0.4835 ± 0.30709	

P< 0.05 Significant **P> 0.05 No significant**

Table 1. Heavy metals in blood serum of workers & controls groups.