



The Level of Lead (Pb) among Students in Qatar Schools and its Relationship to Academic Achievement and Violent Behavior

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Research Article

Volume 5 Issue 3

Received Date: June 12, 2020

Published Date: July 06, 2020

DOI: 10.23880/act-16000187

Abstract

Introduction: Lead (Pb) has no any known biological or physiological function in the body. Its accumulation has been associated with various damaging effects, particularly in the nervous system.

Study objectives: to measure the lead concentration of two groups of school students in Qatar: a group of students with good academic achievement and a group of students with low academic achievement; and to explore different patterns of behavior related to perceptions of violence between student groups and to check if this can be linked to lead exposure.

Methods and subjects: a case control study was conducted. Study sample included 40 schoolchildren students assigned into two groups: group I (N=20) includes students with good academic achievement, and group II (N=20) includes students with bad academic achievements. Urine samples were taken from all students and tested for lead concentration by atomic spectrometer.

Study findings: lead concentration in-group I (0.00015 ± 0.00007 pg/ml) was significantly lower than that in-group II (0.0114 ± 0.008 pg/ml), ($p=0.008$). The modes of behaviors in-group II pointed to rioting modes that involve insulting teachers, colleagues and school properties.

Conclusions: schoolchildren with bad academic achievements tend to have high levels of lead, which is expected to influence their modes of behaviors.

Keywords: Lead; Exposure; Schoolchildren; Academic Achievement; Behaviors

Introduction

Lead (Pb) is a common substance in our environment. It has no known physiological roles in biological systems [1,2]. When exposed to it, it is absorbed inside the body and kept for a long time in the blood and bone. Lead exposure is linked to multiple damages to the various systems in the body, such as the nervous system, which leads to poor academic achievement and growing trends of violence, especially

school violence [3]. Lead exposure has also been associated with mortality (principally because of cardiovascular diseases), impeded renal function, hypertension, fertility troubles, and bad pregnancy results. The accumulation of Pb in human organs is undesirable as it impacts metabolic pathways [4].

The amassing of Pb in people occurs through ingestion of food, drinking water, soil, and the inward breath of

environmental Pb dust [5-7]. Lead may reach into the body because of the erosion of drinking water pipes covered with lead, and may likewise bring about medical issues through learning and social issue, for example, mental alterations [8]. At the point when exposed to high dosages of lead, harmful episodes are likely to occur in the brain, the red blood cells, and the kidney [9]. Lead in drinking water may originate from tainting at the source, yet it can likewise be available in faucet water as a aftereffect of its disintegration from normal sources; rather, its quality is fundamentally from family plumbing frameworks containing lead in pipes, joints, fittings, or the administration associations with homes [4].

Study Problem

Violence in educational circles is considered one of the problems affecting society because of the extremist behaviors that are hostile to civil society. Various social studies are trying to find justifications and explanations related to this phenomenon, but they have not found radical solutions to this phenomenon within the social system, which created a void in the research that needs to be rethought in a new way. In this study, we assumed the presence of environmental and biological factors that lead to violence.

Study Hypotheses

- Exposure to some heavy elements as a lead element has an important correlation with poor academic achievement compared to the non-exposed group at the alpha level of significance less or equal to 0.05.
- Exposure to the lead element has an important correlation with violent behaviors such as abuse of teachers and school-specific properties compared to the non-exposed group of lead element at the alpha level of significance less or equal to 0.05.

Study Questions

The study answers the following questions:

- Do students with low academic achievement have high levels of lead compared with students with high academic achievement?
- Did exposure to lead, lead to violent and riotous behavior among Qatari school students?

The Importance of this Study

The importance of the study lies in the fact that it addresses one of the most important problems facing our region, namely violence and extremism. Extremism leads to violence like attacking others and property. This study

has taken a different approach related to researching the phenomenon of violence environmentally and biologically through studying the impact of the lead component on violent behaviors and academic achievement, and thus this study may be the first of its kind in the region where the research team did not find similar studies, which opens the door to a new type of research. It contributes to identifying and treating individuals who are vulnerable to violence.

Study Objectives

- To measure the lead concentration of two groups of school students in Qatar: a group of students with good academic achievement and a group of students with low academic achievement.
- To explore different patterns of behavior related to perceptions of violence between student groups and to check if this can be linked to lead exposure.

Methods and subjects

Study design

A case control study between two groups of students with good academic achievement and low academic achievement was conducted.

Study Community

School students in Qatar.

Study Sample

The study included 40 students divided into twenty students with a good academic achievement and 20 students with a low academic achievement.

Study Data Collection

Approval of the study was taken from the Research Ethics Committee of the Ministry of Education and Higher Education in Qatar prior to start collecting urine samples and filling study questionnaire.

Study Instrument

A special questionnaire was designed for this study by reviewing the international literature on violent behavior. It involved paragraphs specific to student opinions in the school and administration environment and the motivations for violent behavior. The participation of students was optional and with the consent of the parents, who signed in writing the participation of their children in the study.

Lead Element Measurement

The lead element was measured in urine samples for all students participating in the study by an atomic spectrometer. The result was given in units of pg / ml of urine.

Statistical Analysis

Data was analyzed using SPSS version 21. Descriptive analytical models were used to describe and represent data. The difference in means between study groups was determined by independent T test. Significance was considered at $\alpha \leq 0.05$.

Results

Concentration of Lead

The students were divided into two groups:

- **The first group:** the group of diligent students, and the average lead concentration was 0.00015 pg / ml.
- **The second group:** the group of riot students and their average lead concentration was 0.0114 pg / ml.
- The difference in mean between the two averages was statistically significant ($p=0.008$) (Table 1).

Accordingly, it can be said that exposure to lead has an active role in the lack of academic achievement and violent behavior.

Variable	M	SD	P value
Lead –good academic achievement	0.00015	0.00007	0.008
Lead- bad academic achievement	0.0114	0.008	

Table 1: Identification of P value.

The Opinions of Hard-Working Students (Good Academic Achievements)

As seen in Table 2, the opinions of students with good academic achievements were summarized. The data showed that there were several patterns of good behaviors in the class such as: liking teaching method (100%), the desire to attend class (100%), not to insult teacher (100%), not to quarrel with teacher, or colleagues (100%). Not to riot (100%). On the other hand, school liking was reported by 85% of students, and not to write on the school walls was reported by 90% of the same school children.

Variable	Frequency (N)	Percentage (%)
Like the teaching method	20	100%
Would like to attend classes	20	100%
School liking	17	85%
Do not insult the teacher	20	100%
Do not quarrel with colleagues	20	100%
Do not quarrel with teachers	20	100%
Do not write on the walls	18	90%
Do not riot	20	100%

Table 2: Patterns of Reported Behaviors of Schoolchildren (with A Good Academic Achievement).

The Opinions of the Rioting Students (with Bad Academic Achievements)

As shown in Table 3, rioting students (with bad academic achievements) expressed their views as: 75% of violence is due to distress and discomfort, 45% of these students perceived that violence and quarreling are the most prevalent behaviors, 100% reported that their relationships with their colleagues are good, 90% expressed their views about the relationships with school as good and accepted, 100% expressed their opinions about being ignored by school management in making decisions, 35% expressed

their opinions as crowding is annoying. All rioting students in this study think that lessons are not a matter, and they think that teachers are not treating them well. Also, all rioting students think that teaching methods are not good, and they are not interested in attending classes, and they do not like schools. Insulting teachers was reported by 65% of rioting students, 95% of students reported quarreling with colleagues and teachers. All rioting students reported writing on walls. Rioting actions were reported by 95% students. From these findings, the effect of lead exposure on academic achievement, violent perceptions and behaviors is evident.

Behavior	Frequency (N)	Percentage (100%)
Violence is due to		
• Distress and discomfort	15	75%
• Lack of activities	3	15%
• Secondary conditions	2	10%
Violence and quarreling are the most prevalent behaviors	9	45%
Good relationships with colleagues as good	20	100%
Relationship with the school as acceptable and good	18	90%
Not considered by school management in making decisions	20	100%
Crowding is annoying	7	35%
Lessons are not a matter	20	100%
Teachers are not treating student well	20	100%
Teaching methods are not good	20	100%
Not interested in attending classes	20	100%
They don't like school	20	100%
Insulting teacher	13	65%
Quarreling with colleagues	19	95%
Quarreling with teachers	19	95%
Writing on walls	20	100%
Rioting actions	19	95%

Table 3: Patterns of Reported Behaviors of Schoolchildren (with A Bad Academic Achievement).

Discussion

Exposure to lead element has been associated with physiological alteration through induction of damaging effects on various biological systems and organs including nervous system [1,3,7]. The results of this study showed that school children with bad academic achievement had higher level of lead (Pb) (0.0114 ± 0.008 pg/ml) compared with the lead level of diligent students (0.00015 ± 0.0007 pg/ml). These findings clearly revealed the importance of lead exposure on mental activities. However, lead exposure is an attractive topic and we previously studied it and got similar findings. We studied the impacts of lead exposure on a sample of jailed arrested persons and found that the lead level among jailed persons to be higher than the control group [10]. We also studied the impact of lead exposure on mental retardation and found that patients with mental retardation had relatively higher levels of lead compared with the control group [11].

The results of this study showed that students who had bad academic achievements and higher lead levels also expressed rioting behaviors and tendency towards insulting teachers and colleagues. These results did not agree with other previous studies that showed lead levels

were not correlated with student's behaviors [12]. However, the results of this study are consistent with other studies that showed lead exposure was correlated with defects in neurobehavioural and cognitive development in young children [13-15].

Conclusions and Recommendations

- The results indicated that the effect of exposure to lead is significant on students' behavior and achievement, so the study recommends that all students to be tested for lead element and to adopt special educational policies for students with high blood lead levels.
- To test the possibility of exposure to other elements such as mercury, chromium and nickel.
- To conduct environmental studies to ensure that the environment is compatible with global health standards.
- To search for the appropriate approaches to reduce the lead concentration in students who have high blood lead levels.

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