



## A Review Paper on Lead Exposure and Poisoning in Nigerian Children: The way forward

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### ABSTRACT

Nigerian Children are still exposed to lead from the environment, food, drinking water, cosmetics, parents' occupation, and the use of residual lead painted woods. Although, lead poisoning outbreak in Zamfara and Kaduna which claimed the life of several children, occurred in villages and amidst the lower societal class. Recent studies have however revealed that lead exposure is still a prevalent issue in urban and rural areas with the continued production of leaded paint by the Nigerian paint industries, and the discovery of high lead contents in some canned foods and other food products in Nigeria. Lead exposure and poisoning may be eradicated in the nearest future in Nigeria with greater awareness on its health implications, the use of cleaner fuel for cooking or heating, and with the proactive and collaborative approach by the government, parents, the Ministry of Health and Environment, the food industries, the paint manufacturing industries, and other stakeholders' in the society. There is also the need to encourage the use of cleaner fuel in households. There is the possibility of future study on lead exposure in Nigerian children through the application of leaded beauty products such as leaded eye pencils on their eyes by some mothers.

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### Introduction

Lead poisoning in African children is a cause for concern as there are unregulated leaded paints, cosmetics and lead solder sold in the continent; lead painted woods is also used for cooking and heating in the home (Nriagu et al., 1996). The major sources of lead exposure in some parts of Nigeria according to Adeniyi and Anetor (1999) are from vehicular pollution from leaded gasoline use, consumption of Nigerian leaded salt, drinking water absolutely obtained from wells. Also, about 70% of Nigerian children have blood lead levels of about 10ug/dl (Wright et al., 2005). According to the Centers for Disease Control and Prevention (2012), the unborn child, bottle fed babies, preschool children, and occupants of older houses are susceptible to lead from diverse sources.

Lead itself is a naturally occurring inorganic compound that is obtained from galena (Wilson, 1987). It is a soft grey bluish heavy metal that melts at 327°C, and can be molded into various shapes and sizes (Smith, 1986). The chemical formula of lead is Pb (Farmer and Graham, 1999). Lead has been in existence since 6,000 years ago, history recorded that the Romans made substantial use of lead for production of utensils, plumbing, juice preservation and several other uses (Needleman, 1999). Other uses include lead being used as power cables, in telephones, as telegraph sheathing material, pipes, plastics, roofing sheets, beauty products, ceramics, and lead acid batteries (Urbanowicz, 1986).

### Sources of Children Lead Exposure in Nigeria

The first route of lead exposure is through the production and use of leaded paints in the environment. Based on a study of five paints manufactured by different companies in Nigeria in 2006, it was discovered that about 96% of the paints had more than the recommended lead levels in paint ranging from

84.8ppm to 50000ppm (Adebamowo et al., 2007). The use of lead in paint is a potential hazard despite various measures in place to curb lead petrol, lead pipes and tanks used to supply water (Moore, 1986b). Lead can be ingested through the lungs and carried away by blood to other parts of the body. (Moore, 1986a).

The resolution of the International Conference on Chemicals Management (2009) was for the execution of the agreement reached by the World Summit to eradicate the use of lead in paint production to prevent injurious health situations to children and the environment as a whole. But despite this, recent studies have revealed that leaded paints with lead content above 90ppm and as high as between 600ppm to 5000ppm is still sold and being used to paint new residential buildings in Nigeria (Occupational Knowledge International, 2013). This poses a great hazard to the children and shows that the paint industries in Nigeria are yet to take proactive steps to eradicate lead as a component used in paint production.

The second route of lead exposure is via the soil. According to Agbenin (2002), the application of phosphate fertilisers and organic waste on agricultural soils in long years may cause lead accumulation in soils three times more than other unpolluted soils. In addition to this, it was discovered in Osogbo that higher lead concentration was found in the topsoil of high traffic density roads than in low traffic density roads (Fakayode and Olu-owolabi, 2003). According to Rosen (2002), lead in the soil can be transferred to plants which are consumed by human beings. Rosen (2002) further suggested the following preventive measures:

- Soil contaminated land may be remediated
- Farms or garden soil should not be located near obsolete buildings or majorly plied roads

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➤ Organic manure could be added to soil to disable lead availability in soil

➤ The soil should be placed at a PH of above 6.5 which bind lead activity.

Also, Nigerian children are prone to lead exposure and poisoning in their homes due to the occupation of their parents. An example of this is the case of lead poisoning in Zamfara, Nigeria leading to the death of several children up to the age of 5 as a result of playing on leaded soil where lead rich gold ore is processed in households (Lo et al., 2012). There was another incidence in Kaduna Nigeria, where elevated lead blood levels was found in children aged 1 to 6 years with 2% having lead blood levels as high as 30µg/dl; also 5 year olds were the average worst hits as this age groups are prone to playing longer outdoors in an environment which may be lead contaminated (Nriagu et al., 1997).

In addition to this, in North Western Nigeria, lead poisoning from gold ore processing in 2010 led to the death of several children up to about 5 years of age, it was discovered that gold were processed within household compounds, there was also high levels of lead in the soil and in the primary water source (Dooyema, 2012). A similar event also occurred in China in 2009 involving nineteen people majorly children residing in the village of Hunan who were hospitalized as a result of lead pollution from primitive smelting operations in the environment; their blood level was over 200mg/l and all showed a common symptom of abdominal pains (Jie, 2012). All these incidences are preventable with greater awareness in the rural and urban areas

Furthermore, Pfitzner et al., (2000) observed increased blood lead levels in children who live their battery smelters and in some geographical locations in Nigeria. Onianwa and Fakayode (2000) also observed the soil around a battery factory in Ibadan was elevated with 2000mgkg<sup>-1</sup> close to the company fence, and at a primary school about 500metre away from the battery company had about 1450 mgk<sup>-1</sup> lead in soil. Areas such as the home and the school where children spend most of the time are potential areas of getting exposed to lead poisoning.

Another pathway through which lead is ingested is through food, cooking water, or vitamins and minerals which is absorbed by the gastrointestinal part of the body (Moore, 1986a). In Nigeria, the amount of lead in canned and uncanned consumer products is a cause for concern as a study revealed that all the canned beverages analysed had lead levels beyond the maximum contaminant level of 0.002 to 0.0073mg/L, while 73.9% of uncanned beverages had lead levels beyond the maximum contaminant level of 0.001 to 0.092mg/L (Maduabuchi et al., 2006).

In addition to this, it was discovered from a study in Abeokuta Nigeria that the lead levels in smoked fish is increased by seven times due to the technique used in its processing (Adekunle and Akinyemi, 2004). Also, there is the consumption of lead and other heavy metals prepared herbal medicine in Nigeria due to poverty and lack of knowledge of conventional medical care products (Nnorom et al., 2006). Furthermore, lead levels beyond the maximum contaminant level have been discovered in some sachet water (Orisakwe et al., 2006).

Lead could also be consumed by children through the diet of children in the rural areas whose fathers are hunters in Nigeria. Consuming meat from game birds killed with lead bullet is known to cause poor academic performance in children, and miscarriage in pregnant women (Green and Pain, 2012). Lead consumption through the diet in Nigerian children may

have adverse health effects on the children whose body and immune system are just building up.

#### **Health Effects of Lead Exposure or Poisoning in Children**

Lead exposure in children causes kidney damage, muscle or bone growth retardation, reduced intelligent quotient and speech impairment in children (King County, 2012). Accumulated lead compounds in the body leads to lead poisoning symptoms such as abdominal pains, anemia, and body ache (Lee, 1981). Lead has also been linked with peripheral arterial diseases (Navas-Acien, 2004). Also, lead exposure causes inhibition of protein and enzyme binding which results in malfunctioning of the cells in the body (Markowitz, 2006). Its overexposure is also known to cause motor neuron diseases (Campell et al., 1970). There have been also been cases of dental caries especially in children with blood lead level of more than 10 µg/dl (Youravong, 2011). In addition to this, cognitive impairment has been noticed in children with low blood lead levels (Meyer, 2008).

#### **The Effect of Lead Exposure in Low Doses in Children**

Although, several studies have dwelt on children between the age of two months to five years, there is still the question of whether lead is safe in at any levels in children. According to Adebamowo et al., (2006) who studied the public awareness of people to lead exposure in South Western Nigeria discovered that there is limited awareness of sources of lead exposure, and its health effects even at low doses.

Lead poisoning even at low dose in blood is still a great source of concern in children in spite of measures to eradicate the use of lead in petrol (Cranfield and Jusko, 2008). An example of lead poisoning at low doses is the use of leaded beauty products used by some mothers which is also applied on their children most especially on babies and infant. According to Nnorom et al. (2005) in Nigeria, lead is a component of cosmetics used by women with the highest concentration in the Kawali eye makeup; this concentration although safe make over time increase the lead burden in the eyes and other parts of the body beyond acceptable limits. This is an area where study in limited and provides opportunity for future exploration.

#### **The Lead Prevention versus Lead Treatment Option for Nigerian Children**

Lead exposure affect between 5% to 27% of Nigerian children which costs health and educational institution \$0.38 - \$1.15billion for every 1ug/dl increase in blood lead levels, however lead prevention in 12 months will cost the nation between\$0.076-\$ 0.23 billion (Ogunseitan and Smith, 2007). Also chelating drugs which are used to treat high dose of lead is not readily available in developing countries such as Nigeria, and have minimal effect in treating serious low doses of lead exposure (Meyer et al., 2008). Therefore, the benefits of lead prevention cannot be over emphasized. This means that lead exposure prevention is cheaper than cure if the Nigerian government is ready to take pro active legislative steps. This would also prevent the emergency situation such as the Zamfara lead poisoning (Moszynski, 2010).

#### **Conclusion**

In summary, poverty, lack of effective information dissemination on lead poisoning in rural areas most especially among artisans' parents, as well as lack of government lead prevention policies are the major cause of continued prevalence of children lead poisoning in Nigeria. In addition to this, the industries need to regulate the amount of lead in their canned and other food products. Biomass fuel for cooking and lightening should also be discouraged in Nigerian households. There is also the need to continuous assessment of all routes by which lead enters the environment and human body especially in

children since it is proven that even at low doses of exposure to lead in children several health risks are associated to it.

#### Recommendations

➤ Parents, guardians, teachers and school authorities need to be more aware of the health implications of lead and their duty of care to protect the children.

➤ In the homes and in schools, measures should be put in place to prevent children from exposure to lead in soil and dust since they pick substances from the ground to their mouth (Mielke and Reagan, 1998). Also, children needs to be discouraged from playing in the soil and their toys should be regularly cleaned (Centres for Disease Control and Prevention, 2012).

➤ A Lead Exposure Eradication Programme should be established and passed into law in Nigeria. This should be implemented at the local, state and federal levels of government. This programme should be in partnership with the Environmental Health Officers, and should be carefully mapped out to ensure that grassroots areas are well reached. Also, adequate information on lead exposure should be dissipated via campaigns, leaflets, media, and through the village chiefs in the rural areas.

➤ Nigeria needs to join other countries in the world to eradicate leaded paint via her polices

➤ Primitive mining and smelting operations should be phased out in Nigeria

➤ Salient routes to lead exposure should be placed on watch list. An example of this is the surveillance carried out by British Paediatrics' Surveillance Unit which from the year 2010 to 2013 to look out and treating reported cases of lead concentration in blood greater than 10ug/dl in children from birth to fifteen years, identify sources of exposure and prevent future occurrences (Health Protection Agency, 2012).

➤ The Environmental Health Officers should work in partnership with the Ministry of Education, and Planning Authority, to carry out continuous checks to ensure that schools are not sited near battery factories or auto mechanic workshops, and if it is already situated, remediation action should be carried out.

➤ Artisans' whose occupations that are lead related should be registered and their operations monitored by the government.

➤ Local recycling of lead in batteries should also be banned in Nigeria.

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