Hilla University College Journal For Medical Science

Volume 2 | Issue 1 Article 4

2024

Blood Lead Level and School Violence among Male Secondary School Students in A-Kut City Center/ Wasit Province

Isam Salim Ismaiel
Dept. Of Community Medicine, Al-Kut Health Directorate, Wasit Governorate, Iraq,
issam_health@yahoo.com

Khalida Abdul-Sattar
Dep. of Community Health, College of Health and Medical Technology, Baghdad, Iraq

Hasan Alwan Baiee
Nursing Department, Hilla University College, Hilla, Babylon, Iraq, hasan_alwan@hilla-unc.edu.iq

How to Cite This Article

Ismaiel, Isam Salim; Abdul-Sattar, Khalida; and Baiee, Hasan Alwan (2024) "Blood Lead Level and School Violence among Male Secondary School Students in A-Kut City Center/ Wasit Province," *Hilla University College Journal For Medical Science*: Vol. 2: Iss. 1, Article 4.
DOI: https://doi.org/10.62445/2958-4515.1008

SHORT COMMUNICATION

Hilla Univ Coll J Med Sci

Blood Lead Level and School Violence among Male Secondary School Students in A-Kut City Center/ Wasit Province

Isam Salim Ismaiel [a], Khalida Abdul-Sattar [b], Hasan Alwan Baiee [c,*]

[a] Dept. Of Community Medicine, Al-Kut Health Directorate, Wasit Governorate, Iraq
[b] Dep. of Community Health, College of Health and Medical Technology, Baghdad, Iraq
[c] Nursing Department, Hilla University College, Hilla, Babylon, Iraq

Abstract

Background: Toxic level of blood lead among schoolchildren was associated with violent behavior and may lead to delinquencies and truancy as well as low social skills and poor school performance.

Objective: to assess blood lead level among sample of students in secondary schools in Kut City and determining its relation to violent behavior. Methods: A cross-sectional study was carried out targeting students in three secondary schools in Kut City/Iraq. A convenience sample of 54 students were selected where; (27 violent students and 27 non-violent students) according to certain reference criteria.

Results: This study shows that 74% of our students had blood lead level more than 5 μg/dl. The mean blood lead level in violent students was higher than the mean of blood lead level in non-violent students but this level does not a reach significant statistical level $P < 0.05$.

Conclusion: Three out of four our students had blood lead level more than five μg/dl that indicated local environmental pollution with this toxic heavy metal. Periodic surveillance and further large-scale studies are needed to assess the extent of this health problem in order to plan effective strategic solutions.

Keywords: Blood, Lead, School violence, Wasit, Children

1. Introduction

The hazardous health effects of lead toxicity have been demonstrated from about two thousand year BC. Instead of this, are widely used nowadays by human beings which causes serious consequence environmental pollution. In spite of trails to remove this toxic material from the environment lead have been distributed everywhere around the world, with significant toxic effects [1]. Lead entry occurs through a variety of routs (respiratory, gastrointestinal rout which is the most common that been associated with the ingestion of lead-polluted paint by children. Evidences have suggest that airborne lead is an important exposure. About 70% of airborne lead particles are less than (1 μm), it is absorbed easily and directly into the blood, while the bigger lead particles can be grasped in the mucous of the respiratory tract system and cleaned. Many studies have reported a positive significant association between air lead levels and blood lead levels [2].

The load of lead environmental pollution was not regularly distributed and regions still heavily using leaded gasoline were most affected [1]. It is well known that leaded gasoline account for more than nine tenth (90%) of all air pollution lead contents in many urban areas. Sources of lead contamination vary with local districts. Diagram 1 clarifies a number of exposure pathways and health impacts associated with lead [3].

Received 26 September 2023; accepted 26 November 2023.
Available online 18 June 2024

* Corresponding author.
E-mail addresses: issam_health@yahoo.com (I. S. Ismaiel), hasan_alwan@hilla-unc.edu.iq (H. A. Baiee).

https://doi.org/10.62445/2958-4515.1008

It is well documented that children exposed to even low level 'even at level below 10 mcg per deciliter' put them at abnormal behavioral problems such as delinquency and violence. The high concentration of this trace element in the environment the bad the behavior effects [4].

The scientific American association reported an explanation for Violence', which described the understanding of the correlation between the chemistry of the brain due to exposure even to very low level of, toxic lead, and impulsiveness, and un accepted violence. One explanation is serotonin change in the brain, which play role in mitigating impulsiveness. Individuals with balanced levels of serotonin they behave. They are able to predict their conduct, while people with low level of brain serotonin are more liable to act first and think later, which can put them into trouble and make them behave in violent way [5]. Other neurological disruption, which lead to disturb the synapses formation, affecting dopamine systems, and decrease serotonin. This heavy toxic metal affect the (monoamine oxidase A) activity, and low MAO had negative effects on neural dysfunction in the brain involved in behavioral inhibition such as the frontal lobe cortex [6].

Epidemiological studies in this field have revealed an association between exposure to toxic level of lead and social problems. In a study carried out among Philadelphia youth, a high level of lead exposure considered the most significant risk predictors of adolescent delinquency and adult criminality in males [7]. Other study explained that prenatal and early childhood blood lead toxic level were certainly associated with more risk of behavior problems in adolescence [8].

In a prospective cohort study, Wright *et al.* explained that prenatal and postnatal blood lead high concern are associated with higher rates of total arrests involving violence in early adulthood [6]. Even though; nobody believes that lead is the main cause, which is responsible for all aggressive, violent, or delinquent behavior. Needleman suggested that the lead exposure may explain between 10% and 40% of such behavior changing effects [9]. By examining the literature, there is no single published study in our country on the relationship of violent behavior and blood lead level.

2. Materials and methods

2.1. Study design and sampling

A cross-sectional study carried out targeting students in three secondary schools in Kut City/Iraq at April 2007. A convenience sample of 54 students (aged 13-16 years) was selected, where; 27 violent students and 27 non-violent students.

2.2. Instruments

Violent and non-violent students were verbally assessed by school counselor and by using self-completed anonymous standard questionnaire as part of Global School-based Student Health Survey 'GSHS' questionnaire. School violence including questions about physical fighting and bullying behavior. Physical fighting: defined according to the answer to the following question: In the last 12 months, how many times were you involved in physical fighting? (The answer ranges from 'no time' to '12 or more'). Bullying behavior [victim, bully, bully-victim]: defined according to the answer to the question: During the past 30 days, on how many days were you bullied? For those bullies the question was: During the past 30 days, on how many days were you bullied other? For both victims and bullies (The answer ranges from 'no day' to 'all 30 days').

Blood Lead Level Test done by using: Lead Care® Blood Lead Test Kit; made in USA by ESA, Inc.

2.3. Data collection and procedure

Approval was officially obtained from Wasit educational Department, consents were also obtained from the school management authority and school while verbal consents from all study participants. Students were briefed about the purpose of the study and encouraged to participate in this research work. After completing the questionnaires collection and primarily determining the prevalence of violent behavior, asked the school counselors in the three schools for boys, to assess the violent students who always assault their classmates, and engage in fighting behavior. Verbal consent was obtained from tested students; all were eligible and willing for testing blood lead level. Blood sample taken from hand finger skin puncture by disposable lancet and collected by a capillary tube with standard disinfection procedure. Fresh blood tested with in 24 hrs. in College of Medicine/Babylon University, or freeze for a week. Each sample taken about 5 minutes duration.

2.4. Data analysis

Descriptive statistics and inferential statistics (Pearson Chi-square test, One-sample Test and Independent T-test) used to summarize, examine the mean differences and association of variables. The analyses were performed by using SPSS version 23.0 (SPSS,

Table 1. Frequency distribution of the values of blood lead level.

Blood lead level	Frequency	%
<5 µg/dl	14	26
≥5–9 µg/dl	33	61
10–14 µg/dl	7	13
Total	54	100.0

Table 2. Frequency distribution of the school violence.

School violence	Frequency	%
Non violent	27	50
Physical fighting	8	15
Physical fighting + victim	7	13
Physical fighting + bully	5	9
Physical fighting + victim/bully	6	11
Bullying victim	1	2
Total	54	100.0

IBM Company, Chicago, IL 60606, USA). $P < 0.05$ was considered statistically significant.

2.5. Ethical consideration

The study was carried out in accordance with the ethical standards that have their origin in the Helsinki Declaration. All subjects involved in this work are informed and the agreement was obtained verbally from each one before conduction the study. This study was approved by a local committee on publication ethics at Wasit Health Directorate.

3. Results

The overall mean blood lead level was 7.0 µg/dl ± SD 2.57, ranged 1.4 to 13.8 µg /dl. The BLL mean value statistically significant (p 0.0001) from blood lead reference value of 5 micrograms per deciliter (µg/dl). Finding indicated that 74.1% of our sample have BLL more than 5 µg/dl [Table 1].

The distribution of school violence has shown in [Table 2]. The mean of BLL in violent students 7.5 µg/dl ± SD 2.3 was higher than the mean of BLL in non-violent students 6.6 µg/dl ± SD 2.78 in our study sample. However, this difference does not reach a significant level [Figure 1]. Distribution of blood lead levels for the students according to school violence has shown in [Figure 2].

4. Discussion

To the best of our knowledge, this was the first study aimed to measuring the association blood lead levels with school violence. Our estimate of blood lead level among in-school adolescents was more likely than those reported by previous study by Sadaruddin *et al.* who reported that the blood lead

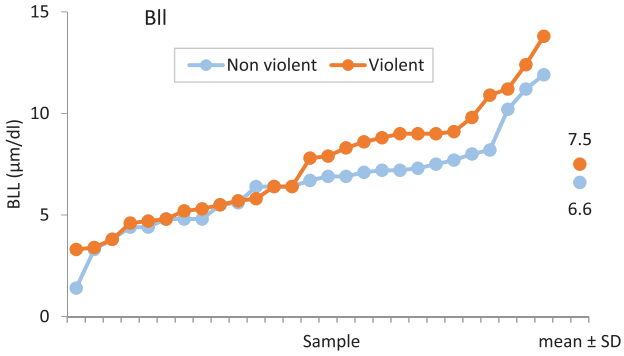

Fig. 1. Test for equality of means for BLL (µm/dl) in violent and non-violent students (n = 54).

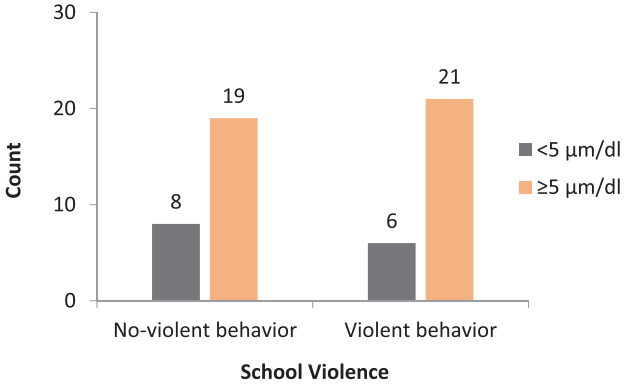

Fig. 2. Distribution of blood lead level for the students according to school violence.

levels were estimated in 170 schoolchildren aged (13–19) years, the overall mean blood lead level was 2.38 µg/dl, ranged 0.2 to 8.6 µg/dl (3.22 µg/dl in boys) [10].

Although, the mean of BLL in violent students was higher than the mean of BLL in non-violent students in our study sample. This difference does not reach a significant level $P > 0.05$. However, previous studies had documented the association between increasing blood lead level and antisocial behavior in adolescence and early adulthood [2, 6–8]. There are new increasing evidences that explain the link between even low exposure to lead concentration and bad antisocial effects on children and the violent behavior of adolescent and young adults in developed countries [11–18].

A cohort observational study was carried out in the US revealed that babies with abnormally elevated blood at birth were at high risk of being put in the jail or arrested for repeated crimes [19]. The same findings were reported by other researchers [20] while a study done in a Scandinavian country found that there is no causality between increase blood lead and criminal acts [21].

There are two main limitations in this study that need to be considered when interpreting the findings first: the small sample size, due to limited financial resources and expensive materials. Considerations of the test, storage, and transportation that may introduce measurement bias, second important limitation is that this is a cross sectional descriptive study in which it is very difficult to identify the causal associations between the study variables.

5. Conclusion

Although there is no significant difference in the correlation between blood lead level and school violence, 3 out of 4 students have blood lead level more than 5 μg/dl which indicates local environmental pollution with this toxic heavy metal. This gives us an appeal for aid depending on evidence that confirms there is no safe level of blood lead. Further large-scale studies are needed to assess the extent of this health problem in order to plan effective solutions.

Acknowledgments

We are grateful to all students for their participation in our study, however we recognized that without out their participation, this work have not been possible. In addition, special thanks to General Directorate for Education in Wasit Province, school management and school counselors.

References

1. Fewtrell L, Kaufmann R, Prüss-Üstün A. Lead: assessing the environmental burden of disease at national and local level. Geneva, World Health Organization, 2003 (WHO Environmental Burden of Disease Series, No. 2).
2. Paul BS, Lynch MJ. The relationship between lead exposure and homicide. Archives of Pediatric and Adolescent Medicine. 2001;155:579–82.
3. WHO, Regional Centre for Environmental Health Activities. A Review of Literature on Healthy Environments for Children in the Eastern Mediterranean Region: I. Status of Childhood Lead Exposure (First Draft). WHO/CEHA; 2003.
4. Montague P. Toxic Lead and Violence. Rachel's Environment & Health News; 2004.
5. Wilkinson SL. "A Recipe for Violence". Chemical & Engineering News. 2003;81(22):33–7.
6. Wright JP, Dietrich KN, Ris MD, Hornung RW, Wessel SD, *et al.* Association of prenatal and childhood blood lead concentrations with criminal arrests in early adulthood. PLoS Medicine. 2008;5(5):e101 doi:10.1371/journal.
7. Denno D. Biology and Violence. New York: Cambridge University Press; 1990.
8. Dietrich KN, Ris MD, Succop PA, Berger OG, Bornschein RL. Early exposure to lead and juvenile delinquency. Neurotoxicol Teratology. 2001;23(6):511–18.
9. Needleman H. Lead Poisoning. Annual Review of Medicine. 2004;55:209–22.
10. Sadaruddin A, Khatoon AF, Sultana KN. Blood Lead Levels in Young Children in Chakshahzad, Islamabad. Journal of Pakistan Medical Association - Pak. Med. Assoc. 1995;45.
11. Mbonane TP, Mathee A, Swart A, *et al.* A study protocol to determine the association between lifetime lead exposure and violent criminal behaviour in young males in conflict with the law. BMC Public Health. 2019;19:932 https://doi.org/10.1186/s12889-019-7025-5.
12. Taylor MP, Forbes MK, Opeskin B, Parr N, Lanphear BP. The relationship between atmospheric lead emissions and aggressive crime: an ecological study. Environ Health. 2016;15(1):23. Available from. https://doi.org/10.1186/s12940-016-0122-3.
13. Boutwell BB, Nelson EJ, Emo B, Vaughn MG, Schootman M, Rosenfeld R, *et al.* The intersection of aggregate-level lead exposure and crime. Environ Res. 2016;148:79–85.
14. Fergusson DM, Boden JM, Horwood LJ. Dentine lead levels in childhood and criminal behaviour in late adolescence and early adulthood. J Epidemiol Community Health. 2008;62(12):1045–50.
15. Sampson RJ, Winter AS. Poisoned development: assessing childhood lead exposure as a cause of crime in a birth cohort followed through adolescence. Criminology. 2018;56(2):269–301.
16. Reyes JW. Lead exposure and behavior: effects on antisocial and risky behavior among children and adolescents. Econ Inq. 2015;53(3).
17. Nkomo P, Galpin J, Mathee A, Richter LM, Norris SA, Naicker N. The association between elevated blood lead levels and violent behavior during late adolescence: the south African birth to twenty plus cohort. Environ Int. 2017;109:136–45. Available from. https://doi.org/10.1016/j.envint.2017.09.004.
18. Feigenbaum JJ, Muller C. Lead exposure and violent crime in the early twentieth century. Explor Econ Hist. 2016;62:51–86.
19. Wright JP, Dietrich KN, Ris MD, Hornung RW, Wessel SD, Lanphear BP, *et al.* Association of prenatal and childhood blood lead concentrations with criminal arrests in early adulthood. PLoS Med. 2008. https://doi.org/10.1016/S0892-0362(01)00184-2.
20. Nevin R. Understanding international crime trends: the legacy of preschool lead exposure. Environ Res. 2007;104(3):315–36.
21. Beckley AL, Caspi A, Broadbent J, Harrington H, Houts RM, Poulton R, *et al.* Association of childhood blood lead levels with criminal offending. JAMA Pediatr. 2018;172(2):166–73.