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Comparative Estimation of Cadmium and Lead Levels between Cigarette and Hookah Smokers

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Abstract

The current study was suggested to detect level of cadmium and lead in smokers (Cigarette and hookah), Cd and Pb were detected in blood using atomic absorption, The results of the present study show that the Cigarette smokers were higher than non-smokers (82.75, 17.24 %) respectively, 55.17% was hookah smokers and 44.82% non-hookah smokers, 41.37% of study population Cigarette and hookah smoking together, The heavy metals represented by Cd and Pb, levels were detected in both groups, current output recorded non-significant differences in Cd and Pb (p 0.889, 0.336), also non-sig in age and BMI. In Cigarette smokers significant elevation in Pb in smokers (p 0.03), non-significant elevation in Cd level in non-smokers, the age and BMI also non-sig changes, also non-sig differences observed in the heavy metals, age and BMI of individuals use Cigarette and hookah smoking together The correlation between Cd and age, BMI and Pb in smokers (Cigarette, hookah and smoking together), Different associations were observed among study variables in study groups Cd was an inverse association with age in smokers but positive association in non-smoker. An Inverse association with BMI in Cigarette smokers, non- hookah smokers and non -Cigarette +hookah smokers. The association Cd with Pb in study groups shows a positive association in Cigarette and Cigarette +hookah smokers. The Pb was a positive association with age in Cigarette smokers and invers correlation in hookah and Cigarette + hookah smokers, the correlation with BMI shows inverse association in hookah and non- Cigarette smokers, positive association between Pb and BMI in Cigarette + hookah smokers and non-smokers. Conclusion: the current study concluded that Cigarette smoking causes elevation in Cd and Pb than hookah, the individuals used Cigarette and hookah show slight elevation in Pb than in non-smokers.

key words
Cadmium, Lead level, smokers, Cigarette, hookah.

The toxicity by chemical molecules has been increasing over a few decades ago (Rafati-Rahimzadeh, Kazemi, & Moghadamnia, 2015; Rahimzadeh & Moghadamnia, 2010). The toxicity happened by the wrong used of drugs and chemical compounds that may be poisoned accidentally or intentionally (Rafati-Rahimzadeh et al., 2015; Rafati-Rahimzadeh et al., 2014).

poisonous chemicals including Heavy metals come from industrial or industrial sources, can pose serious threats to human life (Rafati-Rahimzadeh et al., 2015). Cadmium (Cd) is very poisonous and has eight stable isotopes, The most common isotopes are ^{112} Cd and ^{114} Cd (Adriano, 2001). It can be found in numerous commercial forms Accompanying zinc production, it can be produced in different commercial forms like auto industries, pigments, stabilizers for polyvinyl plastic, and in batteries (Adriano, 2001; Cobb, 2008). many studies found that smokers have substantially elevated levels Cd and Pb (Richter et al., 2009; Tellez-Plaza et al., 2012), and metal bioaccumulation has also been established in those chronically exposed to tobacco smoke pollution (also known as second-hand smoke) (Serdar et al., 2012).

As a result of human activities, Cadmium exists in an environment like use of fossil fuels, waste burning and metal ore combustion, cadmium can be transferred by food through Leaking sewage sludge to agricultural soil , the most common source of cadmium is a smoker, it increased more than 4 times in smoker blood than a non-smoker (Munisamy, Ismail, & Praveena, 2013).

Evidences reported the harmful impact of heavy metals like cadmium exposure like the accumulation of CD in kidney causes renal dysfunction (Järup, 2002) (9), high level of Pb also is a risk factor for cardiovascular diseases and kidney damage (Alzyoud et al., 2013), the potential impact in the reproduction and its development in some mammalian species (Thompson & Bannigan, 2008). Indication by In vitro studies referred to the involvement of cadmium in endothelial dysfunction, the formation of atherosclerotic plaques was also promoted in vivo (Fagerberg et al., 2012). its categorized as carcinogenic molecules in humans by the International Agency for Research on Cancer (IARC) (Kellen et al., 2007).

Methodology

The present study aims to detect Cd and Pb levels in the blood of smokers (Cigarette, hookah) in Baghdad city, 33 individuals. Blood samples were collected with ethical approval of ministry of higher education and scientific research.

blood digestion and Cd, Pb detection: blood samples were digested using 5 ml of blood with 10 ml of nitric acid, mixture then incubated at 80 ºC until ash appeared, then it complete to 25 ml dH_2O, the mixture was filtrate using filter paper then Cd was detected using atomic apportion apparatus.

Data analysis: the Cd and Pb level presented as mean±SE, significant value detected by t test, independent sample at $p < 0.05$.

Results and discussion

The results of the present study show that the smokers (Cigarette) were higher than non - smokers (82.75, 17.24 %) respectively, 55.17% were hookah smokers and 44.82% non-hookah smokers, 41.37% of study population were Cigarette and hookah smoking together. The highest percentage of smokers among Iraqi individuals was recorded in other documents Al-Delaimy and Al-Ani (2021) found an alarmingly high percentage of hookah smoking among Iraqi high school students male. They recorded about (46%) of student use hookah smoking, same level was observed in early studies in secondary school adolescent males have aged more than 18 years, in Saudi Arabia, that reached to 44% (Amin et al., 2010). On the other hand lower percentage of hookah smokers were detected in Iranian and Jordanian male of high school students 6, 24%, respectively (Alzyoud et al., 2013; Fakhari et al., 2015).

The Cigarette smoking in Iraq, belong to individuals' behavior, the social and cultural environment that promotes smoking (Mousawi, 2014; Syme & Alcalay, 1982), Yasso et al. (2014) suggested that the high prevalence of smoking may

because stress, tension, depression and phsycetric problems. In other studies found about (29–31)% males and (3–4)% females of Iraq individuals are active smokers (Hussain & Sullivan, 2017; Maziak et al., 2014), in comparison with Arab countries the reported percentage of smokers in Iraq is lower because of the smoking habits in women and young have an apparently.

The heavy metals represented by Cd and Pb, levels were detected in both groups, current output recorded non-significant differences in Cd and Pb (p 0.889, 0.336), also non-sig in age and BMI. In Cigarette smokers significant elevation in Pb in smokers (p 0.03), non-significant elevation in Cd level in non-smokers, the age and BMI also non-sig changes, also non-sig differences observed in the heavy metals, age and BMI of individuals use Cigarette and hookah smoking together (table 1).

The correlation between Cd and age, BMI and Pb in smokers (Cigarette, hookah and smoking together) are clarified in table (2 and 3). Different associations were observed among study variables in study groups Cd has an inverse association with age in smokers but positive association with age in non-smoker. Inverse association with BMI in Cigarette smokers, non- hookah smokers and non -Cigarette +hookah smokers.

The association Cd with Pb in study groups shows positive association in Cigarette and Cigarette +hookah smokers.

Table (1) the heavy metals level in smokers (Cigarette and hookah) groups.

Smokers (hookah)	Age	BMI	Cd	Pb
No	23.14±0.65	26.27±0.99	27.46±6.433	3.36±0.050
Yes	23.06±0.566	23.71±0.840	26.12±6.713	3.128±0.210
P	0.926	0.059	0.889	0.336
Cigarette				
No	22.80±0.96	23.30±1.03	19.60±6.144	2.67±0.670
Yes	23.16±0.47497	25.23±0.77652	28.20±5.42137	3.34±0.031
p	0.756	0.296	0.491	0.030
Cigarette+hookah				
Yes	22.91±0.712	23.80±1.06	27.91±8.67	3.33±0.03
No	23.22±0.53	25.65±0.85	25.88±5.188	3.16±0.201
P	0.729	0.833	0.185	0.500
T test, independent sample at p value less than 0.05.				

Table (2) the correlation between Cd with age, BMI and Pb in study groups.

cd	Cigarette		Hookah		Cigarette +hookah	
	Yes		Yes	No	Yes	No
Age						
R	-0.222	0.676	-0.360	0.145	-0.466	0.206
p	0.297	0.210	0.171	0.637	0.127	0.427
BMI						
R	-0.033	0.339	0.128	-0.159	0.105	-0.048
p	0.879	0.577	0.636	0.604	0.745	0.855
Pb						
R	0.386	-0.559	-0.047	0.536	0.262	0.007
p	0.063	0.328	0.863	0.059	0.412	0.978

The Pb was a positive association with age in Cigarette smokers and inverse correlation in hookah and Cigarette + hookah smokers, the correlation with BMI shows inverse association in hookah and non- Cigarette smokers, positive association between Pb and BMI in Cigarette + hookah smokers and non-smokers.

Table (2) the correlation between Pb with age, BMI and Cd in study groups.

Pb	Cigarette		Hookah		Cigarette + hookah	
	Yes		Yes	No	Yes	
Age R p	0.157 0.463	-0.329 0.589	-0.154 0.569	0.418 0.155	-0.303 0.339	-0.011 0.966
BMI R p	0.005 0.983	-0.406 0.497	-0.068 0.803	-0.224 0.463	0.336 0.286	0.022 0.934
Cd R p	0.386 0.063	-0.559 0.328	-0.047 0.863	0.536 0.059	0.262 0.412	0.007 0.978

The Heavy metals exposure was accumulated in the body during the smoking period and also depending on the rate of clearness (Dorne et al., 2011; Pappas, 2011) this clarified the differences in Cd and Pb level in study groups, Numerous evidences found Many heavy metals in tobacco like Cr, Cd, Pb, and Ni that accumulate in fluids and tissues by smoking (Galażyn-Sidorczuk, Brzóska, & Moniuszko-Jakoniuk, 2008; Stojanović, Nikić, & Lazarević, 2004). In the human body cadmium and lead have long (10–12 year) half-lives. The present finding that observed the Cigarette smokers have a high level of Cd and less level of Pb and this agreement with other studies in the general population (Richter et al., 2009; Tellez-Plaza et al., 2012). Other studies have recorded that counterfeit cigarette have significantly higher levels of heavy metals than non-counterfeit cigarette (Pappas et al., 2007; Stephens, Calder, & Newton, 2005).

The association of Cd with age an BMI showed varied associations in smokers and non-smokers, this may be because the rate of heavy metals removal from the body, period of smoking, type of cigarette and hookah, other contamination sources like water, air and food that have high levels of heavy metals in Iraqi environment, also the employments types (Al-Dulaimi, Shartooh, & Al-Heety, 2021; Al-Hussaini, Al-Obaidy, & Al-Mashhady, 2018; Radhi, Shartooh, & Al-Heety, 2021). Moreover the IARC recorded that Cd is one of the strongest carcinogens in tobacco smoke (Hecht, 2011, 2012), it's also related to cancer incidence and mortality (Khlifi & Hamza-Chaffai, 2010; Kuo et al., 2006), there were higher concentration of some heavy metals in pulmonary tissues of lung cancer cases than controls (Catalani et al., 2008) same output in documented in head and neck cancers in smokers than non-smokers (Khlifi et al., 2013).

Conclusion

the current study concluded that cigarette smoking causes elevation in Cd and Pb than hookah, the individuals used cigarette and hookah show slight elevation in Pb, current study needs more investigations like included women and type of cigarette, the number of smoking per day and passive smoking habit.

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