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Research Article

POTENTIAL HEALTH RISKS AMONG CHILDREN DUE TO LEAD CONTAMINATED TOYS

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A B S T R A C T

Introduction: Lead is a heavy metal and important environmental toxicant. It can damage the nervous system, the renal, growth and development, psychological behavior and intelligence. Lead exposure in young children is of particular concern because children absorb lead more readily than adults and the developing nervous system of children is vulnerable to the adverse effects of lead. Blood lead levels as low as 10 µg/dl are associated with harmful effects on the children's learning disabilities, behavioural problems and mental retardation.

Aim: To find out the possible lead exposure pathway in children due to toys and intervention possibilities in them

Methodology: The present study is based on the search of materials from different journals, original articles and review articles. Data was studied and analyzed.

Conclusion: Lead toxicity results in low performances on child's intellectual abilities, academic abilities and many other issues. Pediatricians must be well equipped to monitor and help reduce sources of lead contamination and prevent lead exposure in children

INTRODUCTION

Lead is a neurotoxin and carcinogen affecting the nervous system, reproductive organs, cardiovascular system and kidneys etc (Gidlow *et al*., 2004). Most of the harmful health effects of lead are cumulative and can be irreversible (Needleman *et al*., 1991).The harmful effects of childhood exposure to environmental toxic metal lead is meant to be a major health concern. Most of the lead found in soil and dust is due to result of human activity. Lead is considered one of the first anthropogenic environmental pollutants (Aberg *et al*., 1999). The Centre for Disease Control (CDC) currently uses a reference value of federal standard for lead poisoning is 10 µg/dl in children (ATSDR, 2007a, 2007b).

Although lead exposure poses a risk to humans in general, but children are among greater risk in concern (Shilu Tong *et al*.2000, Fels *et al*., 1998; Markowitz *et al*., 2000). A child can absorb up to 50% of lead that enters the body (Wisconsin *et al*., 2007) in comparison to an adult who can absorb 5-10% (Mahaffey *et al* 1977). The metabolic rate of a child is much higher than that of an adult's rate. This includes a rapid respiration, which in turn increases exposure to any air pollutant (Bearer *et al*, 1994).Lead may gain entry in the body through respiration or ingestion when a dust-covered hand is placed into the mouth (Mielke *et al*., 1998b).

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In consideration of the severe threats to health caused by lead exposure, lead-based paint in the United States with a lead content in excess of 600 ppm was banned for use in products marketed to children (USCPSC, 1996, 2001). As more children's products, especially toys containing lead based paints and plastic are imported from countries that do not follow the same standards as the US, the effect of this ban diminished and the need for additional regulations was needed

The Effects of Lead on Human Health

Lead is considered highly toxic to humans. It is presently been recognized as "the single most significant environmental health threat to American children" (Mott *et al*, 1997). It gains entry into the body through ingestion, inhalation of lead containing dust and under some circumstances through the skin. Once it is present inside the body, it can affect any cell type (Markowitz *et al*, 2000). Lead can pass through the blood brain barrier and cause damage to the central nervous system. The presented symptoms observed are decreased cognitive performance in both learning and memory (Stewart *et al*., 2007). Children are the most vulnerable to be affected by Lead contamination within the plastic of children's toys (Finkelstein *et al*., 1998).It was also hypothesized that the use of lead as a stabilizer would result in higher incidents of elevated lead (> 600 ppm) in polyvinyl chloride plastics (PVC) than non-PVC plastics. Also it was hypothesized that due to the use lead chromate "yellow coloured toys" would have higher incidents of elevated lead (> 600 ppm) than toys of other colours.(Shawn L et.al,2009)

Signs and symptoms of lead toxicity depend on blood lead level (BLL) and age, and children are much more vulnerable to lead toxicity than adults. Lethargy, nausea, vomiting, anorexia and colicky abdominal pain are the most common symptoms of lead poisoning in children at BLL of more than 40µg/dl. Blood lead of more than 80µg/dl can cause occurrence of encephalopathy in children. Irritability, lethargy, and ataxia may be early signs of acute encephalopathy, and presentation of convulsions and coma are the hallmarks. Other symptoms include bizarre behaviour, ataxia, apathy, and memory loss. About 30% of children suffering with encephalopathy have resulted in permanent neurological deficits (Ellenhorn *et al*., 1988).

Lead exposure can cause severe impairments in growth and development physically, mentally and emotionally. Lead exposure can also cause anaemia, kidney damage, hypertension, immune system damage and behavioural changes. It is also observed to be a cofactor in various types Cancers (Goyer *et al*,. 1990).

Cognition

Lead is a potent neurotoxin and it was estimated by the American Academy of Paediatrics that about 25% of children with lead poisoning will have resulted in permanent brain damage, and around 82%suffer recurrent seizures and mental retardation (Damstra *et al*,. 1977, Gidlow *et al*,2004).There was observed an inverse correlation between blood lead concentration and skills in maths, verbal reading, verbal and response times. Observations were made that there was an increase in hyperactivity, behavioural problems, and poor attention (Chiodo *et al*., 2007).

Kidney

Children with high lead contents in their blood levels were found to have an abnormally high frequency rate of glomerular damage as well as decrease in the distal tubular function (Fels *et al*., 1998).

Immune System

Lead is a developmental immune toxicant. One of its prominent effects is weakening of the immune system by shifting the body's balance of type 1 T-helper cell responses to type2 T-helper cell responses. This change leads to compromises in the immune system function that causes the individual to be more vulnerable to various infective and autoimmune diseases (Dietert *et al*., 2004)

Growth and Development

Various studies have been done to investigate an existing relationship between BLL and the growth of children. Schwartz *et al*. examined around 2,700 children aged 7 year and younger, and found an inverse correlation between BLL in the range of 5 to 35µg/dl and body height. They made a conclusion that even low-level lead exposure could impair the somatic growth of children. Kafourou *et al*. also found a negative relationship between BLL and growth parameters in children of age 6–9 year, an increase in BLL of 10µg/dl being observed with a decrease of 0.86 cm in height, 0.40 cm in chest circumference and 0.33 cm in head circumference

Why is lead Being used in the Production of toys?

Millions of toys have resulted in lead contamination. Lead and many other heavy metals are used as a softener and stabilizer in PVC plastic products (Kruszewska *et al*., 1996).Pigments containing heavy metals are often mostly used in plastic toys to increase their vibrancy of colours (Lardinois *et al*., 1995). Lead is most frequently used in forms of yellow and red pigments. Lead chromates are used for pigments that range from greenish-yellow to yellowish-red. (Gregory *et al*., 2007). The mid-shade yellows are pure lead chromate (Robert *et al* 2009).Various articles were also found relation to lead within toys and childhood exposure (Schmidt *et al*; 2008, Shriberg *et al*; 2007; Weidenhamer*et al*., 2007).Frequency of elevated lead (> 600 ppm) content can be depicted by the colour of plastic toy. The yellow pigment lead chromate which is used in plastic toys to increase the vibrancy of colours (Lardinois *et al*., 1995). The researchers have also found that yellow plastics more frequently contain high concentrations of lead than any other colours (Gregory *et al*, 2007; Hankin *et al*., 1974).

How the Children are Expose

Children's bodies absorb lead easily and more readily, especially in the brain tissues and central nervous system, making them highly susceptible to the effects of lead poisoning. The most common pathway leading to ingestion of lead could be 'hand-to-mouth' behaviour especially among children of younger age groups. [McDonald J.A et.al, 1996]. Exposure during childhood is thought to be brief, usually until the age of 6 but the side effects persist throughout life (Graff *et al*, 2006; Brown. *et al*, 2012)

Prevention

Exposure to lead is an important risk factor that is directly related to the health of children (Bearer *et al*, 1994). Imported toys contaminated with leaded plastic, have recently been of increasing concern (Schmidt *et al*, 2008).Consumers should strictly avoid the use of lead containing toys made from PVC. Additionally, customers should consider purchasing yellow coloured toys only from manufactures with a good safety record. Frequent screening should be done in the primary care setting to identify children who have elevated blood lead concentrations by role of paediatricians (Ossiander EM et.al,)

CONCLUSION

Lead toxicity results in hampering performances on children's intellectual abilities, academic abilities, behavourial problems, physical growth and birth weight. Paediatricians must be well equipped to advocate for more stringent regulations to reduce sources of lead contamination and prevent lead exposure in children.

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