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IDENTIFICATION OF QUANTITY OF HEAVY METALS IN DIFFERENT TYPES OF TOBACCO IN SHISHA AND CIGARETTE BRANDS

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Abstract

The main objectives of this study is to measure the concentrations of heavy metals (namely Lead (Pb) and Cadmium (Cd)) in tobacco that used in both cigarette and shisha make. The concentration of these heavy metals were measured in the tobacco of 9 imported types of cigarettes, and 9 types of shisha tobacco. The studied samples were randomly collected from local markets in the city of Hilla, Iraq. The concentration of the studied heavy metals was measured using flame atomic absorption spectrometry. The results obtained showed high concentration of Pb in shisha tobacco (0.83 mg/kg) in comparison with its concentration in tobacco of cigarette (0.19 mg/kg). In terms of Cd concentration, the result showed high concentration in cigarettes (0.06 mg/kg) and low concentration in shisha (0.05 mg/kg). Generally, it has been found that the concentration of the studied heavy metals in the tobacco follows the order Pb > Cd. In addition, the outcomes of this study confirm that the concentrations of the studied metals in both Iraqi and imported cigarettes, in Iraq, are above the harmless limits of WHO.

***Keywords*:** Heavy metals, tobacco in cigarette, and shisha.

Introduction

Indoor home environments are the site of a variety of biological and other environmental hazards. These hazards lead to different health problems, ranging from acute and chronic respiratory signs and diseases to cancer (Haines *et al.*, 2006; Raaschou-Nielsen *et al.*, 2013; Beelen *et al.*, 2014; Lelieveld *et al.*, 2015; Munajad *et al.*, 2018). Indoor pollutions a significant public health hazard due to many considerations, such as the people in modern societies spend nearly 90% of their time in indoor environment (Raaschou-Nielsen *et al.*, 2013). The previous studies gave a rigid proof about the serious impacts on human health. For instance, it has been reported that poor indoor environments could contain different harmful pollutants, such as volatile organic compounds, remains of combustion processes and construction materials, and gases from heating and cooling systems. In addition, the previous studies confirmed that indoor smoking could be a main reason for different serious health problems, and indicated the presence of a relationship between smoking and improvement of cancer-specific mortality (Warren *et al.*, 2014). A wide body of literature was focused on smoking parents and the effects of this phenomenon on babies during and after pregnancy period. It has been found that smoking during pregnancy could results in many obstetric problems, such as abortion and premature tear of membranes. In addition, it is responsible for about 15% of preterm births and a significant ratio of perinatal mortality (Menden *et al.*, 2013). Moreover, the farmers use different types of chemicals, such as herbicides and fungicides, during the tobacco plantation to enhance the productivity. Unfortunately, these chemicals contain a considerable amount of metals in there structures, which could be transferred to the consumers of these tobacco. Where more than 4000 types of harmful chemical compounds were identified in some types of tobaccos, which makes tobaccos a direct threat to human health (Galażyn-Sidorczuk *et al.*, 2008). For example, cadmium, lead and nickel were found in some types of tobaccos; and these heavy metals have the ability to be accumulated in tissues and fluids of the human body (Erzen & Kragelj, 2006; Pääkkö *et al.*, 1989). Al-Bader *et al.* (1990) studied the concentration of cadmium in human body and its sources. The outcomes of their study indicated that the main sources of cadmium in the human body are the food chain and smoke of tobacco. It is noteworthy to explain what the Shisha is. Shisha smoking is "an operation by which the smoking sublimates are passed via a pot containing water. The pot is connected on one side to a mouthpiece through a tube and to the other side to a receptacle holding the tobacco to be wasted. The material and size of the pot and tubing differ from one type to another. The tobacco used in Shisha is called *Meassel* which is a mix of ordinary tobacco and molasses (or fruit juice, where it is called after the name of the fruit juice used) in ratio 1:2.4. Measselis put in a slime container called *Hagar* where it is fire with pieces of coal. The tobacco content of one *Hagar* is called *Korsi* and is almost equivalent in weight to one cigarette" (Israel *et al.*, 2003).

Materials and Methods

Ten different kinds of cigarettes and twenty types of shisha tobaccos were collected from local markets in the city of Hilla. The studied tobacco samples were prepared according to method of Elinder *et al.* (2011). Where, the tobacco of five cigarettes, of each one of the studied types, was collected and dried at 85°C for 14 hrs using lab oven (type: Gallen Kamp) . Then, the dried sample was left in a desiccator to cool down to the room temperature. 5 g of each sample was then burned at 500°C (to make it ash) in a muffle oven (type: Gallen Kamp). Then, 1.0 g of the ash was acidified using HNO_3; and heated to near dryness. Finally, the treated sample was digested in 1 M HNO_3, and filtered on No.4 What-man filter paper. The filtrate was transferred into a 50 ml flask; and the volume was completed, to the mark, using deionized water. This solution was tested for the concentration of cadmium, lead and nickel using flame atomic absorption spectrophotometer SP-300 (Type : Optima).

Results and Discussion

The obtained results from the current study indicated a clear variation in the concentration of the studied heavy metals, depending on the type of cigarettes. Where, it has been found that the highest concentration of cadmium was in type (A) of cigarettes (0.06 mg/kg), and type (B) of Shisha (0.08 mg/kg), while the lowest concentration was noticed in type (F) for both cigarettes (0.02 mg/kg), and Shisha (0.05 mg/kg) Figure1.

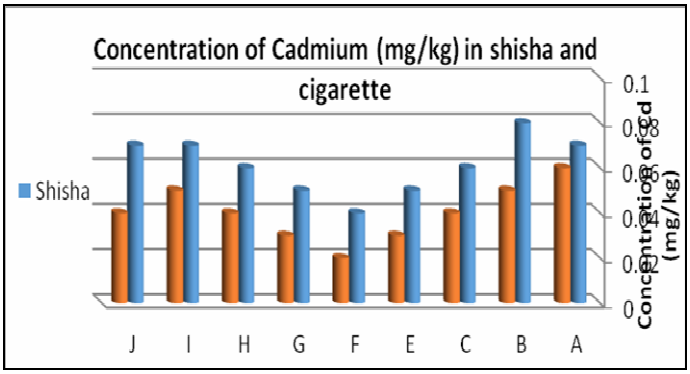

Fig. 1 : Concentration of Cadmium (mg/kg) in shisha and cigarette

The highest concentration of lead noticed in type (C) of cigarettes (0.19 mg/kg), and type (B) of Shisha (0.83 mg/kg), while the lowest concentration was noticed in type (A) of cigarettes (0.11 mg/kg) and type (E) of Shisha (0.54 mg/kg) Figure 2

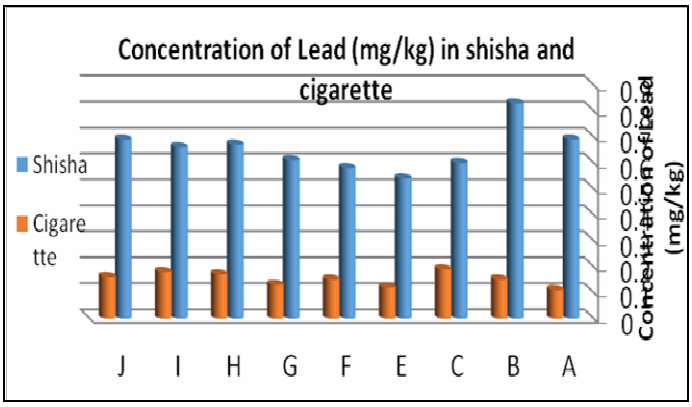

Fig. 2 : Concentration of Lead (mg/kg) in shisha and cigarette

According to the standard limitations, the permissible concentrations of cadmium and lead are 1 to 3 and 1 to 2 µg/g, respectively (Mussalo-Rauhamaa *et al.*, 1986). This indicates that the measured concentration of cadmium in Affair, Pine, Pentley, and Miami cigarettes were more than the allowable limits. On average, it has been found that each 20 cigarettes contain 1-2 µg of cadmium, which means that smoking 20 cigarettes/day is enough to accumulate (at least)1 µg/day in the smoker's body. For comparison, the average concentration of cadmium in the ambient air is ≤5 ng/m^3, and "less than 0.01 µg in airborne origin is absorbed in the lungs daily" (Lin, 1992). These results are in highly agreement with those obtained by Ashraf (2012) who confirmed that the concentration of cadmium in each 20 cigarettes is about 1.40–2.70 µg. While the measured concentration lead in 20 cigarettes was ranging between 1.98 and 3.37 µg, which is 4 times higher than the reported concentration in the UK cigarettes (0.22–0.65 µg) and 3.5 times higher than the reported concentration in the Korean cigarettes (0.4–1.19 µg).

Table 1: Refer to concentration of heavy metal in shisha and cigarette.

Smoking type	Pb	C d
Shisha Smoking	0.70±0.06 A	0.13±0.084 B
Cigarette	0.090±0.00 27 B	0.60±0.11 A

In terms of Shisha smoking, which is becoming very common in Iraq (about 33% of the Iraqi males are Shisha smokers (Israel *et al.*, 2003), it has been found that the percent of lead in shisha tobaccos was 0.70±0.06%, which is much higher than its percent in cigarettes (0.090±0.00 27). Contrarily, the percent of cadmium in shisha tobaccos (0.13±0.084) was less than its percent in cigarettes tobacco (0.60±0.11%). Although the obtained results indicated that the concentration of cadmium in the tobacco of shish is less than its concentration in cigarettes, the negative impacts of shisha smoking on the community could be significant due to the lack of health education programs about shisha. In addition, "the laws against smoking are not taking shisha seriously and overcrowding of shisha smokers are common" (Israel *et al.*, 2003).

Conclusions

It was noted that the selected tobacco tobacco for this study was considered to be contaminated with heavy metals, the results also showed that the lead element (Pb) in all samples was the highest compared to the element cadmium (Cd). Additionally, it is noteworthy to highlight that due to the lack in studies about the concentrations of cadmium and lead in the local and imported cigarettes in Iraq, the current study could provide important data for the Iraqi health foundations, such as the Ministry of Health.

References

Al-Bader, A.; Omu, A. and Dashti, H. (1999). Chronic cadmium toxicity to sperm of heavy cigarette smokers: immunomodulation by zinc. Archives of andrology, 43: 135-140.

Beelen, R.; Raaschou-Nielsen, O.; Stafoggia, M.; Andersen, Z.J.; Weinmayr, G.; Hoffmann, B.; Wolf, K.; Samoli, E.; Fischer, P. and Nieuwenhuijsen, M. (2014). Effects of long-term exposure to air pollution on natural-cause mortality: an analysis of 22 European cohorts within the multi centre ESCAPE project. The Lancet, 383: 785-795.

Caruso, R.V.; O'connor, R.J.; Stephens, W.E.; Cummings, K.M. and Fong, G.T. (2013). Toxic metal concentrations in cigarettes obtained from US smokers in 2009: results from the International Tobacco Control (ITC) United States survey cohort. International journal of environmental research and public health, 11: 202-217.

Erzen, I. and Kragelj, L. (2006). Cadmium concentrations in blood in a group of male recruits in Slovenia related to smoking habits. Bulletin of environmental contamination and toxicology, 76: 278-284.

Galażyn-Sidorczuk, M.; Brzóska, M.M. and Moniuszko-Jakoniuk, J. (2008). Estimation of Polish cigarettes contamination with cadmium and lead, and exposure to these metals via smoking. Environmental monitoring and assessment, 137: 481-493.

Haines, A.; Kovats, R.S.; Campbell-Lendrum, D. and Corvalán, C. (2006). Climate change and human health:

impacts, vulnerability and public health. Public health, 120: 585-596.

Hofhuis, W.; DE Jongste, J. and Merkus, P. (2003). Adverse health effects of prenatal and postnatal tobacco smoke exposure on children. Archives of disease in childhood, 88: 1086-1090.

Israel, E.; El-Setouhy, M.; Gadalla, S.; Aoun, E.L.; Sa, M.N. and Mohamed, M. (2003). Water pipe (Sisha) smoking in cafes in Egypt. J Egypt Soc Parasitol, 33: 1073-1085.

Kjellström, T. (1979). Exposure and accumulation of cadmium in populations from Japan, the United States, and Sweden. Environmental health perspectives, 28: 169.

Lelieveld, J.; Evans, J.S.; Fnais, M.; Giannadaki, D. and Pozzer, A. (2015). The contribution of outdoor air pollution sources to premature mortality on a global scale. Nature, 525: 367.

Lin, Y. (1992). Cd in tobacco. Biomedical and Environmental Sciences, 5: 53-56.

Menden, E.E.; Elia, V.J.; Michael, L.W. and Petering, H.G. (1972). Distribution of cadmium and nickel of tobacco during cigarette smoking. Environmental Science & Technology, 6: 830-832.

Munajad, A.; Subroto, C. and Suwarno, S. (2018). Fourier Transform Infrared (FTIR) Spectroscopy Analysis of Transformer Paper in Mineral Oil-Paper Composite Insulation under Accelerated Thermal Aging. Energies, 11: 364.

Mussalo-Rauhamaa, H.; Salmela, S.; Leppänen, A. and Pyysalo, H. (1986). Cigarettes as a source of some trace and heavy metals and pesticides in man. Archives of Environmental Health: An International Journal, 41: 49-55.

Pääkkö, P.; Kokkonen, P.; Anttila, S. and Kalliomäki, P.-L. (1989). Cadmium and chromium as markers of smoking in human lung tissue. Environmental research, 49: 197-207.

Raaschou-Nielsen, O.; Andersen, Z.J.; Beelen, R.; Samoli, E.; Stafoggia, M.; Weinmayr, G.; Hoffmann, B.; Fischer, P.; Nieuwenhuijsen, M.J. and Brunekreef, B. (2013). Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE). The lancet oncology, 14: 813-822.

Warren, G.W.; Alberg, A.J.; Kraft, A.S. and Cummings, K.M. (2014). The 2014 Surgeon General's report: "The Health Consequences of Smoking–50 Years of Progress": a paradigm shift in cancer care. Cancer, 120: 1914-1916.