Evaluation of Clinical Symptoms and Serum Lead Level in Patients with History of Oral Opium Use being Admitted to Hazrat Rasoul Akram, Firoozgar, Firoozabadi and Haft Tir Hospitals, Tehran

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Authors’ contributions

This work was carried out in collaboration between both authors. Both authors red and approved the final manuscript.

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ABSTRACT

Introduction: Drug abuse and its complications is a socio-health problem in Middle Eastern countries such as Iran. Smugglers may add lead to drug during drug production, which is in order to increase its weight for greater benefit. Considering the frequency of the patients with various complaints among Iranians, this study was designed and conducted to evaluate the clinical symptoms and serum levels of lead in patients being admitted to Hazrat Rasoul Akram, Firoozgar, Firoozabadi and Haft Tir hospitals with any complaints.

Materials and Methods: In this case-control study, serum levels of lead were measured in 128 samples in case and control groups. The case group consisted of 64 patients using oral opium who being admitted to Rasoul Akram and Firoozgar, Haft Tir and Firoozabadi hospitals with different complaints in May 2017. The control group consisted of 64 patients with no history of addiction that were homogenized with the case group in terms of age and sex. They were evaluated for serum levels of lead and other variables. Data were analyzed by SPSS software.

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Results: The mean serum lead level was 76.34±17.82 in the group using opium and was 7.68±3.72 in the control group that the difference was statistically significant (P <0.001). The most common complaints of patients were abdominal pain and symptoms of bowel obstruction. The mean rate of oral opium consumption was 1.73±0.23 in subjects under 50 years old and with a mean of 2.89±0.27 in subjects over 50 years old. Serum lead level was significantly (P = 0.032) increased compared to the amount consumed. Duration of oral opium consumption was 5 months to 30 years with a mean of 15.24 years, which was not significantly correlated to serum lead level (P = 0.213). Also, the hemoglobin range was significantly correlated to different levels of lead in patients consuming oral opium (P = 0.027).

Conclusion: The findings of the present study showed a high mean serum lead level in oral opium addicts in the study population. The results also confirm numerous reports suggesting the definitive diagnosis of lead poisoning as a justifying factor in addicted patients with nonspecific symptoms, which may indicate the need for serum lead level screening in opiate addicts to prevent more serious complications.

Keywords: Serum lead level; oral opium use; clinical symptoms; drugs.

1. INTRODUCTION

Lead is a heavy metal found in nature and can cause acute or chronic poisoning [1]. Today, the use of lead in many materials as well as in various industries has contaminated our environment [2]. Since the major sources of contaminants include colors, cosmetics, dust, drinking water, parents' workplace, air and food, the likelihood of lead contamination in societies is high, although the prevalence of this contamination among people of society is unknown and unfortunately the concentration of lead in blood have never been tested publicly, but the prevalence of lead poisoning has varied from 8 to 20% in various studies [3]. Recently, the World Health Organization (WHO) has been considering lead poisoning and its dangers, because in most countries, exposure to lead and the transfer of this metal to the body have been observed and led to problems for people's health to the extent that continuous contact with lead can accumulate in the body and cause numerous injuries to various parts of the body such as the nervous system, blood, digestive system, kidney and cardiovascular system [4]. The manifestations of lead poisoning are nonspecific, including: nonspecific abdominal pain, constipation, irritability, muscle pain, headache, anorexia, decreased libido, focusing disorders, and so on. Nonspecific abdominal pain in these cases can be confused with cholecystitis, pancreatitis, and acute abdomen. In these cases, gastrointestinal examinations and even unnecessary surgeries may be performed [5].

The number of reports on lead poisoning has increased compared to the past, and these reports do not relate to a specific geographic area, but almost one can say that a kind of lead poisoning epidemic has occurred among opium users in all provinces of the country [6]. Most people who have been admitted to hospitals with symptoms of lead poisoning have been oral opium users and this has reinforced the notion that it is due to lead added to their used drugs [7]. Adding lead to opium is extremely dangerous and in addition to acute poisoning, it can dramatically increase the complications and even mortality, and it causes irreparable damage to individuals and society [8,9]. Considering the population of 2 million at risk, this issue has also raised a new challenge for responsible institutions, while increasing the demand for specialized lead poisoning medications from various cities and the psychological stresses created in the society [6,10]. For this reason, it seems that implementing a targeted care plan can greatly reduce the psychological burden as well as the subsequent problems and consequences of this phenomenon.

Considering the frequency of the patients with various complaints such as headache, nonspecific abdominal pain, constipation, irritability, focusing disorders and so on among Iranians, this study was designed and conducted with the aim of evaluating the clinical symptoms and serum lead level of patients being admitted to Hazrat Rasoul Akram, Firoozgar, Firouzabadi and Haft Tir hospitals with any complaints during one month.

2. MATERIALS AND METHODS

In this cross-sectional case-control study, blood lead levels were measured in 128 samples in two case and control groups during one month in
Rasoul Akram, Firoozgar, Haft Tir and Firoozabadi Hospitals in May 2017. Inclusion criteria in the case group were all patients consuming oral opium with various complaints. Accordingly, 64 patients in the control group were studied and serum lead level was measured in all of them. Also, 64 healthy control individuals who were homogenized with the first group in terms of age and sex but did not have disease were evaluated for serum lead level and other variables. Exclusion criteria were those who worked in battery manufacturing factories, or had jobs such as soldering, wiring, pottery, ammunition manufacturing, radiator manufacturing and paint manufacturing.

To evaluate blood lead level (BLL), 5 ml of venous blood was collected from the study groups in sterile blood tubes (containing EDTA as anticoagulant). Lead level of the samples was evaluated through atomic absorption spectrophotometry by GBCavanta. In this method, after serum extraction from blood, the proteins in serum were separated by trichloroacetic acid (TCA) and the resulting solution was centrifuged for 5 min and the resulting supernatant was injected into the atomic absorption apparatus and after calibration the lead level was measured.

2.1 Data Analysis

Data were analysed using SPSS version 21 for descriptive statistics. The relationship between BLL and the amount of drug used was assessed by regression analysis.

3. RESULTS

The case group consisted of 29-77 year olds with mean age of 46.27±9.12 years and 97% of patients were male and 3% were female. The most common and most important complaint was abdominal pain and symptoms such as bowel obstruction, which led the patients being admitted to hospital emergency. All patients with abdominal pain were given surgical consultation service, endoscopy and colonoscopy were performed for all, and gastrointestinal consultation was performed after discharge. All were normal, with only 1 case of erosive gastritis and 2 cases of inflammatory colitis.

Symptoms observed in the patients include loss of appetite, chronic constipation, nausea and vomiting, memory impairment, pins and needles in fingers, anemia and paleness, weakness and lethargy, weight loss, bone and muscle pain.

All patients underwent ultrasound, all of which were normal except for 4 cases of gallbladder stone and sludge. Two others underwent exploratory laparotomy but the final diagnosis was ileus. Of the 3 patients with abdominal pain, 71.28% had anemia, and the liver enzyme was increased in 32.41% of the cases. Kidney function was normal in all of them.

The mean serum lead level in the case group (41 to 105 mg/dl) was 76.34±17.82 and in the control group (3 to 18 mg/dl) it was 7.68±3.72. Mean serum lead level in the case group was higher than the control group, the difference between the two groups was statistically significant (P <0.001).

The level of lead in the patients consuming oral opium with dominant symptoms at 0.0% was below 25 mg/dl (non-toxic), 12.13% (25 to 45 mg/dl) (toxic), 21.21% of them had mild lead poisoning (45 to 69 mg/dl), 57.57% had moderate poisoning (70 to 99 mg/dl) and the lead level was over 100 mg/dl at 9.09% of the patients which is severe poisoning. As shown in Fig. 1. In the patients consuming oral opium with non-dominant symptoms at 29.04% it was below 25 mg/dl (non-toxic), 41.95% (25 to 45 mg/dl) (toxic), 19.35% of them had mild lead poisoning (45 to 69 mg/dl), 9.67% had moderate poisoning (70 to 99 mg/dl) and at 0.00% of the patients the lead level was over 100 mg/dl which is severe poisoning.

Serum lead level in the case group were over 25 mg/dl (toxic) in all the patients with dominant symptoms, in the patients with non-dominant symptoms at 70.96% it was over 25 and it was below 25 in the control group in all subjects. In the control group, serum lead level was below 25 in all and was lower than the toxic level and was in the normal range, which had a significant difference (P = 0.016) shown in Table 1.

The rate of oral opium consumption in subjects under 50 years old was 1-3 g daily, with a mean of 1.73±0.23. In subjects over 50 years old, it was 2-4 g daily with a mean of 2.89±0.27. In the case group, the serum lead level was significantly correlated to the amount of drug use and the serum level of lead was significantly increased compared to the amount of drug use. (P = 0.032).
Table 1. Serum lead level in patients consuming oral opium

<table>
<thead>
<tr>
<th>Lead level (mg/dl)</th>
<th>Number</th>
<th>Frequency percentage</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with dominant symptoms</td>
<td>Less than 25</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>25-45</td>
<td>4</td>
<td>12.13</td>
</tr>
<tr>
<td></td>
<td>45-69</td>
<td>7</td>
<td>21.21</td>
</tr>
<tr>
<td></td>
<td>70-99</td>
<td>19</td>
<td>57.57</td>
</tr>
<tr>
<td></td>
<td>Over 100</td>
<td>3</td>
<td>9.09</td>
</tr>
<tr>
<td>Patients with non-dominant symptoms</td>
<td>Less than 25</td>
<td>9</td>
<td>29.04</td>
</tr>
<tr>
<td></td>
<td>25-45</td>
<td>13</td>
<td>41.95</td>
</tr>
<tr>
<td></td>
<td>45-69</td>
<td>6</td>
<td>19.35</td>
</tr>
<tr>
<td></td>
<td>70-99</td>
<td>3</td>
<td>9.67</td>
</tr>
<tr>
<td></td>
<td>Over 100</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Control group</td>
<td>Less than 25</td>
<td>64</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>25-45</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>45-69</td>
<td>0</td>
<td>0.00</td>
</tr>
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<td></td>
<td>70-99</td>
<td>0</td>
<td>0.00</td>
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<td></td>
<td>Over 100</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Duration of oral opium consumption in the case group ranged from 5 months to 30 years with a mean of 15.24 years. In the case group, the serum lead level had no significant relationship with duration of drug use (P = 0.213). As shown in Fig. 2.

The serum lead level in the case group was over 25 mg/dl (toxic) in all. Hemoglobin range was significantly correlated to different levels of lead in patients consuming oral opium (P = 0.027).

4. DISCUSSION

Lead poisoning has been diagnosed thousands of years ago and still exists. Lead is one of the heavy metals that can act as an acute or chronic toxic agent [11]. Natural BLL is different in different parts of the world, for example it is 12.37 µg/dl in Tehran, less than 10 µg/dl in Australia, 1.79 in New York and 13.9 µg/dl in Pakistan [7]. Inorganic lead is absorbed from the lungs and digestive system and accumulates in blood, soft tissue and bone. The clinical symptoms of lead poisoning are quite different from one person to another. Lead poisoning affects the central and peripheral nervous system, kidney function, vascular system and digestive system and causes anemia, kidney damage, neuropathy and gastrointestinal symptoms [12].
In this study, BLL was compared in the case and control groups and it was shown that BLL was higher in the case group than in the control group; the difference between the two groups was statistically significant. In addition, BLL in addicted patients was correlated to amount of drug use. Both groups were homogenized and the only difference was oral drug use. Therefore, an increase in BLL in the case group may be due to contamination of drug with lead. All the patients had a toxic level of lead that was equal to blood lead more than 25 µg/dl [8]. On the other hand, the prevalence of multiple symptoms, including mental illness, symptoms that mimic diseases such as cholecystitis, pancreatitis, and nonspecific abdominal pain was high in drug-dependent patients. Also, lack of patients’ participation in the project and collection of information and incomplete information needed by the patients were among the limitations of the present study.

Soltaninejad et al. 2018, in a review study on lead poisoning in opium abuse in Iran, stated that assessment of blood lead level is highly important for early diagnosis of lead poisoning in opium addicts [13]. Massoudi et al. reported 3 cases of lead poisoning in drug dependents and suggested it as a new source for lead poisoning in Iran [14]. Algora et al. reported examples of lead poisoning in addicts with abdominal pain and anemia [15]. Betty et al. reported 5 cases of drug and lead injection [16]. Anthony et al. described a case of lead poisoning in heroin addicts [17]. Afghanistan and Iran share borders, and Afghanistan is the world’s largest producer of drugs. In addition, Iran is one of the main routes of drug trafficking to the world, so Iran could potentially be exposed to the effects of drug abuse. The presence of lead in drugs has also been reported by Aghaei et al. [12]. They showed that traffickers and smugglers may add lead to the drugs during drug production, which is to increase its weight for greater benefit. As a result, drugs are considered as a potential source of lead poisoning [18-20].

In a study in southeastern Iran in 2016, which is consistent with the present study, Nemati et al. stated that there was a significant difference in BLL between opium users and the control group, but no correlation was found between blood lead concentration and the way of opium use [21]. In the study of Salehi et al., similar to our study, blood lead level was measured in 44 samples in two case and control groups with mean age of 38.8±6.7. The case group consisted of individuals (n=22) who were consuming oral drugs. The control group (n=22) was homogenized in terms of age and sex according to the exclusion criteria. According to the results of their study, the serum lead level in the case group was (69.90±7.20 mg/dl) with a mean of 21.9±13.2 and in the control group it was 17.4-4.1 with a mean of 3.5±8.6. The difference between the two groups was statistically
significant. In the case group, BLL was significantly correlated to drug use. However, there was no significant relationship between duration of use and serum lead level [22].

In a study by Wolf et al., 2001, drugs are therefore considered as a potential source of lead poisoning. In this study, BLL was higher in the patients than in the control group and the difference between the two groups was statistically significant. In addition, BLL was correlated to amount of drug use in the addicted patients. Both groups were homogenized and the only difference was oral drug use. Therefore, an increase in BLL in the case group may be due to contamination of drug with lead. About 40% of the patients had a toxic level of lead, which was equal to blood lead more than 25 µg/dl [18].

In a study by Anderson et al., 2001, considering the results of this study it seems that high BLL may justify the findings in drug-dependent individuals. Therefore, screening for blood lead concentrations in drug dependents, especially with nonspecific complaints, may be useful. No obvious relationship was observed between BLL and duration of drug use in the case group, which is expectable with respect to 36-day half-life of lead and duration of drug use in patients (at least two years) [20].

In cases of moderate to chronic exposure, symptoms of central nervous system involvement and nephropathy-related symptoms are often observed [23]. In adults, increased blood lead level is mainly due to occupational contacts [24]. In recent years, due to increased workplace safety, the incidence of occupational lead poisoning in adults has declined worldwide and new forms of non-occupational poisoning have emerged [25]. A new type of lead poisoning due to the use of lead-contaminated opium is gradually emerging in our area [26]. Drug addiction and its adverse effects are one of the most important health problems in Middle East countries including Iran. And the pattern of addiction is changing to hazardous drugs and methods. Drug suppliers and consumers may add lead to drugs during the preparation process for increasing the weight and other lucrative reasons. Numerous cases of pathological findings such as abdominal pain, neuropathy and anemia have also been observed in opium addicts [27].

In general, given that the costs and consequences of lead poisoning are totally preventable by reducing and eliminating sources of exposure and early diagnosis of high levels of lead in blood, it is imperative that primary care clinicians play an active role in prevention and early diagnosis of patients who are exposed to known lead exposure methods. Also, further studies with larger groups of opioid addicts (oral and inhaled) will allow these criteria to be more clearly identified and reported.

5. CONCLUSION

The present study showed a high mean serum lead level in oral opium addicts in the study population. Also, the findings of this study confirm the numerous reports on final diagnosis of lead poisoning as a justifying factor of symptoms in addicted patients with specific symptoms including abdominal colic pain, nausea, vomiting, weight loss, anemia, neuropathy, etc. which may indicate the need for serum lead level screening in opium addicts to prevent more serious complications. Therefore, screening for blood lead concentration in drug addicts, especially with nonspecific complaints, may be useful.

CONSENT AND ETHICAL APPROVAL

The authorization of this research was obtained from the Ethics Committee of Iran University of Medical Sciences and a checklist was used to collect all information of the both groups, including demographic information, health status and lifestyle. After completing the checklists, the information was analyzed according to the research objectives. The patients informed of the study and signed their consent to participate.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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