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ORIGINAL ARTICLE

Relationship of Serum Lead Level in Opium Consuming Patients with Clinical and Demographic Symptoms: A Retrospective Study

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KEYWORDS

Drug abuse;
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ABSTRACT: Drug abuse and its complications and side effects are one of the big problems of the Middle East, especially in Islamic Republic of Iran. Lead is a mutagen and carcinogen and it causes disruption of the body's enzymatic reactions, disruption of molecule synthesis, reduction of the life of red blood cells, kidney, heart and nerve complications, effects on the fetus, hallucinations, memory loss, nephropathy, brain and nerve damage, pain. It is in the device. Drug providers may use lead during narcotics production to increase the weight of opium, leading to lead poisoning. The present study was conducted with the aim of epidemiologically investigating the clinical indicators of patients admitted to Shahid Beheshti Hospital in Babol due to lead poisoning. This is a retrospective descriptive cross-sectional study. Census sampling was used to include the medical records of all patients who attended Rouhani Hospital and Shahid Beheshti Hospital emergency departments in Babol city, Mazandaran province, Iran due to lead poisoning in a 5-year period from 2016 to 2021. In order to describe variables, the mean and standard deviation were used for quantitative data. For qualitative data, frequency and percentage were used. To evaluate the relationship between variables, t-test and Chi-square test were used. A p-value of less than 0.05 was considered statistically significant. According to the findings, 44.2% of patients were older than 57 years; 62.5% lived in urban areas; 50% were unemployed; 88.3% were married, and 42.5% held a diploma. The mean serum lead level in patients was 74.8±20.22. A total of 52 patients (43.3%) had mild poisoning, 45% had moderate poisoning, and 11.7% of patients had severe poisoning. The obtained results showed a statistically significant relationship between lead poisoning severity and the age, education level, place of residence, history of previous poisoning and duration of narcotics use by

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patients (*P*-value<0.05). Moreover, the results showed that there is a statistically significant relationship between serum lead level and abdominal pain, nausea, limb weakness and convulsions in patients (*p*-value <0.05). According to the results, measuring serum lead level in opium-addicted patients who attend the medical centers with clinical symptoms such as anemia, nephropathy, convulsions, limb weakness, fatigue and abdominal pain, can be a great help in poisoning diagnosis.

INTRODUCTION

Drug abuse and its complications and side effects are one of the big problems of the Middle Eastern countries [1, 2]**.** Drug abuse imposes a substantial socio-economic burden on societies across the world [3]. According to the World Narcotics Report, about 62 million people worldwide misuse opioids [4] half of whom are the main users of minimally processed products such as opium [4]. Opium is among those narcotic drugs that are widely used in the Middle Eastern Countries [5]. Addiction not only leads to severe and deep physical and mental damage in the addicted person, but also leads to social damage such as increasing divorce, delinquency and unemployment [4,5]. Moreover, over many decades, opium has been the most commonly abused substance in Iran, and more than 2 million Iranians use this narcotic drug [6]. Opium users take it orally, inhaled, or smoked [7, 8]. Due to the increasing price of opium, impurities are commonly made in opium products to strengthen its profitability [9]. Lead is one of the most commonly used impurities in this process [10]. Lead addition is not part of the opium production process, but it may be added to opium to increase its weight or improve its appearance [6, 11]. Secondary addition of lead may also occur due to the contamination of soil or equipment used during opium production [12]. Lead can easily be swallowed together with opium [13]. The lead existing in the opium can cause acute and chronic poisoning in humans [14]. Lead poisoning is one of the poisonings whose manifestations depend on the serum lead level [8, 15]. It may occur in the oral or inhaled form or in both during opium use [16]. The lead existing in the adulterated opium products is best absorbed through the gastrointestinal tract and causes acute or chronic poisoning [17]. Lead poisoning effects are broad and non-specific, challenging diagnosis [12]. Moreover, depending on the acute, sub-acute, or chronic exposure to lead, the poisoning symptoms will be different [15]. However, most patients with chronic lead poisoning attend a hospital emergency department with abdominal pain [18, 19]. Abdominal pain and constipation are among common complaints in opium-related lead poisoning [20, 21]. Moreover, the presence of many non-specific symptoms in drug addicts mimics the symptoms of lead poisoning. On the other hand, there is a high prevalence of multiple symptoms, including the symptoms of mental diseases and those that mimic diseases such as cholecystitis and pancreatitis, as well as non-specific abdominal pains in narcotics-dependent patients [22]. Most patients attending hospitals with symptoms of lead poisoning have been opium users in oral form. This issue has strengthened the mentality indicating that these poisonings occur due to adulteration of narcotic drugs with lead [23-25].

Since the consumption of oral opium is high among Iranians, especially in the city of Babol, and the addition of lead to opium is common for the heaviness of the opium, the present study was conducted with the aim of epidemiologically investigating the clinical indicators of patients admitted to Shahid Beheshti Hospital in Babol due to lead poisoning.

MATERIALS AND METHODS

This retrospective descriptive cross-sectional study was conducted by reviewing the medical records. Census sampling was used to include the medical records of all patients who attended Rouhani Hospital and Shahid Beheshti Hospital emergency departments in Babol city (Mazandaran province, Iran) due to lead poisoning in a 5-year period from 2016 to 2021. The criterion for entering the study is the symptom of abdominal pain in patients who used oral opium. According to the Census, 120 patients presenting with a chief complaint of

abdominal pain who used oral opium were registered. Data collection was started after getting the approval of the Vice-Chancellor for Research and Ethics Committee, and introducing the researcher to Babol Forensic Medicine Center to announce the evaluation time period. In order to gather data, a researcher-made checklist developed based on the scientific resources and text review was used. The researcher-made checklist included the patient's basic and demographic data, data related to clinical symptoms, as well as laboratory findings. The validity of the checklist was examined using face validity and qualitative and quantitative content methods. In order to determine the validity of each item, the checklist was provided to 10 faculty members, including 3 members of the General Surgery Department, 4 members of the Department of Forensic Medicine, and 3 members of the Pathology Department. Content validity ratio (CVR) and content validity index (CVI) were calculated for all items one by one. Therefore, all items had acceptable validity in terms of necessity. The reliability of the checklist was also examined using Cronbach's alpha coefficient (internal consistency of the instrument), and the internal consistency of the checklist was calculated to be 0.90. In this research, 4 medical records were excluded from the study due to incomplete data.

Overall, 120 medical records were investigated, and the obtained data were analyzed with SPSS v.16 software. In order to describe variables, the mean and standard deviation were used for quantitative data. For qualitative data, frequency and percentage were used. To evaluate the relationship between variables, t-test and Chi-square test were used. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 120 patients with the mean age of 50.9±15.09 years were included in the study. In general, 95% of patients were male, 44.2 % of patients were older than 57 years, 62.5% lived in urban areas, 50% of patients were unemployed, 88.3% were married, 42.5% held a diploma, 44.2% had no history of poisoning, 94.2% did not take psychiatric drugs, 41.7% had a history of drug abuse for more than 21 years, 62.5% took narcotic drugs orally, and 72.5% were opium users. Most of the chelating agents were used in the pharmacological treatment of lead poisoning (89.2%).

According to the obtained results, 52 patients (43.3%) had mild poisoning, 45% had moderate poisoning, and 11.7% had severe poisoning. Table 1 reports the mean level of lead variables in patients in terms of the poisoning severity.

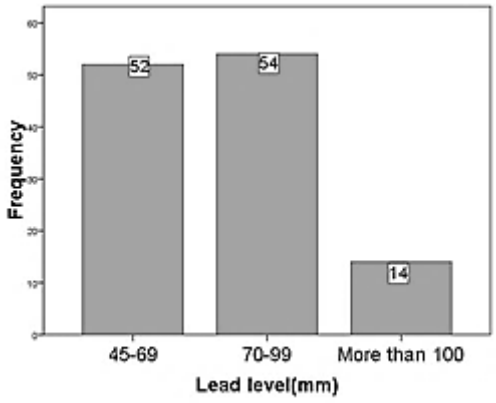

Figure 1. Frequency distribution of serum lead levels in patients.

Table 1. Frequency distribution of the severity of lead poisoning and serum lead level in patients with lead poisoning

Serum lead level (micrograms per deciliter (mcg dL^{-1})	Frequency	Percent
45-69 (mild poisoning)	52	43.3
70-99 (moderate poisoning)	54	45
>100 (severe poisoning)	14	11.7

Chi square test was used to evaluate the relationship between clinical symptoms and lead poisoning severity

in patients. Based on the Chi square test results, there is no statistically significant relationship between the lead poisoning severity and gender, marital status, history of taking psychiatric drugs, type of narcotic drug, and drug consumption method (p-value> 0.05) (Table 2).

The results of Chi square test showed that there is a statistically significant relationship between lead serum level and abdominal pain, nausea, weakness and convulsions in patients (p-value <0.05) (Table 3).

Table 2. Evaluation of the relationship between personal and social characteristics of drug addicted patients and lead poisoning severity in patients.

Variable		Serum lead level (micrograms per deciliter (mcg dL^{-1})			Total frequency (%)	P-value
		Mild Frequency (%)	Moderate Frequency (%)	Severe Frequency (%)		
Age	Below 41 years old	(13.3)16	(11.7)14	(4.2) 5	(29.2)35	0.04
	42-56 years old	(12.5)15	(8.3)10	(5.8) 7	(26.7) 32	
	Older than 57 years	(17.5)21	(25)30	(1.7) 2	(44.2) 53	
Gender	Male	(40.8) 49	(44.2) 53	(10) 12	(95) 114	0.196
	Female	(2.5) 3	(0.8) 1	(1.7) 2	(5) 6	
Education level	High school and lower levels	(23.3) 28	(30.8) 37	(3.3) 4	(57.5) 69	0.021
	Diploma	(20) 24	(14.2) 17	(8.3) 10	(42.5) 51	
Residence place	Urban areas	(21.7) 26	(32.5) 39	(8.3) 10	(62.5) 75	0.04
	Rural areas	(21.7) 26	(12.5) 15	(3.3) 4	(37.5) 45	
Marital status	Married	(39.2) 47	(39.2) 47	(10) 12	(88.3) 106	0.821
	Single	(4.2) 5	(5.8) 7	(1.7) 2	(11.7) 14	
History of previous poisoning	Yes	(18.3)22	(30) 36	(7.5) 9	(55.8) 67	0.033
	No	(25) 30	(15) 18	(4.2) 5	(44.2) 53	
History of taking psychiatric drugs	Yes	(39.2) 47	(43.3) 52	(11.7) 14	(94.2) 113	0.189
	No	(4.2) 5	(1.7) 2	(0) 0	(5.8) 7	
Duration of drug use (years)	10>	(9.2) 11	(10) 12	(7.5) 9	(26.7) 32	0.02
	11-20 years	(14.2) 17	(15.8) 19	(1.7) 2	(31.7) 38	
	21<	(20) 24	(19.2) 23	(2.5) 3	(41.7) 50	
Type of drug use	Opium	(27.5) 33	(36.7) 44	(8.3) 10	(72.5) 87	0.183
	Sap	(13.3) 16	(5) 6	(2.5) 3	(20.8) 25	
	Smoked	(2.5) 3	(3.3) 4	(0.8) 1	(6.7) 8	
Drug use method	Oral	(24.2)29	(31.7) 38	(6.7) 8	(62.5)75	0.272
	Inhaled	(19.2)23	(13.3)16	(5) 6	(37.5)45	

Table 3. Evaluation of the relationship between clinical symptoms and lead poisoning severity in patients

Variable		Serum lead level (micrograms per deciliter (mcg dL^{-1})			Total frequency (%)	P-value
		Mild Frequency (%)	Moderate Frequency (%)	Severe Frequency (%)		
Abdominal pain	**Yes**	(40) 48	(45) 54	(10.8) 13	(95.8) 115	0.04
	No	(3.3) 4	(0) 0	(0.8) 1	(4.2) 5	
Constipation	**Yes**	(38.3) 46	(43.3) 52	(10.8) 13	(92.5)111	0.309
	No	(5) 6	(1.7) 2	1	(7.5) 9	
Fatigue	**No**	(18.3) 22	(17.5) 21	(7.5) 9	(43.3) 52	0.228
	Yes	(25) 30	(27.5) 33	(4.2) 5	(56.7) 68	
Nausea	**Yes**	(22.5) 27	(21.7) 26	(10) 12	(54.2) 65	0.03
	No	(20.8) 25	(23.3) 28	(1.7) 2	(45.8) 55	
Limb weakness	**No**	(9.2) 11	(10.8) 13	(6.7) 8	(26.7) 32	0.022
	Yes	(34.2) 41	(34.2) 41	(5) 6	(73.3) 88	
Convulsions	**Yes**	(2.5) 3	(1.7) 2	(5.8) 7	(10) 12	<0.001
	No	(40.8) 49	(43.3) 52	(5.8) 7	(90) 108	
Nephropathy	**No**	(3.3) 4	(2.5) 3	(1.7) 2	(7.5) 9	0.542
	Yes	(40) 48	(42.5) 51	(10) 12	(92.5)111	

DISCUSSION

About half of the studied patients had mild poisoning. The results of the studies [27-29] were also in agreement with those obtained in the present study. However, most of the people studied [25] were reported to have severe lead poisoning. Such contradictory findings can be attributed to the type of study, sample size, and different sampling methods. The results of the present study showed no significant relationship between serum lead level in patients and gender, marital status, history of taking psychiatric drugs, and opium consumption method. In line with the findings of the present study, the study by Afzali et al. found no significant relationship between serum lead level and different methods of narcotic drugs usage (oral, inhaled, smoked) [30]. However, in a systematic and meta-analysis, Farnia et al. showed that the route of administration and gender are significantly related with the serum lead level in opium users [13]. Contrary to the results of the present study, Najari et al. [29] showed that the mean serum lead level was significantly higher in oral opium addicts as compared to the addicts who used opium as an inhaled substance. The results of the present study showed that there is a statistically significant relationship between serum lead level in patients and their age and duration of narcotic drug use. The results of the research studies [25, 28, 29, and 32] were inconsistent with those obtained in this study.

The results of the present study showed that the most common clinical symptoms of lead poisoning were constipation, fatigue, abdominal pain, nausea, body weakness, and convulsions. Najari et al. found abdominal pain, constipation, anorexia, and anemia to be respectively the most common symptoms of lead poisoning [29]. A researcher reported anemia as the most common symptom of lead poisoning [32]. Research reported abdominal pain, constipation and anorexia to be respectively the most common symptoms of lead poisoning [25]. Moreover, symptoms such as abdominal pain, nausea, vomiting, abdominal tenderness, irritability, lethargy, and anemia were reported by researcher as the most common symptoms of lead poisoning [33]. Considering the findings, lead poisoning symptoms seem to be multiple diseases that often lead to unnecessary diagnostic methods, misdiagnosis and even surgery [34]. Finally, as lead poisoning is accompanied by non-specific symptoms, screening for elevated blood lead

levels, and blood lead level evaluation in high-risk persons should be prioritized. Screening tests are recommended to be conducted for every drug-addicted patient with non-specific sub-acute symptoms such as abdominal pain, constipation and anemia [21]. Medicinal plants and plant products [35-38] such as opium can be naturally obtained from sources such as water and soil or manually through drug dealers to heavy metals such as lead which have toxic effects on various body tissues and cause chronic diseases such as become infected with diabetes, cancer, etc [39-46]. The results of this study showed that lead poisoning occurs in drug-addicted patients due to adulteration of opium with lead. According to the results of this study, it can be concluded that serum lead level measuring is a great help in diagnosis for oral opium-addicted patients who attend the hospital with clinical symptoms such as anemia, nephropathy, convulsions, limb weakness, fatigue and abdominal pain.

CONCLUSIONS

Moreover, specialized treatment for lead removal should be started by the emergency and poisoning physician if necessary. Raising awareness at the community level about the narcotic drugs contamination, encouraging people to live a healthy lifestyle and kick an addiction to drugs, and using an alternative treatment are suggested. Every research study has its own limitations. Among the limitations of this study, we can refer to the dispersion of information in medical records of patients, retrospectivity of the study, lack of access to patients during the study, and failure to take history and comprehensive clinical study by the researcher.

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ETHICAL CONSIDERATION

Data collection was started after getting the approval of the University Vice-Chancellor for Research and obtaining the ethical code of IR.MUBABOL.REC.1401.093, and introducing the researcher to Educational and Therapeutic Center of Babol city and getting permission from hospital management to announce the evaluation time period.

Conflict of interests

Authors denied any possible conflict of interest with other people or organizations regarding research, writing and publication of this study.

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