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Original Research

Evaluation of blood lead level in children

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ABSTRACT:
Background: The concentration of lead in the environment has increased, and lead pollution has become a serious problem. The present study was conducted to assess blood lead level in children. **Materials & Methods:** 80 children age ranged 1- 14 years of lead poisoning of both genders were included. Lead level was estimated by inductively coupled plasma-optical emission spectrometer with microwave digestion system. **Results:** 1-5 years had 10 boys and 11 girls, 6-10 years had 11 boys and 14 girls and 11-14 years had 14 boys and 20 girls. Time since last paint less than 5 years showed 24 had normal and 25 had elevated, 5-10 years had 6 normal and 14 elevated and >10 years had 5 normal and 6 elevated blood lead level. The difference was significant (P< 0.05). Children attributes such as pets in 6, coloured toys in 16, not school going in 4, thumb sucking seen in 2, pica in 3, absence of hand washing in 7, use of Kohl in 3 and herbal medications in 4 had high blood lead level. The difference was significant (P< 0.05). **Conclusion:** Children had high blood lead level. Coloured toys are potential source of lead exposure.
Key words: Children, Lead, Paint

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INTRODUCTION

The concentration of lead in the environment has increased, and lead pollution has become a serious problem. Lead poisoning can damage and produce irreversible harm to fetal growth, the growth of teenagers, and psychological, behavioral and cognitive development.[1]Most international long-term follow-up investigations of the effects of lead exposure on neurological dysfunctions in children have reported that these effects of lead are persistent, especially lead exposure in 2-year-old children, an age that appears to be a critical period for a child's later intelligence quotient and academic achievement.[6] There is very strong evidence clearly indicating that lead has a negative influence on children's intelligence and behavioral development.[2]

Since lead in the environment gradually accumulates in the body, lead is regarded as one of the most harmful environmental toxins to toddlers. When the blood lead level reaches about 50 μg/L in the body of children, it can impair growth, memory, intelligence, and behavior, even when there is no obvious clinical manifestation. The most important untoward effect of lead exposure is the impairment of the intelligence of infants and the learning abilities of children.[3] Most recent investigations have verified that lead exposure can affect learning and memory, and the intelligence quotient of children is inversely proportional to their blood lead level. Blood lead concentration is the most widely used marker for inorganic lead exposure.[4] Zinc protoporphyrin (ZPP) concentration in blood usefully reflects lead exposure over the prior 3 months. Symptomatic patients with blood lead concentration >2.4 μmol l^{-1} (50 μg dl^{-1}) or in any event >3.8 μmol l^{-1} (80 μg dl^{-1}) should receive sodium calciumedetatei.v., followed by succimer by mouth for 19 days. Asymptomatic patients with blood lead concentration >2.4 μmol l^{-1} (50 μg dl^{-1}) may be treated with succimer alone.[5] The present study was conducted to assess blood lead level in children.

MATERIALS & METHODS

The present study comprised of 80 childrenage ranged 1- 14 years of lead poisoningof both genders. All were informed regarding the study and parental written consent was obtained. Permission from schools was also obtained.

Data such as name, age, gender etc. was recorded. A thorough physical examination was carried out. Symptom such as pallor, unexplained fatigue, abdominal pain, constipation or anorexia, deteriorating school performance, and recently acquired irritability or hyperactive behaviour was recorded. 5 ml venous blood was drawn in ethylene diamine tetra-acetic acid (EDTA) vacutainers. Lead level was estimated by inductively coupled plasma-optical emission spectrometer with microwave digestion system. A value of 10 µg/dL was considered as the cut-off for elevated blood lead levels (BLLs). Hemoglobin estimation was done by Sahli's hemoglobinometer. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

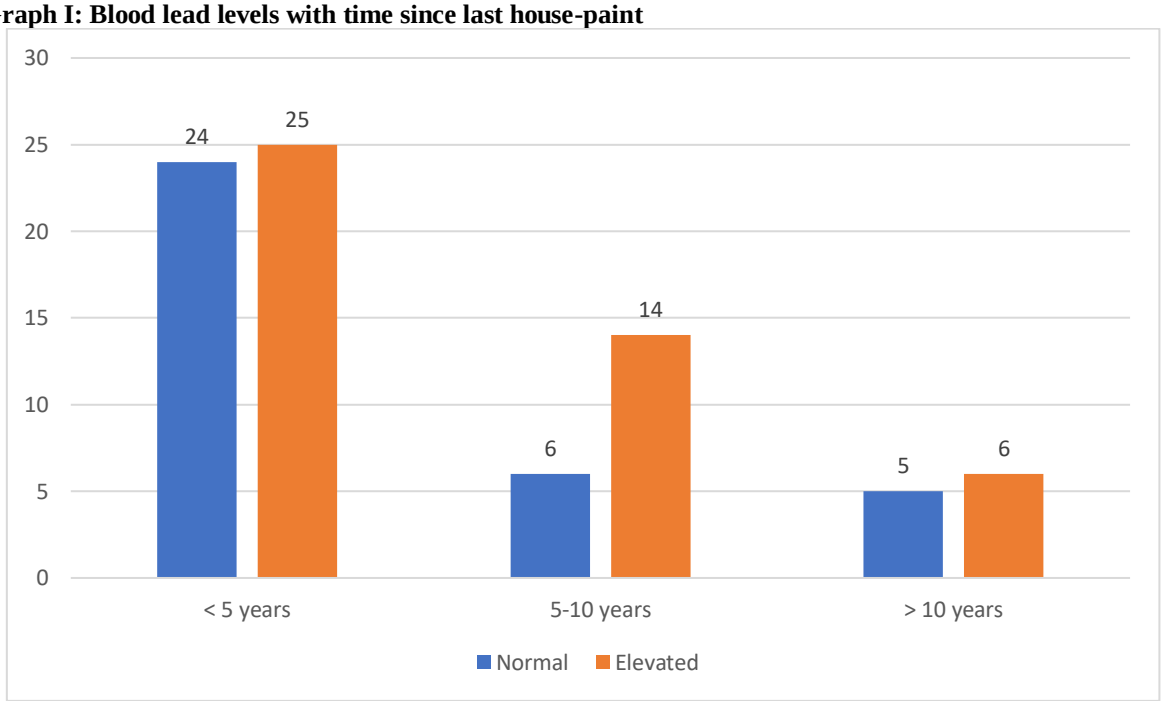
RESULTS

Table I: Distribution of patients

Age group (years)	Boys	Girls
1-5 years	10	11
6-10 years	11	14
11-14 years	14	20
Total	35	45

Table I shows that 1-5 years had 10 boys and 11 girls, 6-10 years had 11 boys and 14 girls and 11-14 years had 14 boys and 20 girls.

Graph I: Blood lead levels with time since last house-paint



Graph I shows that time since last paint less than 5 years showed 24 had normal and 25 had elevated, 5-10 years had 6 normal and 14 elevated and >10 years had 5 normal and 6 elevated blood lead level. The difference was significant (P< 0.05).

Table III: Child attributes with blood lead levels

Time since last house-paint	Normal	Elevated	P value
Pets	6	6	0.01
Coloured toys	4	16	
Not school going	2	4	
Thumb sucking	15	2	
Pica	5	3	
Absence of hand washing	1	7	
Use of Kohl	1	3	
Herbal medications	1	4	
Total	35	45	

Table II shows that children attributes such as pets in 6, coloured toys in 16, not school going in 4, thumb sucking seen in 2, pica in 3, absence of hand washing in 7, use of Kohl in 3 and herbal medications in 4 had high blood lead level. The difference was significant ($P< 0.05$).

DISCUSSION

Lead exists widely in the environment, and it is a heavy metal element with neurotoxic effects. In contrast to trace elements such as iron and zinc, lead has no know beneficial effects in the human body.[6]Early clinical features of lead toxicity are non-specific and an occupational history is particularly valuable.[7] Lead in the body comprises 2% in the blood ($t_{1/2}$ 35 days) and 95% in bone and dentine ($t_{1/2}$ 20–30 years). Blood lead may remain elevated for years after cessation from long exposure, due to redistribution from bone.[8]A decline in cognitive function is possible at a lead level lower than the World Health Organization/ Centers for Disease Control and Prevention (WHO/CDC) cut-off (10 µg/dL). Studies suggest that the population groups at greatest risk of exposure are young children and workers involved with construction, mining, and manufacturing. This may be due to greater gut absorption of lead in infants and young children than in adults.[9] The present study was conducted to assess blood lead level in children.

We found that 1-5 years had 10 boys and 11 girls, 6-10 years had 11 boys and 14 girls and 11-14 years had 14 boys and 20 girls.Lewendon et al[10] found that blood levels of lead in children with behavior problems were higher than those in healthy children, and suggested that the blood lead content of children with behavior disorders should be monitored regularly.

We observed that time since last paint less than 5 years showed 24 had normal and 25 had elevated, 5-10 years had 6 normal and 14 elevated and >10 years had 5 normal and 6 elevated blood lead level.Hou et al[11]investigated the relationship between lead poisoning and the intellectual and neurobehavioral capabilities of children.Blood lead levels were detected by differential potentiometric stripping analysis (DPSA). Intelligence was assessed using the Gesell Developmental Scale. The Achenbach Child Behavior Checklist (CBCL) was used to evaluate each child's behavior.Blood lead levels were significantly negatively correlated with the developmental quotients of adaptive behavior, gross motor performance, fine motor performance, language development, and individual social behavior ($P < 0.01$). Compared with healthy children, more children with lead poisoning had abnormal behaviors, especially social withdrawal, depression, and atypical body movements, aggressions and destruction.

We observed that children attributes such as pets in 6, coloured toys in 16, not school going in 4, thumb sucking seen in 2, pica in 3, absence of hand washing in 7, use of Kohl in 3 and herbal medications in 4 had high blood lead level. Mendola et al[12]found low levels of perinatal lead exposure were associated with attention problems in children. Researchers also found recently that antisocial behavior, behavior disorders, and adolescent crime in childhood and adolescence are also related to lead exposure before and after birth. The limitation of the study is small sample size.

CONCLUSION

Authors found that children had high blood lead level. Coloured toys are potential source of lead exposure.

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