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Lead toxicity: a probable cause of abdominal pain in drug abusers

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Abstract

Background: Lead toxicity is caused by ingestion, inhalation, or contact with particles or vapors containing lead. It can present with nonspecific signs and symptoms such as abdominal pain, constipation, irritability, difficulty concentrating, and anemia. In this study, we have tried to find a relationship between lead poisoning and drug abuse.

Methods: In a cross sectional study, drug addicts presenting with abdominal pain referring to GI center of Imam Khomeini hospital in 2008 were observed. Patients having occupational contact with lead were excluded from the study. Required data included age, sex, clinical findings, Para clinic results and blood lead level. Results were analyzed through SPSS-15 software.

Results: 42 patients (all male) with average age of 46.9 ± 10.1 years were included in the study. Average blood lead level was 51.17±27.96µg/dl. 22 patients (52.6%) had lead toxicity. A significant relation was found between lead toxicity and mode of opium drug use; however relation between lead toxicity and duration of addiction was not significant. Similarly, a meaningful relation was found between lead toxicity and abnormal liver function test, urine tests, ECG, presence of basophilic stippling and hyperuricemia.

Conclusion: There seems to be a significant relation between opium drug abuse and lead toxicity. Further studies with more cases and ethnicities are needed.

Keywords: Lead toxicity, opium, drug abusers, abdominal pain.

Introduction

Lead is one of the elements found combined with other inorganic compounds in nature and it is rarely observed as organic (combined with organic substances).

Nowadays, considerable amounts of lead is found in water, soil, air and food stuff which stems from modern industrial world [1,2]. Studies indicate lead toxicity existed prior to the emergence of human civilization, however, epidemic lead toxicity relates to the industrial revolution [3]. Lead can enter body through various routes including ingestion, inhalation, and direct dermal contact.

The majority of adult elevated blood lead levels come from occupational exposures. The use of leaded paint has resulted in lead exposures at work in the construction trades [4,5], as well as home. An additional source

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of lead exposure has been identified as lead dust deposited on radiographs stored in lead-lined boxes [6]. In some parts of the United States, illegally distilled alcohol (moonshine) is an important source of lead exposure [7].

Lead poisoning has also occurred in those Ayurvedics [8-11] and in those cooking or eating off of lead-glazed tableware and cookware [12]. In adults, absorption of lead via the respiratory tract is the most significant route of entry, with an average absorption rate of approximately 40 percent [4].

The manifestations of lead poisoning are highly diverse and can vary from individual to individual. Many of the toxic effects of lead are reversible if lead poisoning is identified early. Among the common symptoms of lead poisoning are abdominal pain (lead colic), constipation, joint pains, muscle aches, headache, anorexia, decreased libido, difficulty in concentrating and deficits in short-term memory, anemia, nephropathy, lead line at gum tooth line, peripheral neuropathy frequently manifesting with extensor weakness or "wrist/ankle drop and other symptoms and signs in various combinations [13].

Prolonged exposure to lead has been associated with a number of potential health effects such as progressive renal disease characterized by diffuse interstitial fibrosis and renal failure, and more subtle decreases in renal function markers [14,15], hypertension [16], declines in neurocognitive functioning [17,18], psychiatric symptoms of phobic anxiety and hostility [20], white matter lesions in the brain and loss of brain volume [21], increased brain gliosis [22], distal sensory and motor neuropathies [23], and electrocardiographic evidence of conduction delays [24], and also increased risk of cataract. [25]

One of the cases recently recognized as the expediting factor of lead toxicity, or at least accompanying it is opium drug abuse. This hypothesis was formulated when clinicians found some drug addict cases presenting with abdominal pain, whose diagnosis remained ambiguous despite complete evaluation for abdominal pain. Due to suspicion as to the probability of lead poisoning, blood lead level was measured. In view of adverse consequences of lead toxicity as well as expansion of drug abuse, the necessity to have a special look at drug abuse as a probable source of contact with lead is felt. In this study, blood lead level of opium drug abusers presenting with ambiguous abdominal pain were explored.

Methods

In one descriptive- analytical study carried out is a cross-sectional way; drug addict patients presenting with abdominal pain and having normal imaging (sonography- CT scan) were evaluated. Exclusion criteria for the study included patients who had noted GI pathologies as a cause of abdominal pain, and patients who were occupationally placed at the setting of increased lead level. In this study, all patients qualifying to be included into the study were considered during one year and no specific sampling method was employed (accessible consensus).

Firstly, patients were required to give their account clinically, and the reason for referral and accompanying symptoms were taken into consideration. Then previous and present records were inquired and patients were questioned about addiction status including type, duration of addiction and route and method of taking drugs. Clinically, these patients were examined in terms of presence of lead line, blood pressure, peripheral neuropathy, etc., besides referring them to ophthalmologists for evaluation of cataracts.

Then after clinical examinations and paraclinical tests including CBC, blood biochemistry, liver function test, blood lead level, and cardiogram, their results were recorded. In this study, cut-off point designated for lead toxicity was blood lead level more than 25 μg/dl.

Statistical analysis: In this research, mean and standard deviation were applied for statistical analysis of quantitative data, and frequency and ratio have been used for the qualitative data. The comparison of means with t-test and comparison of ratios were carried out with χ^2 test. P value of less than 0.05 was considered significant.

Results

Forty two patients qualified the inclusion criteria for the study. All patients were male and the mean (± standard deviation) of their ages was 46.9 ± 10.1. In terms of type of addiction, all patients were opium-abusers. Based on their statements, 12 people (28.6%) inhaled opium and 30 people (71.4%) ingested it. Duration of their addiction was on an average 17±10 years. The amount of consumption of drugs was announced averagely 2.225± 1.13 gr. Our findings showed that the average blood lead level in these patients was 51.17 ± 27.96. Minimum and maximum concentrations were 3.4 µg/dl and 296 µg/dl respectively. Based on this, 22 people (52.4%) with confidence interval of 95%, equaling 37.35 – 67.5% had excessive lead concentration, and 20 people (47.6%) harbored blood lead level within normal limits.

So far as clinical manifestations are considered, lead line at gum-tooth line was observed in 8 patients (19%), electrocardiographic evidence of conduction delays 6 patients (14.3%), cataract 12 patients (28.6%), hypertension 10 patients (23.8%) and anemia observed in 18 patients (42.9%).

On the basis lab observations, 8 patients (19%) showed greater than 2 fold rise in liver enzymes above normal limits and 8 patients (19%) were peripheral blood smear (PBS) positive.

Our study showed that the average systolic pressure of patients under observation was 121.11±15.39 mmHg and average diastolic pressure was 75.3±9.6mmHg.

Average age of patients who had chronic toxicity with lead was 43.9±9.3 years in comparison to 50.2±10.2 years in patients with no chronic lead toxicity, implying to a statistically significant relation between lead toxicity and age of patients under observation. (p=0.039, t test).

According to our observations, no lead toxicity was seen in patients who consumed drugs through inhalation while 22 out of 28 patients (78.6%) ingesting the drugs, were seen to have lead toxicity (95% CI: 2.296-9.485, Relative Risk= 4.7; p=0.001, χ^2).

Average addiction duration of patients who had chronic toxicity with lead was 17.5±6.7 years in comparison to 16.5±12.4 years in patients with no chronic toxicity indicating that no statistically significant difference existed between addiction duration and lead toxicity(p=0.70, t test).

Similarly no significant relation was found between amount of drug consumed and lead toxicity; 2±1.1gm per day in patients with chronic toxicity and 2.4±1.1gm per day in those with no chronic toxicity. (p=0.253, t-test).

Discussion

Substance abuse is one of the health and treatment issues of Iran which has always been noted by the health care workers due to its expansion as well as complication of the factors affecting it. In addition to the issues and problems about drug abuse's threatening social health from a very long time, new issues and problems have also emerged part of which relates to type of the substance abused and the other part pertains to how such drugs are produced and consumed. Tendencies which have been presented as cases indicate that contamination of drugs with poisonous substances (independent from epiopids) during production or consumption have had many new problems and issues, thereby formulating this hypothesis that some symptoms and clinical complaints of the substance abusers relates to toxicity with these substances, and if physicians ignore this matter, they may make mistake in diagnosing the cause of disease and problems of the addicted patients.

In terms of description, features of the population considered in our study have points to ponder, some of which are as follows: All patients in the study were male. Although male was more in exposure to the peril of addiction and other dangerous behaviors than female, the latter sex has also been exposed to the narcotics in the recent years. Thus, in terms of gender, our population is not representative of all substance abusers in the society. It can be hypothesized

from this finding that male addicts suffer more from stomachache than female addicts. Proving or rejecting this hypothesis requires further study and is not considered here. In terms of age, patients were often in their middle age, living in their fifth decade of life. All patients studied stated that they were on opium, often swallowing it. This consumption pattern conforms to the high mean of addiction length (17 ± 10 years). Due to the fact that the patients have been addicted for long and due to the resistance against narcotics, their consumption increased. Our study has revealed that 47.6% (20 people) had abundant concentration of blood lead. Since they had no known occupational contact with lead and besides pollution caused by lead-loaded petrol has decreased during the last 10 years, it seems that taking narcotics is one of the possible causes of this pollution – the hypothesis supported by our findings. Other findings also support this hypothesis, including: swallowing narcotics has meaningful relationship with lead toxicity. Since the substance and its relevant impurities enter the body more through ingestion, this toxicity can be attributed to the consumption of narcotics or how it is prepared to be swallowed. However, there are also findings that do not support this relationship, since the dose of narcotics and duration of addiction did not relate to lead toxicity. Because the opium consumed in the previous years was less contaminated and the patients were on drugs for long, it is highly likely that the relationship between lead toxicity and duration of addiction could be achieved.

In spite of these contradictory results on the relationship between lead toxicity and substance abuse, paraclinical and clinical findings support the hypothesis stating the presence of relationship between narcotics and lead toxicity. Augmented ratio of patients with the symptoms related to plumbism, like lead line in the gum, basophilic stippling in the environmental blood in proportion to the normal population can reinforce the said hypothesis. In order to obtain definite results and prove or reject this hypothesis, conduction of case-observation studies can contribute much.

Our findings suggest that the patients suffering from plumbism did not have renal failure (based on the blood creatinine). Since blood creatinine is not a sensitive index for the study of renal failures, no statement can be made merely on this base regarding the relationship or non-relationship between plumbism and kidney failure. In this regard, we should note that there is meaningful relationship between abnormal findings in the urine test and plumbism. Also, no meaningful relationship was observed between anemia and plumbism, the reason for which is the probable presence of other chronic diseases in the population studied causing no meaningful relationship between plumbism and anemia.

Our studies suggest that patients poisoned with lead had elevated liver enzymes. ECG disorders were more in the form of conduction delay and arrhythmia in the cases of plumbism, and the said patients had more hyperuricemia than the non-poisoned patients.

The results of our study on the basis of clinical symptoms and complaints and their accompanying with plumbism were not quite accurate, since such symptoms as arthralgia, decreased libido, constipation, easy fatigability etc. are common in working population especially with low socio-economic conditions, besides, cataract and hypertension are also expected due to senility of patients. Meanwhile, lead line available in the gum, observed in 20% of the patients & relating to lead toxicity as well, has high precision, supporting the relationship between substance abuse and plumbism.

Conclusion

Our study reinforces the hypothesis on the relationship between substance abuse and lead toxicity, through further studies are required to reach more definite results since unrecognized lead poisoning in drug abusers presenting with symptoms of abdominal pain can be misdiagnosed and cause unnecessary gastrointestinal evaluations and abdominal surgery.

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