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Research Paper: Evaluation of Lead Poisoning in Opium Consumers

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ABSTRACT

Background: Because opium is mixed with lead to increase its weight, the prevalence of lead poisoning is high among opium consumers. Hence, measurement of serum lead level in these people is important for the prevention or early treatment of lead poisoning. To evaluate the blood lead level in opium consumers.

Methods: In this cross-sectional and descriptive study, a total of 214 opium consumers with lead poisoning referred to Imam Reza Hospital in Mashhad, Iran, in 2016, were evaluated. Atomic absorption spectrophotometry (Covanta Energy, GB) was used to measure the lead level of the blood samples.

Results: The mean (SD) age of the participants was 43.11(18.14) year, also their average (SD) blood lead level was 139.5(48.5) µg/dL. No relationship was found between the blood lead level and age in the participants (P=0.11). The number of male participants was significantly higher than females in this study (92.5% vs. 7.5%). Also about 129(60.3%) participants consumed opium orally and 85(39.7%) ones used opium by inhalation.

Conclusion: The blood lead level is higher than the acceptable limit in opium addicts, and the risk of lead poisoning should be considered among them, especially in oral consumers.

1. Introduction

The main sources of lead exposure compose of industrial pollution, dust, car exhaust, and contaminated foodstuff. Oral ingestion, inhalation, or skin contact contamination with lead from each of these sources may cause lead poisoning [1]. Lead toxicity is a major threat to public health because of its long lasting presence in the environment [2].

Lead poisoning in adults can have various reasons. In Iran, miners, industrial workers in dye or battery-manufacturing factories, residents of industrial cities, and drivers are at risk of lead poisoning [2]. Recently,

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several cases of non-occupational lead poisoning were reported, due to consumption of lead-contaminated compounds such as opium [3]. Inorganic lead is absorbed through the lungs and digestive system. Lead is accumulated in the blood, soft tissue, and bone [4]. Lead poisoning affects the central nervous system, peripheral nervous system, renal function, and vascular and digestive systems, and causes anemia, renal failure, neuropathy, and gastrointestinal symptoms [5, 6]. It may present with non-specific signs and symptoms, such as abdominal pain, constipation, irritability, difficulty in concentration, and anemia [7].

Today, considering the promotion of occupational health, lead poisoning is mostly traced in non-occupational cases, which may lead to late diagnosis. Clinical manifestations of lead poisoning are diverse [8]. Patients with undiagnosed lead poisoning are hospitalized repeatedly for gastrointestinal symptoms, like jaundice, and abdominal pain; undergo diagnostic procedures; and mistakenly experience surgeries for acute cholecystitis, chronic pancreatitis, and acute abdominal pain [9, 10]. Lead poisoning may increase liver enzymes, cause jaundice, or liver failure [10, 11].

Acute lead poisoning is also reported in self-injection and consumption of lead-contaminated opium cases [12, 13]. Since opium is mixed with lead to increase its weight, the risk of lead poisoning is high among opium addicts [14]. Recently lead poisoning has increased in Iran due to opium consumption [15-17]. Therefore, measurement of serum lead level in these people is important for the prevention and early treatment of lead poisoning. Although in recent years, cases of lead poisoning due to opium use in Iran have increased, few studies evaluated lead poisoning in opium consumers. This study aimed at evaluating the blood lead level in opium consumers in Mashhad, Iran.

2. Materials and Methods

This cross-sectional and descriptive study was conducted to evaluate the mean blood lead level in opium consumers with abnormal (high) blood lead level who were referred to Imam Reza Hospital, the only referral hospital of poisoning in Mashhad, Khorasan Razavi, Iran in 2016. This hospital is a general governmental hospital. This study only recruited opium consumers with lead poisoning in Mashhad. All of the participants had no history of lead poisoning in their past medical history or any occupational contact with lead. First, the blood lead level was measured in the participants based on the following procedure, and then, the demographic variables such as age, sex, opium-consumption-associated factors including the route and duration of opium consumption were investigated with relation to the found lead blood level.

All ethical considerations, such as voluntary participation in the study, obtaining written informed consent, freedom to withdraw from the study, data confidentiality, free of charge participation, explaining the objective and goals of the study to participants, and observing participants' right, were involved in the current study. Ethical approval was obtained from the Ethics Committee in Research of Mashhad University of Medical Sciences, Mashhad, Iran on February 19, 2016.

All addicted patients with abnormal blood lead level who were referred to the clinic or poisoning ward of Imam Reza Hospital were recruited until the saturation of the sample size. Based on The Cohen formula, the sample size was found as 214 people. The age and sex of the participants were recorded based on their ID cards. Duration and the mode of opium consumption were determined based on the participant's report.

To measure the blood lead level, 5 mL venous blood was drawn from each participant into sterile tubes containing ethylenediaminetetraacetic acid as anticoagulant. The atomic absorption spectrophotometry (Covanta Energy, GB) was used to measure the blood lead level of the samples. For this purpose, after separating the serum from the red blood cells, serum proteins were also separated using the trichloroacetic acid. Then, the solvent was centrifuged for 5 min and the final clear liquid was analyzed using the atomic absorption spectrophotometer to measure the lead level. Measurement was done by only one observer.

Inclusion criteria were as follows: 1. Confirmation of lead poisoning higher than 50 µg/dL [18]; 2. Opium addiction for more than one year; and 3. Lack of any serious physical illness. Exclusion criteria were as follows: 1. Co-ingestion; and 2. Incomplete files. Statistical analyses were performed using the SPSS version 18. The quantitative variables were reported as the mean ± standard deviation (SD) and the qualitative variables as frequency and percentage. For the statistical tests, the Fisher test was used to compare the means and Chi-square to compare the qualitative variables. The $P<0.05$ was considered as the level of significance.

3. Results

A total of 214 opium consumers with lead poisoning were enrolled in the current study with the mean age (SD)

of 43.11(18.14) year. All of them had signs or symptoms like abdominal pain (100%), constipation (100%), anorexia (100%), anemia (100%), peripheral neuropathy (67% only axonal pattern). Participants were classified into six age groups (Table 1) and the largest group (n=61; 28.5%) comprised people of 41 to 50 years old. The average (SD) blood lead level in the study participants was 139.5(48.5) µg/dL. The mean (SD) duration of opium consumption in the participants was 5.6(2.4) year, ranging from 1 to 25.

No significant relationship was observed between the blood lead level and age of the subjects (P=0.11), while the relationship between the blood lead level and the duration of opium consumption was statistically significant (P<0.003), in a way that higher blood lead levels were only observed in patients with at least 2 years of opium consumption history. The number of male participants in this study was significantly higher than females (92.5% vs. 7.5%). Of the total study population, 129(60.3%) consumed opium orally and 85(39.7%) as an inhalant. The relationship between the blood lead level and administration route of opium was statistically significant which indicated that the blood lead level of addicts who used opium orally was significantly higher than those who used its smoke (P<0.001).

4. Discussion

Based on the study results, the mean (SD) age of the participants was 43.11(18.14) year, and no significant relationship was observed between the age and average blood lead level. In Salehi et al. (2009) study, the mean age of opium consumers was 38 year, which was consistent with our study results [14]. Kalantari et al. reported that the mean blood lead level increases as the industrial workers' age increases [15], which was inconsistent with our results. This contradiction can be attributed to different study designs.

Meybodi et al. (2012) and Karimi et al. (2009) showed that the mean age of opium consumers with lead poisoning were 42 year [16] and 41 year, respectively which were both similar to the results of this study [17]. However, Abbasi et al. (2010) reported that the mean age of opium consumers was 22 year, which was inconsistent with our results. This contradiction can be attributed to different study populations and mode of opium consumption [19].

Based on our study results, lead poisoning was more prevalent among male opium addicts than among female addicts (925% vs. 7.5%). The same prevalence (96% vs. 4%) was also reported by Meybodi et al. (2012) [16]. However, Karimi et al. reported that all opium consumers with lead poisoning were males [17]. In Abbasi et al. study, male opium consumers were more than females ones (68% vs. 38%), which was consistent with the results of this study [19].

The results of this study showed that 60% of the participants consumed opium orally, and the rest inhaled its smoke. Moreover, the average lead level was 139 µg/dL among the study participants, while based on the Occupa-

Table 1. Demographic data of study participants with high blood lead level

Variable		Frequency	Percentage	P
Age group (year)	21-30	29	13.5	0.11
	31-40	53	24.8	
	41-50	61	28.5	
	51-60	40	18.7	
	61-70	25	11.7	
	71-80	6	2.8	
Sex	Female	16	7.5	<0.001
	Male	198	92.5	
Administration route	Oral	129	60.3	<0.001
	Inhalation	85	39.7	

tional Health/Hygiene Publication Committee of Iran, the acceptable blood lead level is 50 µg/dL [18]. Blood lead level of more than 50 µg/dL causes anemia [20]. Salehi et al. and Kalantari et al. reported that the average blood lead levels among opium addicts (28.6 µg/dL) and industrial workers (16.06 µg/dL) were higher compared with the healthy cases and the general population [14, 15].

Meybodi et al. in a study similar to this survey, reported that the average blood lead level in opium consumers was 145 µg/dL. Hence, the risk of lead poisoning should be considered in opium consumers following the presentation of non-specific symptoms, such as acute abdominal pain [16]. Based on Abbasi et al. results (2010), the average lead level in opium addicts was significantly higher than that in the control participants. They indicated that using opium as an inhalant may affect the level of lead absorbed through blood flow [19].

Khatibi Moghadam et al. (2016) reported a higher average blood lead level in opium consumers (7.14 µg/dL) than in healthy controls [21]. Hayatbakhsh MM et al. study in Kerman (2017) showed an increase in the frequency of acute lead poisoning amongst opium users [22]. These results were consistent with our study. This can be associated to the consumption of fake opium impregnated with lead. Therefore, screening the blood lead level of opium addicts can be helpful, especially in those who developed non-specific symptoms [21].

Similar to our study, Domeneh et al. (2014) reported that the average level of blood lead in addicts who used opium orally (11.75 µg/dL) was significantly higher than those who used opium as an inhalant (7.14 µg/dL) and healthy controls; but significant difference was not observed in the blood lead level between the participants who used opium as inhalant and the healthy controls. Hence, the blood lead level is higher among opium consumers, especially in those who use it orally [23].

Study Limitations: This study also had some limitations. First, there was no control group. Therefore, we recommended that further case-control studies in the same field should be designed. Second, due to the low number of similar studies, comparing our results with those of the other studies was impossible; hence, further studies in the same field are recommended. Third, this study used a cross-sectional design; therefore, the relationships could not be attributed to cause and effect. Further cohort and controlled studies are recommended in this regard.

5. Conclusion

In sum, the blood lead level is much higher than the acceptable limit in opium addicts; hence, the risk of lead poisoning should be considered, especially in those who take it orally.

Ethical Considerations

Compliance with ethical guidelines

Ethics approval was obtained from the Ethics Committee in Research of Mashhad University of Medical Sciences, Mashhad, Iran on February 19, 2016.

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Conflict of interest

There are no conflict of interest to report. All authors were equally involved in the study design and data collection, interpretation of the results, and editing for intellectual content. All authors approved the final version of the manuscript.

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