Original Article

Comparing serum lead level in drug abuse pregnant women with non-addicted pregnant mothers referring to Shiraz university hospitals in 2017-2018

Mehrdad Rezaie[1], Seyedeh Zarrin Abolhassanzadeh[2], Hourvash Haghighinejad[3]

[1]Department of Family Medicine and Pediatric Medicine, Neonatology Research Center, [2]Department of Family Medicine, Student Research Committee, [3]Department of Family Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

Abstract

Introduction: In recent decades, there are multiple reports of lead poisoning in drug abusers in Iran and other Middle East countries. The lead in the mother's blood can cause many dangerous, harmful effects on the mother and the fetus. Therefore, in this study, we evaluated the blood lead level (BLL) in pregnant women who were an illegal drug user and compared it with pregnant women who did not use these agents. **Method:** A cross-sectional study was conducted among 60 pregnant women referred to Shiraz Hazrat Zinab and Hafez Hospitals. All pregnant women with a history of any drug abuse were sampled. Two pregnant women without any history of drug abuse were sampled for each pregnant mother with a history of drug abuse on the same day. To check BLL, 5 cc blood sample of all participants sent to a reference laboratory. BLLs have been assessed by atomic absorption spectrophotometry with GBC Avanta, and all reports were confirmed by a specific pathologist. The data were completed with maternal demographic information and infants' anthropometric indices. Data analysis was performed using SPSS software version 24, and the significance was 0.05. **Results:** There was a significant difference in BLL among pregnant women with and without drug abuse history (9.91 ± 26.2 and 2.95 ± 0.7, respectively) (*P*-value: 0.001). The prevalence of lead levels of more than 5 μg/dl in mothers with and without substance abuse was 20% and 7.5%, respectively. Anthropometric indices, Apgar score, and gestational age in the mothers with a history of drug abuse were significantly lower than the control group (a significant level less than 0.05). **Conclusion:** The level of lead in pregnant women taking illegal drugs is higher than that of the control group who do not have a history of illegal drug abuse. On the other hand, it is likely that increased serum levels of lead with fetal complications and maternal health threats childbirth and clinical outcomes during childbirth.

Keywords: Blood lead level, poisoning, pregnancy, substance abuse

Introduction

The use of tobacco and drugs of different age in women has become increasingly evolving in recent decades. World Health Organization reports the addiction rate was between 5 and 10% in pregnant women and expressing concern about maternal and fetal complications.[1,2] Although there is no accurate statistics on the number of women with drug abuse in Iran, according to statistics reported by the Ministry of Health, for each eight drug-dependent men, one woman has such a drug dependency.[1,2]

Increased risk of low birth weight, intrauterine growth retardation, congenital disorders, and increased risk of perinatal mortality are among the most common complications following maternal drug use in pregnancy.[3]

Address for correspondence: Dr. Hourvash Haghighinejad, Department of Family Medicine, Shiraz University of Medical Sciences, Shiraz, Iran.
E-mail: hhaghighi@sums.ac.ir

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Considering the heavy use of lead metal in the industry and its significant presence in the environment around us, it is inevitable that there is always a small amount of lead in the blood of many people. During pregnancy, lead reabsorption from the mother's bones increases more and more, so that it can cause fetus intoxication. The World Health Organization has stated that the level of normal lead in pregnant women should be less than 5 μg/dL.[4]

Today, in parts of Central Asia, also Iran, many cases of lead poisoning were reported in illegal drug abusers. It is either a result of industrial drug production or as a way to gain more profit by increasing the weight of drugs. These cases present with severe hemodynamic and physiologic complications and even death.[5,6] It is undeniable that the maximum range of complications and disorders of lead poisoning presents in pregnant mothers because lead can easily pass through the placenta and enter the bloodstream of the embryo; thus, the risk of abortion, stillbirth, and early delivery can increase. The increased blood lead level (BLL), on the other hand, increases the amount of complications, such as low birth weight, cognitive impairment, behavioral disorders, and hypertension in newborn babies born to mothers with high lead levels in the blood and cord blood.[6]

The uses of lead contaminants illegal drugs in pregnant women, as well as, increased lead bone reabsorption are the main sources of elevated BLL in these pregnant women. Measuring BLLs even in the absence of drug use during pregnancy by those who have a history of drug abuse can be critical in pregnant women. Therefore, in this study, we determined the serum level of lead in pregnant women with drug dependence during delivery that could be a function of the condition of this group during the critical period of pregnancy and compare it with normal non-addicted pregnant women.

Method

In this descriptive-analytic cross-sectional study, sample size was determined beforehand. Due to a small number of drug abuse pregnant women, researchers decided to assign two pregnant women without any history of drug abuse for each pregnant woman with a history of drug abuse. The sample size was calculated using a formula for comparing two means (case to control group ratio 1:2, $\beta = 0.8$, $d = 3$, $\alpha = 0.05$, and variance: 30). The sample size was determined as 20 in drug abuse pregnant women and 40 in non-drug abuse. For the first group, all pregnant women with a history of drug abuse before or during pregnancy (according to the patient declaration), who referred to Shiraz Hazrat Zinab and Hafez hospitals for delivery, were enrolled after obtaining informed consent.

These participants have a history of drug abuse regardless of the type of administration (rout of administration or type of drug).

To provide the sample size, for each drug abuse pregnant woman two non-addicted pregnant women who were matched in the maternal age were included in the study. Demographic characteristics, such as age, marital status, number of pregnancies, number of live births and abortions, monthly income level, educational level, history of the use of psychoactive drugs, also data about history of drug abuse, such as duration of drug use, the type of drug, as well as information about complications of pregnancy and neonatal parameters, such as head circumference, weight, height, vital signs, were registered.

For the measure of BLL, 5 cc of whole blood was withdrawn from all individuals and immediately sent to the reference laboratory to assess by atomic absorption spectrophotometry with GBC Avanta and reports were confirmed by one specific pathologist. The information was entered into SPSS version 24. To compare the BLL in mothers' blood and also to compare height, weight, and head circumference of neonates in both groups, T-test or Mann − Whitney test was used.

Results

Participants included in this study were 20 drug abuser pregnant women and 40 pregnant women without any history of illicit drug use. The mean age of the population studied in the positive and negative drug abuse group was 32.1 ± 5.5 and 30.7 ± 6.6 (*P*-value: 0.4), respectively. There was a significant difference between the mothers of the two groups regarding demographic information such as level of education, marital status, and history of mental disorders and the use of psychosocial drugs [Table 1]. Duration of drug abuse in the 20 pregnant women who were illicit drug abuse was less than 5 years in 14 mothers (70%), between 5 and 10 years in 2 mothers (10%), and more than 10 years in 5 mothers (20%). More common types of drug used include Opioid (65%), methadone (40%), heroin (30%), and methamphetamine (30%) [Figure 1].

There was a significant difference in BLL among pregnant women with and without drug abuse history (9.91 ± 26.2 and 2.95 ± 0.7, respectively) (*P*-value: 0.001). Four (20%) of pregnant women with a history of illicit drug abuse had a serum level of lead greater than or equal to 5, with serum levels of 5, 5/5, 21, and 120 μg/dL. It should be noted that mothers with serum lead

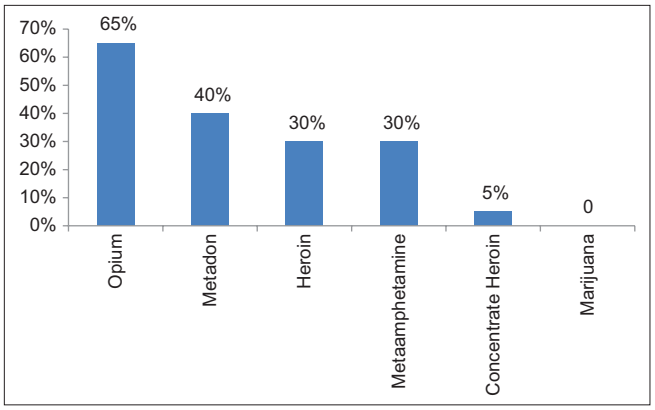

Figure 1: Types of illegal drugs used by pregnant women

Table 1: Demographic information divided into two groups of pregnant mothers entering the study

Variable		Positive history of drug use group	Negative history of drug use group	
Level of Education	Less than a high school diploma	19 (43.18%)	25 (56.81%)	0.006
	more or equal than high school diploma	1 (6.25%)	15 (93.75%)	
marital status	Married	17 (29.83%)	40 (70.17)	0.03
	Divorced	3 (100%)	0 (0%)	
Employment status	Housewife	20 (34.48%)	38 (65.52%)	0.54
	Employee	0 (0%)	2 (100%)	
History of mental disorders	yes	7 (100%)	0 (0%)	0.0002
	no	13 (24.52%)	40 (75.47%)	
The number of addicts in the family	Only mother	11 (100%)	0 (0%)	Undetectable
	Mother and at least one other family member	9 (100%)	0 (0%)	
Smoking at home	Mother	2 (100%)	0 (0%)	
	A member of the family except for the mother	12 (70.58%)	5 (29.41%)	
	nobody	6 (14.28%)	37 (85.71%)	
Number of pregnancies	Once	2 (15.38%)	11 (84.61%)	0/3
	Twice	8 (47%)	9 (52.94%)	
	Three times	5 (31.25%)	11 (68.75%)	
	More than three times	5 (35.71%)	9 (64.28%)	
Number of children	-	Median: 2 (IQR: 1.7)	Median: 2 (IQR: 2)	-

levels of 21 and 120 μg/dL, respectively, were opium users plus methadone and opium user alone. However, only 3 (5.7%) of pregnant women without a history of illegal drug abuse had a serum level of lead equal to or greater than 5 μg/dL (two BLL equal to 5 and one BLL equal to 6). There was no significant difference between the two groups of pregnant women in terms of the number of subjects with a BLL equal to or greater than 5 μg/dL (*P*-value: 0.2).

In total, 7 of the subjects with BLL more than 5, six were complicated (71%); on the other hand, of 53 subjects with BLL less than 5, only 27 cases (52%) were complicated. Although this difference was not statistically significant, it showed a high odds ratio (*P*-value Fisher exact test: 0.116; OR: 5.7, CI: 0.65-51.3).

Mantel − Hanzel test was used to control the drug dependence factor in the relation between BLL ≥5 and pregnancy complication which was not statistically significant, but the odds ratio was still high (*P* value mantel Hanzel: 0.39; ORMH: 5, CI: 0.44-56.7).

The incidence of pregnancy complications in the groups of mothers with and without the history of drug abuse was 17 (85%) and 16 (40%), respectively, and the odds ratio was calculated to be 8.5%. This difference is statistically significant, so drug abuse increases the risk of pregnancy complications considerably. Anthropometric indices, Apgar score, and gestational age in the mothers with a history of drug abuse were significantly lower than that of the mothers without a history of drug abuse (*P* value for all variables <0.05). However, none of the anthropometric, Apgar, or gestational age indices were found to be significantly different between patients with BLL equal or greater than 5 μg/dl and mothers with BLL less than 5 μg/dL [Table 2].

Respiratory distress in neonates of pregnant women with a higher level of lead had 5 significant differences in the level of lead (*P* value: 0.027). However, all of these cases occurred in subjects with a history of drug use. This relationship had no statistical significance among patients who consumed substances and had lead level differences (*P* value: 0.1, OR: 9, CI: 0.7-113).

Discussion

To our knowledge, this is the first report that evaluates BLL in pregnant drug abuse women and compares it with non-drug abuse pregnant. Our findings showed that not only in pregnant women with illegal drug abuse, but also in mothers who had no history of drug use, serum levels of lead may be equal or greater than 5 μg/dl, but the difference in these two groups is significant. It is important that even regardless of the type of illegal drug used this difference was shown. Although no statistically significant difference was found in our study in terms of all pregnancy complications in the group of BLL ≥5 μg/dl compared to those with BLL <5 μg/dl, but a considerable odds ratio was found.

Also, anthropometric indices, Apgar score, and gestational age in the mothers with a history of drug abuse were significantly lower than that of the mothers without a history of drug abuse.

According to a study done by Dr. Salehi and his colleagues in Rafsanjan, Iran, the mean lead level in opium addicted men was 21.9 ± 13.2 μg/dl, which were significantly different from the

Table 2: Anthropometric, Apgar, and gestational age profiles based on the existence or absence of a history of drug abuse and serum levels of lead

	Classification	Gestational age (week)	Apgar score	Head circumference (cm)	Height (cm)	Weight (g)
Effect of use of illicit drugs	With a history of drug use (Mean±SD)	34.8±5.2	7.8±2.2	33.2±2.4	47.7±4	2536±780
	No history of drug use (Mean±SD)	38.47±1.2	8.7±1.4	34.5±1	50.6±2	3073±539
	The significance level	0.002	0.01	0.006	0.008	0.004
lead level	Serum level of lead is equal to or greater than 5 (median; IQR)	38; 4	9; 0	34; 2	50; 6	2980;1320
	Serum lead level less than 5 (median; IQR)	39; 1.7	9; 0	34; 1.75	50; 2	3000; 882
	The significance level	0.89	0.19	0.6	0.3	0.8

control group. The mean level in the study was much higher than in our study.[7] The reason for this may be the restricted use of illegal drugs in pregnant women, which reduces absolute levels of these substances during pregnancy, and the other reason is the difference in the type of illegal substances used in the two study geographic areas.

The relationship between BLL and neonatal weight, length, head circumference, and Apgar score was assessed in different studies. In a study by Ladansky *et al.* neonates whose mothers have higher BLL have a lower weight.[8] In another study in Chine, no difference was found in weight and height of lead-exposed neonates.[9] Also in two other studies, no difference in birth weight was found in an exposed neonate.[10,11]

The study of Dr. Aliyan Moghaddam and his colleagues on pregnant women during the week of 14 to 20 showed that BLLs were not significantly correlated with anthropometric indices, while strongly correlated with the 5th minute Apgar score.[12] In this study also, no differences were found in birth weight, height, head circumference, and Apgar score of a neonate with higher mother's BLL, but this may be due to a low number of patients with abnormal BLL.

The relationship between illegal drug use and antropometric characteristics of a newborn have been assessed in several studies.

Kelly JJ, *et al.* show illegal drug user pregnant women associated with a decrease in their newborns' head circumference. This finding is compatible with our results.[13]

It had been shown that these newborns also had about 7 times higher risk of small gestational age.[14]

The use of Heroin during pregnancy is associated with lower birth height and head circumference in the offspring of drug abuser pregnant women.[15]

Our findings also showed that anthropometric indices such as head circumference, height, and birth weight, as well as Apgar score and gestational age, were significantly lower in children born to mothers with a history of drug abuse, which is compatible with previous research studies.

In general, we can conclude that lead levels in the drug user pregnant women are higher than those in the control pregnant group who do not have a history of illicit drug abuse, and, on the other hand, increased BLL may be accompanied with overall fetal and maternal complications during pregnancy.

Conclusion

We strongly recommend that the BLL should be assessed in all pregnant mothers, especially among those who express a history of drug abuse at the time of perinatal and prenatal care to prevent excessive maternal and familial lead-related complications.

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Conflicts of interest

There are no conflicts of interest.

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