

Original Article

Comparison of Serum Lead Level in Oral Opium Addicts with Healthy Control Group

Hossein Salehi MD*, Ahmad Reza Sayadi MSc**, Mahnaz Tashakori PhD***, Rokhsareh Yazdandoost PhD[†], Narges Soltanpoor[‡], Hossein Sadeghi MD[‡], Mahmood Aghaee-Afshar MD*

Background: Drug abuse and its consequences are major health problems in Middle-East countries such as Iran. Salesmen and smugglers may add lead to opium during the process of opium preparation to increase the weight of opium for more profit. Several reports have found lead poisoning symptoms in opium addicted patients and there are many nonspecific symptoms mimicking lead poisoning in opium addicted patients. As far as the literature review is concerned, there is no comparative study about blood lead level (BLL) in addicted patients with healthy controls. Therefore, it seems evaluation of blood lead level in opium addicted patients to be important.

Methods: In this study, the BLL of forty-four subjects in two patient and control groups was evaluated. The patient group (22 subjects) was comprised of patients who used oral opium. Control group (22 subjects) was matched with the patient group for age and sex, considering inclusion and exclusion criteria with a mean age of 38.8±6.7. For blood lead assay, 3 mL of whole blood was obtained from both groups by venipuncture and BLL was assessed immediately using an atomic absorption spectrophotometer.

Results: The BLL in patient group had a range of 7.2 to 69.9 µg/dL with a mean of 21.9±13.2. In the healthy control group, BLL was between 4.1 to 17.4 µg/dL with a mean of 8.6±3.5. The mean difference of both groups ($t=4.56$) was statistically significant ($P<0.0001$). In the patient group, BLL had a significant correlation with the amount of opium ingested ($r=0.65$, $P<0.01$). However, there was no significant correlation with duration of opium ingestion in the patient group.

Conclusion: It would be concluded that opium addicts have an elevated BLL compared to healthy controls. Therefore, screening of blood lead concentration is helpful for opium addicted people especially with non-specific symptoms. In this regard, a similar investigation with a larger sample size of opium addicted patients (including both oral and inhaled) and a control group is suggested to confirm the findings of this research.

Archives of Iranian Medicine, Volume 12, Number 6, 2009: 555 – 558.

Keywords: Opium • serum lead level

Introduction

Lead is a heavy metal that commonly exists in the environment. It can either be an acute or chronic toxin.^{1,2} Car

exhausts, contaminated food, industrial emission and soil are the most important sources of lead exposure. Exposure to any of the above mentioned sources of lead through ingestion, inhalation, or dermal contact can cause significant toxicity.³

Manifestations of lead poisoning are non-specific, such as nonspecific abdominal pain, constipation, irritability, myalgia, muscle aches, headache, anorexia, decreased libido, concentration difficulties and so on. Nonspecific abdominal pain in lead poisoning can be misdiagnosed as acute cholecystitis, pancreatitis and acute abdomen. In these instances unnecessary gastrointestinal evaluation and abdominal surgery are often performed. During recent years, due to

Authors' affiliations: *Department of Surgery, Iran University of Medical Sciences, **Department of Psychiatry, Iran University of Medical Sciences, ***Department of Laboratory, Iran University of Medical Sciences, [†]Department of Humanity & Behavioral Sciences, Iran University of Medical Sciences, Tehran, [‡]Medical Student, Rafsanjan University of Medical Sciences, [‡]Department of Internal Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran.

Corresponding author and reprints: Hossein Salehi MD, Department of Surgery, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. Tel: +98-913-191-5227
E-mail: dr_hosseinsalehi@yahoo.com
Accepted for publication: 15 July 2009

increased levels of safety at work, the incidence of occupational and adult lead poisoning has declined; however, several reports have indicated lead poisoning in opium addicted patients.⁴⁻⁸

Drug abuse and its consequences are major health problems in Middle East countries such as Iran. In addition, nonspecific symptoms similar to lead poisoning, as mentioned above, are found in opium addicted patients. It seems that evaluation of blood lead level (BLL) in opium addicted patients might be important. Therefore, this study investigates BLL in two groups, consisting of oral opium addicts and a control group in order to understand the difference in BLL between them.

Materials and Methods

In this study, BLL of 44 subjects in two patient and control groups was evaluated. The patient group consisted of 22 patients who were selected through systematic incidental sampling from 225 orally opium addicted patients referred to the self-introducer unit of Moradi Hospital at Rafsanjan University of Medical Sciences. The control group consisted of 22 healthy subjects with no history of opium addiction who accompanied the patients. The two groups were matched with regard to age and sex.

Using a personal data questionnaire, all subjects of the two groups were interviewed on demographic characteristics, health status, and life style.

A written informed consent was taken from all subjects. Persons who worked in manufacturing or used batteries, solder, ammunitions, paint, car radiators, cable, wires, ceramic with lead glazes, and tin cans were excluded.^{2,9} For blood lead assay, 3 mL of whole blood was obtained from the studied groups by venipuncture in sterile blood collecting tubes containing EDTA as an anticoagulant. The sample was transferred and BLL was assessed immediately using an atomic absorption spectrophotometer. Data were analyzed statistically through SPSS 15. *T*-test was applied to compare the means of BLL in the two groups. The relation between BLL and rate of substance used was found through regression analysis.

Results

In this investigation, BLL of 44 subjects was measured. The patient group included 22 men with a mean age of 38.8±6.7 years with an age range of

26 – 50 years and 2 to 5 years duration of oral opium addiction. Healthy control group was matched with patient group in age and sex. The BLL in patient group was 7.2 to 69.9 µg/dL with a mean of 21.9±13.2. In the healthy control group, the BLL ranged from 4.1 to 17.4 with a mean of 8.6±3.5. The BLL mean was greater in the patient group than the control group. The mean difference between both groups *t*=4.56 was statistically significant (*P*<0.0001; Table 1). Lead poisoning diagnosis is based on blood lead level elevation defined as equal or greater than 25 µg/dL.¹⁰ On this basis about 40.9% (N=9) of the patient group had a toxic BLL but there was no BLL more than 25µg/dL in the control group (N=0; Table 2).

In the patient group, the amount of opium ingestion was 1 – 5 g daily with a mean of 3.03±1.13. The BLL had a significant correlation with the amount of opium ingestion (*r*=0.65, *P*<0.01). However, there was no significant correlation between BLL and duration of opium ingestion in the patient group (*r*=0.074, *P*=NS). BLL of all control group samples was below toxic level.

Table 1. The mean difference of BLL in opium addicted patients and healthy control group

Group	M	SD	<i>t</i>	<i>P</i> value
Patient	21.9	13.24	4.56	<i>P</i> < 0.0001
Control	8.6	3.5		

Discussion

Lead poisoning has accompanied human beings throughout history. *A number of research studied BLL in different countries of the world also in different groups (*Numerous researchers have studied BLL in various groups of different countries, worldwide). Normal BLL ranges differ throughout the world; for example Tehran's range is 12.37, Australia <10, New York 1.79 and Pakistan 13.9µg/dL.¹¹ A study in Tehran showed 35.5% of the bus drivers had a BLL≥50 µg/dL.¹² In another study of copy center workers, 94% of

Table 2. Number and percentage of BLL categories

BLL Categories	N	%
<25	13	59
25 – 35 µg/dL	7	32
36 – 45 µg/dL	1	4.5
>45 µg/dL	1	4.5

N total=22; N≥25; µg/dL=9

them had a BLL > 49.9 µg/dL, significantly higher than the control group.¹³ In addition, the mean BLL of paint factory employees was 50.71 µg/dL and significantly higher than the control group (20.44 µg/dL).¹⁴ Due to the increased levels of safety awareness at work, the incidence of occupational poisoning has decreased and new forms of nonoccupational poisoning have emerged. Opium addiction and its socioeconomic consequences is one of the biggest challenges in countries such as Iran. There are few studies of lead poisoning due to drug addiction. Lead poisoning in opium addicted patients has been observed previously. Algora et al. reported cases of lead poisoning in addicted patients who had abdominal pain and anemia.¹⁵ Beattie et al. in their research showed five cases of lead toxicity resulting from self injection of lead and opium.¹⁶ Masoodi et al. reported three cases of lead poisoning in opium addicted patients and suggested it as a new source of lead poisoning in Iran.¹¹ Antonini et al. described a case of lead poisoning during heroin addiction.¹⁷ To our knowledge this study is the first one comparing BLL in oral opium addicted patients with healthy controls in Iran.

Afghanistan and Iran have the same border and Afghanistan is the biggest producer of opium in the world. On the other hand, Iran is one of the main routes of worldwide opium transit. Therefore, Iran can be potentially affected by diverse aspects of opium usage. The presence of lead in opium is considered by Aghaee-Afshar et al. in Iran.¹⁸ Their report revealed that salesmen and smugglers may add lead to opium during the process of opium preparation to increase the weight of opium for more profit. Therefore opium can be potentially a source of lead poisoning.

In this study, BLL was found to be greater in the patient group than the control group. The difference between both groups was statistically significant. In addition, BLL in addicted patients correlated with the amount of opium ingestion. Since both groups were matched, the only different factor between the two groups was the usage of oral opium. Therefore, increased BLL in the patient group can be related to opium contamination with lead. About 40% of the patient group had toxic levels of lead defined as equal or greater than 25 µg/dL.¹⁰ In addition, the mean BLL of the control group in this study in the city of Rafsanjan was 8.6±3.5, while in Tehran it was

greater^{14,19} which is mostly related to air pollution in Tehran, as emphasized by Kebriaeezadeh et al.¹⁹

On the other hand, the prevalence of multiple symptoms including psychiatric disorders, cholecystitis, pancreatitis and nonspecific abdominal pain are high in addicted patients which is similar to lead poisoning.²⁰⁻²² It seems elevated BLL may explain the presence of these findings in addicted patients. Therefore, screening of blood lead concentration is helpful for oral opium addicted patients, specifically patients with nonspecific symptoms.

There was no significant correlation between BLL with duration of opium ingestion in the patients group. Of course this seems rational due to the relative short half life of lead in blood, which is approximately 36 days¹¹ compared with the length of duration of opium ingestion in the patient group i.e. at least two years of addiction.

Of course, the findings of the present study should be generalized carefully, because increased BLL in opium addicted patients depends on the amount of contamination of opium by lead. On the other hand, smugglers may contaminate opium by materials other than lead or not contaminate opium at all.

In conclusion, the findings of the study indicate reportable elevated toxic BLL in opium addicted patients compared to healthy controls. Therefore, screening of blood lead concentration is helpful for oral opium addicted patients, particularly patients with nonspecific symptoms. It is suggested that more investigations are needed with larger groups of opium addicted patients (oral and inhaled) and control groups to confirm the significant differences of the present study.

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