

Nature and extent of lead poisoning in Tricycle Repairers in Nigeria.

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ABSTRACT

Lead poisoning is a serious public health concern in Nigeria. Exposure to lead exerts toxic effects in several body organs and interferes with a variety of biochemical processes including nervous system development, thus, more toxic in children. Notwithstanding, occupational exposure particularly tricycle repairers in Nigeria is vague. The survey reports on the nature and extent to which tricycle repairers at Oshodi, Nigeria exposure to lead at workplace. Twenty tricycle repairers were randomly recruited and their anthropometric parameters were collected and recorded in a Quantum Health Machine (QHM). The automated QHM examined each repairer's total (blood, tissues, organs, bones and body) lead contents immediately each repairer held the QHM's sensitive handle and results displayed on detector screen. Repairers were mainly exposed to lead through lead tetraethyl (an antiknock agent in petrol). Repairers were exposed by ingestion and inhalation routes during siphoning of petrol in and out from petrol tanks. Generally, 85% of studied repairers had moderate 40% to severe 48% abnormal contents of lead in their bodies while 15% repairers were of mild abnormal lead contents. The overall mean and median levels of lead in studied repairers were 162.8 and 165.1 (range: 100.2–196.4)µg/dL respectively. These levels are higher than levels of lead reported in other adult populations elsewhere in Nigeria but exceeded the Food and Drug Administration provisional total tolerable intake level of 75 µg/dL/day for adults. The situation may be worse considering long term exposures, thus, education intervention strategies to reduce exposure levels are urgent

Keywords: Lead, occupational exposure assessment, tricycle repairers, Nigeria, Quantum Health Machine (QHM).

INTRODUCTION

The toxic heavy metal, lead (Pb), occurs naturally in the earth's crust and has been a serious public health concern in Nigeria contaminating water, soil, and air spaces ^[1,2,3]. Usage of lead or lead included material or instrument is unavoidable in our environment today, for example, lead is used as pigment in paints to decorate houses, pipes, covers of cables to prevent electric shocks, and in car batteries. This leaves us with constant interactions with lead materials at home and at workplaces. The major routes of human exposures to lead is via ingestion, aside from inhalation, and even mother to child (e.g. in-utero and via breast milk) ^[4, 5]. Exposure to the carcinogenic heavy metal, lead, exerts toxic effects in several organs and interferes with a variety of biochemical processes including nervous system development, thus, more toxic in children ^[6] who are generally characterised by learning disabilities, mental retardation, slowed growth, and hearing defects ^[7]. Notwithstanding, exposure to lead may either be acute (intake of high doses at short instances) or chronic (long-term exposures to low doses).

Out of the several reports on lead poisoning, only very few have considered exposures at work place ^[8] which is increasing becoming a serious risk factor to several human diseases and even death. The situation is worse in cases of small unorganized groups of creative informal unskilled labourers such as tricycle repairers. To the best of our knowledge, this paper reports on findings from a preliminary survey on lead exposure levels of tricycle repairers in Nigeria in their workplace environment for the first time in Nigeria

MATERIALS AND METHOD

Study site and recruitment of target participants: The study site was Oshodi community, Lagos, Nigeria. Target participants were tricycle repairers. Tricycle repairers were randomly visited in April-May 2013 at their workplace and presented the project to them after which responses were provided to their questions. Where they agree to participate

they were randomly recruited. A total of 20 tricycle repairers (generally males) were randomly recruited to provide anthropometric data and benefit from free lead test in their body.

Anthropometric data collection: Ages of each repairer was calculated based on their date of births (as on birth certificates). Weight and height was directly measured with an electronic scale balance and heights calibration instrument by the investigator.

Laboratory analysis: The anthropometric characteristic of each repairer and their names was recorded into the Quantum Health Machine (QHM) that was connected to a detector computer. Each repairer was asked to hold the sensitive rod or handle of the QHM, at which time, the automated QHM, which works via electromagnetic wave, instantly examined lead contents in blood, tissues, organs, bones and body and presented a global lead content for each repairer on the detector screen. This data reflected the nature and extent of lead poisoning in each repairer's body.

Statistical analysis: Median lead contents mean and standard deviations, and also analysis of variance (ANOVA) in lead loads across different exposure categories were calculated using GraphPad InStat package (p-value less than 0.005 at 95% CI was considered statistically significant).

RESULTS

The table (table 1) below shows the result of the nature and extent of lead poisoning in the body of twenty tricycle repairers at Oshodi, Lagos State, Nigeria. The studied repairers were of age range 25 – 40 years old; weight range: 55 – 70 kg and height range: 165 – 200 cm tall. Generally, 17/20 (85 %) of studied repairers had moderate (8/20, 40 %) to severe (9/20, 48 %) abnormal contents of lead in their bodies while 15 % (3/20) repairers were of mild abnormal lead contents. The overall mean and median levels of the studied repairer population was 162.8 and 165.1 (Range: 100.2 – 196.4) µg/dL respectively

Table 1: Mean and median lead contents in the bodies of studied repairers in Oshodi, Nigeria and lead exposure classification

Number of subjects	Mean ± Standard deviation µg/dL	Median levels (Range) µg/dL	Interpretation (exposure classification)
09	188.5 ± 9.3a	192.5 (165.8 – 196.4)	Severely abnormal
08	157.3 ± 7.3b	157.9 (100.2 – 100.5)	Moderately abnormal
03	100.4 ± 0.1c	100.4 (145.6 - 165.7)	Mildly abnormal
Total:20	Overall:162.8 ± 30.9	Overall:165.1(100.2–196.4)	Overall: Abnormal

P-values between data with superscript a and b, and between b and c were all equal to 0.0001

DISCUSSION

In this preliminary survey to find the nature and extent to which tricycle repairers are exposed to lead in their blood, tissues, organs and bones, twenty repairers were randomly recruited from the Oshodi local area in Lagos State of Nigeria. Accordingly, the anthropometric characteristics and names of each repairer was entered into the Quantum Health apparatus (QHM) which examined blood, tissues, organ and bone lead contents globally using electromagnative wave once its sensitive handle is held by an individual. Based on this method, all 20 repairers were poisoned by lead in their systems and most cases had moderate to severe abnormalities. For the first time in Nigeria and elsewhere, this paper has reported on lead poisoning in informal sector unskilled workers (aka keke Napep repairers) whose works include repairing tricycles, repainting tricycle and cars.

Based on their nature of work and workplace environment, repairers were supposing exposed to lead through an antiknock agent in petrol called lead tetraethyl. This is probably by ingestion and inhalation of lead during siphoning of petrol in and out from petrol tanks using their mouths through hose. Additional exposure routes include inhalation of fumes from exhaust pipes, dermal contact with lead polluted soil and lead paints in workplace environments. Therefore, the levels of lead detected in the bodies of repairers under study were not surprising. Although these levels are not tolerable, they are lower than those reported in other cases such as the case in those in mining environment e.g. the Zamfara State in Nigeria that lead to the death of over 163 people especially children^[9]. Likewise, our findings are higher than those from the occupational exposure assessment from Sokoto, NorthWest Nigeria where 70 % of workers had lead contents greater than 55 µg/dL; another 40 % had levels 60 µg/dL and above, whilst 5 % of studied workers had below 40 µg/dL^[10]. Furthermore, although lead contents in repairers under study are also higher than the U.S. Food and Drug Administration (FDA) provisional total tolerable intake levels (PTTILs) of 75 µg/dL/day for adults, the levels may be exceeded considering long term exposures, and may serve as a risk factor to several health disorders of these repairers. All studied tricycle repairers were detected to be exposed to abnormal levels of lead in their bodies with

statistically significant ($p < 0.005$) differences across the mild, moderate and severely exposed categories. Education intervention strategies to reduce lead exposure levels amongst unskilled labourers such as tricycle repairers are urgent.

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