OnLine Journal of Biological Sciences 2 (6): 390-391, 2002
ISSN 1608-4127

Lead Poisoning in Children Working at Automobile Workshops in Peshawar (Pakistan)

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Abstract: The study was aimed to analyze the concentration of lead in blood samples of 60 randomly selected children aged between 7-14 years from different auto-workshops of Peshawar. The results revealed that a large proportion of the children had high level of lead ranging from 8.2 to 68.5 μg dL^{-1} with mean 38.203. This attempt disclosed the health risks including loss in memory, anemia and body pain, rising of threshold of hearing and general weakness related to child labour.

Key words: Lead poisoning, children, automobile workshop, Peshawar

Introduction

In Peshawar metropolis, there are hundreds of motor vehicles, radiator and battery repairing workshops, where lead (Pb) materials are handled without taking any safety measures. A considerable number of children work in these workshops due to their poor socio-economic conditions and handling lead material without taking any precautionary measures are, therefore, prone to be lead poisoned (Barry and Mossman, 1970).

High lead level in blood is linked with acute neuro-toxicity (Manser *et al.*, 1990), low I. Q level (Bellinger and Needleman, 1983), increased cerebrospinal fluid pressure (Kehoe, 1961; Teisenger and Styblova, 1961) blood pressure (Harlen *et al.*, 1985), Cognitive effect (Baghurst *et al.*, 1992; Mushak *et al.*, 1989), Kidney Effects (Staessen *et al.*, 1992), Neurotoxic effects (Goldstein *et al.*, 1974) and haem biosynthesis and hematological effects (Meridith *et al.*, 1978; Shaltout, 1989).

Excessive occupational exposure to lead over a brief period of time can cause a syndrome of acute lead poisoning. Classical clinical findings in this syndrome include abdominal colic, constipation, fatigue and central nervous system dysfunction. Lead has the ability to pass through placenta and finds way in mother milk and poses a potential hazard to fetus and infants (Sadeeq-ur-Rehman *et al.*, 1998).

The study was centered to determine the lead levels in blood to safeguard the children against the deadly exposure to it in the automobile workshops, its adverse health impacts, correlation with the source and to raise the voice against the child labour in Peshawar Pakistan.

Materials and Methods

A thorough survey of the study area, Peshawar, NWFP, Pakistan, was conducted in January-June 2001, during which different automobile workshops on G.T. Road, Kohat, Ring, University, City Circular and Charsadda Road, Shoba Chowk, and Nauthia were visited and primary data was collected. Out of 35 workshops, 20 were selected for this study and among 98 working children, 60 were aged between 7-14 years and selected through Purposive sampling technique. The individuals spent less than a year in the relevant job, aged over 14 years or working for less than six hours a day were excluded from the study. After the selection of the samples, the owner of workshop/parents of each individual signed the consent form, which included objectives and purpose of the study.

Two ml of blood was taken through disposable syringes in lead free potassium salt of Ethylene diamine tetra acetic acid (EDTA) in screwed cap bottles, properly mixed, secured, labeled and transported to the laboratory of Department of Environmental Sciences, University of Peshawar. The samples were preserved according to the Thompson and Raynold (1978) method and were analyzed by atomic absorption spectrophotometer. A questionnaire was formulated to collect the specific information regarding the age, family size, education, socio-economic status, use of utensils at home, workshop and duration of stay at workshop.

Results and Discussion

It is generally considered that the danger of lead toxicity is increased due to ignorance, lack of safety measures and lack of basic health education. In this study, we observed such conditions in the workshops and the children involved in handling lead materials had high lead levels in blood. Mean lead level in blood was found to be 38.203 μg dL^{-1} i.e. ranged between 7.5-68.3 μgdL^{-1} (Table 2). There were much variation in the lead level in the blood of the subjects associated with the time spent in the particular profession, nature of work of the subjects and practical exposure to leaded materials.

Table 1: Data for age, weight, education, duration and utensils of subjects at automobile workshops of Peshawar

Parameters	Age group	No. of subjects
Age	8-10	08
	10-12	15
	12-14	37
Weight (kg)	21-30	22
	31-40	26
	41-above	12
Education	Up to Middle	02
	Matric	07
	Nil	51
Duration in workshop (years)	1-2	36
	3-4	22
	5 +	2
Utensils used	Silver	39
	Steel	17
	Plastic	04

Table 2: Lead level in blood for different groups of subjects

No. of subjects	Percentage	Lead levels in blood (μgdL^{-1})
03	5.0	00-10
05	08.3	11-12
08	13.3	21-30
19	31.7	31-40
12	20.0	41-50
07	11.7	51-60
06	10.0	61-70

The safety limit fixed for lead level in blood by the Bioscience Laboratories and Centre for Disease Control are 40μgdL^{-1} for adults and 30 μgdL^{-1} for children. While European Community and the Centres for Disease Control USA has set 35 μgdL^{-1} and 25μgdL^{-1} as safe upper limits for adults and children respectively (CDC, 1985). But the acceptable level of lead in blood had been redefined as less than 10 μgdL^{-1} (CDC, 1996-99).

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Table 3: Symptoms of lead poisoning

Symptoms	No. of subjects	%age
Anemia	23	38.3
Weakness	13	21.7
Memory Loss	9	15.0
Rise in hearing threshold	4	06.7
Body pain	2	03.3
Headache	1	01.7
Nil	8	13.3

So it showed that 73% of the subjects had crossed the upper safety limits and were in danger zone, 21.6% had crossed the acceptable limits and only 5.0% had an acceptable lead level.

Although lead encephalopathy occurs at much higher levels, low-level lead exposure in pre-school children is associated with decreased intellectual and academic performance later on in life (Bellinger, 1992). Lead exposure is also associated with hyperactivity, decreased attention span and learning disorders (Needleman, 1983). In the study group (Table 3) 15% had memory loss, 6.7% had rising of hearing threshold, 21.7% had weakness and 1.7% had headache problems, which may cause decreased attention span, learning disorders and also may decrease intellectual and academic performance later on in life. Lead interferes with many enzymes responsible for haem biosynthesis and leads to hematological, neurological, gastro-intestinal, renal, gonad and ocular manifestations (Vale, 1996), which is clear from the study because 38.3% subjects had the problem of anemia.

In this study, 73.4% of subjects had lead level above 30 μg dL^{-1}, which showed high prevalence of lead poisoning in workshop children of Peshawar. The Agha Khan University Karachi, has declared the same results in preliminary studies. They found that the lead level in blood among children from a school in KDA, ranged between 21.3 -52.2 μg dL^{-1}, which coincided well with our results, range 8.2-68.3 μg dL^{-1} (mean 38.203 μgdL^{-1}). The difference is that they selected school children not handling lead materials and in this case those children were studied who were handling lead materials extensively. It showed that the atmosphere of Karachi is well polluted because the mean blood lead levels reported for other populations in the same study were also higher i.e., Academic Staff of Medical College 34.4 μgdL^{-1}; Traffic Police 46.6 μg dL^{-1} and Soldiers 29.9 μg dL^{-1} (WWT. Plumbum, 1988). This similarity may be attributable to the atmospheric pollution of Karachi, a city, where traffic exhaust fumes are clearly the major source of air pollution.

Similar study was conducted on 500 school children including males and females of Peshawar city (Zahoorullah *et al*., 1994). The mean age of the males was 14.0 ± 2.0 years and that of females 13.2 ± 2.2 years. The mean lead level in blood of the males and females was 21.2 ± 8.15 and 16.8 ± 4.8,1 respectively. But as compared to this study, the subjects were lead handlers. The high lead level in blood of the study group is attributed to their handling of lead material, ignorance, lack of safety measures, poor hygiene, poor working conditions and lack of basic health education.

It was concluded that 73.4% of subjects had above 30μg dL^{-1} of lead level in blood which is in danger zone when compared with the international limits i.e., 10 μg dL^{-1}, showing the high prevalence of lead poisoning in workshop children of the study area. 21.6% had crossed the acceptable limits (less than 10 μg dL^{-1}), only 2 % had an acceptable lead level; 1.7% of the respondents suffered from problems of headache, 39% had physical anemia, 15% were having memory loss, 21% had weakness, 3.3% had body pain, 6.7 % had shifting of hearing threshold and 13.3% had no symptoms of lead poisoning although they had high blood level. The questionnaire survey conducted in the study area linked the child labour problem with the lack of awareness, lack of education among the parents, poor socio-economic conditions and large family size. Most of the children exposed to lead environment in the workshop had suffered from lead poisoning, loss of memory, weakness, anemia, headache and body pain. The basic rights of children are violated in general in developing countries and organizations actively engaged in protection of child rights should come forward to safeguard the future of the innocent children.

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