



## AN OVERLOOK OF SOURCES AND STRATEGIES OF MINIMISING LEAD POISONING IN NIGERIA

MOHD ALIYU MAHUTA

*Adamu Augie College of Education, Argungu, Kebbi State, Nigeria*

### **Abstract**

*Lead is a useful metal that had been utilised for thousands of years but the lead metal is a dangerous poison when it is accidentally inhaled or ingested beyond the minimum level. This paper therefore extensively examines the various sources of Lead poisoning which include cultural usage of lead, lead pipes and drinking water, lead in paints, lead and*

*occupations, gasoline lead exhaust wastes, lead in human/animal foods, and lead from industries and mines. The paper thereafter outlined the strategies of minimising*

**Keywords:** *Lead Poisoning, Sources, Elimination/Minimising*

*g the lead poisoning from the family roles, increased cleanliness and avoidance of domestic sources of Lead exposure*

### **INTRODUCTION**

Lead poisoning (also known as plumbism, colica pictorum, devon colic or painters colic) is a type of metal poisoning and a medical condition in humans and other vertebrates that is caused by increased levels of lead in the body. The lead interferes with a variety of body process as it is toxic to many organs and tissues including the heart, bones, intestines, kidneys, reproductive organs and nervous systems. Symptoms of lead poisoning include abdominal pain, constipation, headache, irritability, memory problem, inability to have children and tingling in the hands and feet. In severe cases anaemia, seizures, coma or death may occur. The several deaths from lead exposure may comes from decreased lifespan and long term health effects. In fact lead

to wider governmental paints and finally State Lead poisoning roles of monitoring and medication of lead poison must be eliminated if the regulating of public victims and relocation of nation is to achieve drinking waters, foods, extremely lead exposures sustainable development public environment, resident communities. goals. leaded gasoline, leaded Incidences of Zamfara

Exposures accounts for 0.2% of all deaths and 0.6% of all disability adjusted life years globally.

According to Nriagu (1992b) lead poisoning had remain as one of the unrecognized public health issues. The questions therefore are Nigerians to allow the challenge of lead pollution to continue contaminating the environment? Have Nigerians for instance forgotten with the several Zamfara children victims of Gold mining sewages? This is what this paper seeks to achieve for lead poisoning is preventable (WHO, 2016). So this paper will examine and bring into light the several sources or routes of lead poisoning challenges confronting the people especially younger children of Nigeria. Reference will be made with United States and China whose restrictive measures on lead poisoning had succeeded in reducing the lead exposure challenge.

### Sources of Lead Poisoning

#### 1. Lead poisoning from History and Cultural Practices:

Lead metal poisoning is not only a problem of modern technological society but also is of historical perspectives (Hickmal *et al*, 1974). Lead was among the first known and widely studied environmental hazard. In the second century BC, the Greek botanist, Nicander described the colic and paralysis that were seen in lead poisoning people while Dioscorides, a Greek physician who lived in the first century AD wrote that lead makes the "mind gives away" (Flora and Mehta, 2008). Gout prevalent in affluent Rome is thought to be the result of lead or leaded eating and drinking vessels. Sugar of lead (Lead acetate) was used to sweeten wine and the gout that resulted from this was known as "Saturnine gout. The Lead poisoning may have contributed to the decline of the Roman Empire. In addition, analysis of the Roman era utensils, knives, cups, etc had shown them to be made of lead thus confirming the theory that decline of Roman Empire comes from lead poisoning (Hickman *et al*, 1974; American Chemical Society 2009).

Cultural practices, living conditions and life styles can influence the exposure to toxic metals in terms of religious beliefs, medical treatment, food habits and beauty practices. Thus preparations of lead sulphide in various organic bases are used in most parts of Africa as an eye salve or cosmetic under such names as kohl, tiro,

tanjere etc (Nriagu 1992a). The kohl according to Dapul and Laranque (2016) is an ancient cosmetic from the Middle East, South Asia and parts of Africa.

Lead is commonly incorporated in to herbal remedies such as Indian Ayurvedic preparations and the remedies of Chinese origin. There are also risks of elevated blood lead levels caused by folk remedies like azarcon and grata which each can contain about 95% lead (Rossi, 2008).

Some jewellery that are made of lead can pose a danger to children if they put the jewellery in their mouth as the jewellery of lead cannot harm the skin because it is principally made up inorganic lead which is not absorbed in the skin (King County, 2016) when compared with organic lead that cross easily in to the skin as they are fat soluble (Anonymous, 2016).

### **2. Lead Poisoning from Drinking Water/Lead Pipes.**

Lead is one of the most serious pollutants that can makes its way into drinking water where the ionic cations of  $Pb^{2+}$  are soluble and deadly. Thus the Lead in connecting solder (50-70% lead) that is used to join drinking water fountains, a holding tank or seams may dissolve in the water when it stand overnight. Therefore the lead in drinking water may come from corrosion of the public water systems and not from the water source itself. The Lead ( $Pb^{2+}$ ) ions may be three (3) times in hot water than in cold water hence drinking cold water minimizes chances of  $Pb^{2+}$  ions ingestion (American Chemical Society 2009). In fact in 2004, test results in USA shows over two thirds of more than 6000 homes had unacceptable lead levels with some data as high as 20 times the 15 ppb lead limit and the cause was attributed to ageing lead pipes. The discovery in 2004 of this high lead level in the Washington DC by a team of seven reporters enabled them to win an award for investigative reporting's of series of articles on the high lead exposures (American Chemical Society 2009). In the United States, the total lead exposure that is attributed to drinking water is about 14 – 20%.

### **3. Lead Poisoning from Paints.**

Paint is the major sources of Lead exposures to children as they bite painted toys, paint dust and lead pencils. In addition, because compounds of heavy metals can have brilliant colours, they are heavily used in paint pigments, glazes, inks, and dyes (Wright, 2008). Lead carbonate [ $PbCO_3/Pb(OH)_2$ ] is usually in paints to speed drying, improve durability and protect the surface from corrosion. Even though negative health effects of the lead paints in residual apartments were known as far back as the early years of 1900s but the paint was not banned in USA until 1978. However France, Belgium and Austria banned the lead interior paints as far back as 1909 (Anonymous, 2016).

Studies in the United States which were conducted in 1978 – 2000 found that 38 million housing units had lead based paints. The deteriorating lead paints and lead

containing dusts are easily ingested by children that are crawling on the floor and old people suffering from pica (King county, 2016). As low-income people lives in old houses that had lead paints which have begun to peel exposing residents to high level lead, such people have been found to have high level blood pressure particularly the young African American children in the USA (Anonymous, 2016).

In 2007, millions of toys made in china were recalled back from multiple countries owing to safety hazards including lead paints (Anonymous, 2016).

#### **4. Lead Poisoning from Leaded Gasoline Car Exhaust.**

The lead is added to petrol or gasoline in amount of the order of  $3 \times 10^8$ kg/year and almost 75% of the lead is emitted as particulates from the exhaust. The vehicle exhaust waste contain organic lead which can be inhaled directly or may settle on food, water or any number of items that are put in to the mouth. This knowledge led United State EPA to mandate the elimination of leaded gasoline by the end of 1996. The outcome had been a dramatic reduction of lead concentrations in the environment. Thus between 1980 and 2005, the lead concentrations fall by 98% in the United States. At the same time there was a great drop in children's lead level (Wright, 2008).

Though gasoline is generally no longer a measure source of lead, decades of leaded gasoline usage had left contamination in the soil next to roadways of up to a quarter of a mile from the road. Again the tetraethyl lead is still added to aviation fuels thereby contributing to soil contamination especially in urban areas and this raises concern about the safety of urban agriculture where intake of food grown in contaminated soil can present a lead hazard (King county, 2016). Similarly most developing countries still allow leaded gasoline fuel which forms the primary source of lead exposure.

Investigations shows high atmospheric lead levels in Cairo, Ibadan, Lagos, and many other cities of Africa which were attributed to traffic congestions, high dust leads in the air, narrow streets, arrested air flow, lack of rainfall and helter skelter development and citing of industries (Nriagu, 1992b). As of 1992, 10—30% of the African children are suffering from lead poisoning. Yet up till now, most of the developing countries are yet to ban the use of leaded petrol. In fact this makes the USA to test for blood lead levels of foreign visitors in order to find those with high blood lead levels that needs medical chelating (King county, 2016).

Anonymous (2016) says it is believed that the USA ban on lead points in the 1970s and the phasing out of leaded gasoline in the 1970s and the 1980s partially contributed to the decline of violent crimes in the United States since the early 1990s. This was theorized by Rick Nevin who stated that reduction in lead exposure from ban on leaded gasoline explain reduction in 65% to 90% of the violent crimes rate in the USA.

#### **5. Lead Poisoning from Foods of Humans and Wild Life.**

The diet is the main source of human exposure to trace elements. Daily lead intake levels from food are on the average around 300 $\mu$ g. It is assumed that the solid food lead intake should not exceed 600  $\mu$ g per day. This makes the lead uptake by vegetable plants of direct importance for human health conditions as certain species may have high Pb toxicity or accumulation level but show no toxic symptoms and apparently look healthy at Pb level which are hazardous for human consumption. Thus radish was reported to contain lead levels as high as 498ppm in the roots and 136ppm in the tops while lettuce also have high Pb accumulation levels which pointed to the need of selection (Bolt and Bruggenwest, 1978).

In some places, the cans used to store foods and drinks may contain lead solder. There is possibility of lead exposure in smoking of tobacco leaves which contain lead containing pesticides or grown in leaded pesticides contaminated soils which is common in developing countries (Bolt and Bruggenwest, 1978).

Lead poisoning is a major cause of mortality for many species of wildlife (Cunningham and Cunningham, 2010). Ingestion of metallic lead such as small lead fishing lures increases blood lead levels and can be fatal. Lakes bottom feeding water flows such as ducks, swans, and cranes ingest spent gun pellets instead of stones in gizzards and the lead slowly accumulates in the blood and other tissues. It is estimated that two (2) to three (3) million water fowls dies each year from lead exposure in marshes, seas and lakes (Cunningham and Cunningham, 2010). Again predators that eat these dead water fowls are also at risk. In similar to lead poisoned water fowls, game animals can be shot using lead bullets, the potentials for lead ingestion from game meat consumption becomes eminent. Even vultures, carthates and candors can be poisoned when they eat the carcasses of animals shot with lead pellets (Anonymous, 2016).

#### **6. Lead Poisoning from Occupations and Manufactured Products.**

Occupational exposure is the main sources of lead poisoning in adults. People are exposed when working in facilities that produce a variety of lead containing products which include radiation shields, ammunition, certain surgical equipment's, plumbing, circuit boards, jet engines, and ceramic glazes. In addition lead miners and smelters, plumbers and fitters, auto mechanics, glass manufacturers, construction workers and plastic manufacturers are all at risks of lead exposure (Anonymous, 2016). Parent workers should be careful as they can bring lead dust onto their home and children (Anonymous, 2016). Shower and change clothes at work place and do not contaminate your car (King county, 2016).

Mini vinyl blinds from China, Indonesia, Taiwan and Mexico before 1997 contain lead which is used to make them less brittle. Lead dust forms on blinds particularly when they are exposed to sun and heat ( King county. 2016). The printing industries are

also source of lead exposures where newspapers and Xeroxed copies all contain lead (Salawu, 2008).

Estimates had shown that more than three (3) million workers in the United States are potentially exposed to lead in their work place (Anonymous, 2016). However, even though lead poisoning is one of the oldest known work and environmental hazards, modern understanding of the small amount of lead necessary to cause harm, did not come about until the latter half of the 20<sup>th</sup> century and up till now no safe threshold for lead exposure had been discovered that cannot cause harm to the body (Anonymous, 2016)

#### **7. Lead Poisoning from Mines/Industries.**

The ingestion of lead by people living in the vicinity of a Lead/Zinc smelter is at least 50% higher than normal (Bolt and Bruggenwest, 1978). According to Narayanan (2009), lead is probably the most widely used nonferrous metal poison that has a number of industrial applications. Specific industries in which lead containing solids, dust and fumes are encountered are petroleum industries, mining and smelting of sulphide ores, printing, cutlery, and manufacture of storage batteries, paints and pigments, ceramics and ammunitions.

Historic smelter operations such as ASARCO Copper smelter that operated in Ruston near Tacoma Washington DC have contributed for almost 100 years in contaminating the soil with elevated levels of lead and arsenic (King county, 2016). In China about 15,000 people have to be relocated to other locations in Jiyuan of central Henan province to other locations after 1000 children living near China's largest smelter plant own and operated by Yuguag Gold and Lead were found to have excess lead in their blood. The total cost of the project is estimated around 1 billion Yuan (150,000), 70% of the cost will be paid by the government and smelter company while the rest is to be paid by the residents themselves which includes about 10 villages. The Chinese government then suspended production at 32 of the 35 lead plants (Anonymous, 2016).

The cases of lead poisoning in Zamfara State, Nigeria are glaring incidences that occurred in October 5, 2010 where at least 400 children died of lead poisoning which indicates the need for relocation of people of the area from the mines or closing the mine altogether. In other incidences in Zamfara State, apart from the dead of lead poisoning some men were rendered impotent (Muibat, Christy and Alhaji, 2010).

#### **Strategies to Minimize/Eliminate Lead Poisoning**

The public health system should have screening programs for children at high risk of lead exposure such as those who live near lead related industries like Gold mining villages of Zamfara State, Nigeria. The blood lead elevated victims should be put on immediate medication before their health situation deteriorates to epidemic lead

poisoning emergencies. The families of such lead poisoning prone areas should be relocated to safer lead exposure areas through joint ventures of the government, the smelting industries and the resident families involved with the transfer as cited earlier with case of Jiyuan in Central China Province relocation project (Anonymous, 2016)

The government should group high lead exposure professions and occupations into excluded parks or villages like lead acid battery workers, metal welding workers, metal recycling companies and smelter Industries which should be sited away from the general public. The government should set regulations banning/limiting the use of lead on certain products like paints, rubbers, plastics and above all leaded petrol especially the developing countries. Success had been achieved by developed countries like USA since 1970s and 1980s in minimizing lead exposures from paints and leaded gasoline. The government should also ban importation of hazardous products that contains lead such as leaded mini blinds, leaded cosmetics, toys, jewellerys, glaze wares and electrical/electronics. The European Union had put regulations on high lead electronics (Anonymous, 2016).

The government should make laws to regulate public tap water supply especially the minimum amount of lead that is to be allowed in drinking water. The water should be monitored in every towns especially cities where the primary source of public waters are surface rivers and streams which in turn are the receiving end of industrial and household sewage/refuse waste that may contain high amount of lead (Salawu, 2008). Since the solubility of the lead in waters increases with the decrease of water pH, the pH of the waters especially those coming through old pipes or old tanks must be monitored to avoid corrosion of the pipes or solder welding connections. There should be monitoring of not only surface waters but also deep underground boreholes or well waters to analyze their lead content because of underground weathering of rocks. Wild water animals like fish, cramps, shrimps and water fowls must be analyzed to find their lead level content as water fowls had earlier been shown to be lead poisoned because of lead pellets storage in gizzards. Shrimps and Snails also show higher lead levels above WHO limits in Sokoto State (Abdurrahaman and Yahaya, 2008).

The governments should sponsor Post graduate studies on lead poisoning and other heavy metals accumulation both within Nigerian Universities and foreign Universities. All University teaching hospitals, medical centres and specialist hospitals should have lead/heavy metal exposure consultants considering the problem of metal poisoning which had been hitherto unrecognized/silent health risks but now brought to surface with Zamfara State lead poisoning cases. The health hazards are endemic that must be minimised.

The governments should introduce applied environmental education in to the school curriculum (Salawu, 2008) especially the topics on sources, impacts of lead and other heavy metals pollutants for better awareness and enlightened future generations. The general public must be given orientations and campaigns on the dangers of lead exposures right from the various sources to the impact of the lead exposures on their wards and the pica old.

The governments should sponsors researches on Lead poisoning not only in Zamfara state but all the 36 states of the federation in order to determine lead ore areas, high lead water lakes, dams, streams and the animal grass forages especially tolerant plant species. The investigations should include the nutritional food lead status of the people and the soil of farms which may be contaminated with lead from pesticides or waste manures. The government should also sponsor investigations on municipal air and roadside soils/sludge in urban traffic jam areas of for instance Lagos, Ibadan, and Kano where the Car exhaust fume is sending lead particulates, in large amount. The urban airports surrounding lands particularly those used for agriculture should be analysed of high Lead content which may come from burnt leaded airplane exhaust waste.

The private sector should always utilise lead free cans for retailing their nutritional food and drink products. The industries should fit filters capable of reducing noxious substances from entering their environment (Salawu, 2008). The private sector must be a complement of the government through provision of their industrial resident neighbours with social facilities such as lead medication hospitals and relocation housing construction projects of people affected by their lead containing wastes.

The families should give emphases on cleanliness of their houses, children's toys and their play areas. The families should also be eating foods high in calcium, vitamin C and iron which may helps in preventing the body from absorbing lead. Crawling children and old pica should be monitored to prevent them from ingesting paint scraps.

The lead containing mini blinds and jewellery should be avoided by the families. Old lead pipes in the house must be replaced with plastic pipes while families that cannot afford replacement should run the first morning tap water draw for some seconds to flush out the most contaminated water. As hot water can contain two thirds the lead content of cold water, the families should use cold water from the tap for drinking, cooking and for making baby formula. Lead testing kits are commercially available, so each family should purchases the kits for detecting the presence of lead in their households.

### **Conclusion**

In conclusion, the paper had shown that lead is a hazardous metal that could be inhaled or ingested from various sources thereby resulting in lead poisoning. The challenge therefore is to minimize/eliminates the lead poisoning from the joint



hands of the governments, the private sectors and the individual families. Lead poisoning incidences must never be allowed to be recurring in the country.

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