

Research Letters

Lead Levels in Women at Delivery at the Muhimbili National Hospital: A Public Health Problem

Summary

Lead poisoning is a global health problem but unrecognized in African countries. Umbilical Cord Lead levels can be used to determine community exposure to lead. At delivery, 150 women were recruited for cord blood lead. A prevalence of 10% beyond the accepted range was found. Cord blood levels ranged from 0.1–18.1 µg/dl, with a mean of 4.1 µg/dl. There was no association between lead levels and pregnancy outcomes in terms of low birth weight and pre-term delivery. There was a weak association between lead poisoning and living in a painted house and use of tap water (OR = 1.4). There was no association between lead poisoning and use of facial cosmetics. Living near heavy traffic was more associated with increased cord blood lead levels.

Key words: lead toxicity, pregnancy outcomes, risk factors.

Introduction

Lead poisoning is a global health problem but unrecognized in African countries. Umbilical cord lead levels can be used to determine community exposure to lead.

Studies done in Africa suggest that lead poisoning is a widespread urban health problem throughout the continent. These are prevalence studies focussed more on children, however, evidence suggest that lead poisoning is a public health problem, which affects every age-group [1, 2].

The use of leaded gasoline pervasive dust formation, characteristic of much of the African landscape, facilitates the dispersion of ambient concentrations of lead and thereby increases the likelihood of exposure through respiration [3]. It has been found in one study that 40.8% of newborns had lead poisoning and this was associated with living adjacent to major traffic roads. The foetus is more sensitive to lead toxicity because the foetal blood–brain barrier is more permeable and the foetus has less bone tissue for sequestering lead. Therefore, a child's lead burden and its effects begin before birth [4–7].

The magnitude of the problem is not known in Tanzania.

Methodology

A descriptive cross-sectional study using cord blood at delivery at the Muhimbili National Hospital was done on 150 cord blood of live newborns whose mothers consented for the study were assessed and tested. Detailed gestational assessment was carried out.

Blood sample collection

Two millilitres of whole cord blood was drawn using a trace metal free disposable syringe from the cord vein on the placental side after clamping the cord before cutting. Samples were collected in trace metal free Eppendorf tubes containing heparin as an anti-coagulant.

Sample preparation

Samples were haemolysed with deionized water at a ratio of 1:19 before analysis. To reduce sample contamination, all laboratory vessels and sample cups used, were washed thoroughly and soaked in diluted nitric acid over night.

Lead level estimation

Blood lead level estimation was done at the Tanzanian government chief chemist's laboratory Dar es Salaam, using Atomic Absorption Spectrometer (AAS) with Electro thermal Atomisation (Graphite furnace), model-UNICAM 939. Lead values were recorded as the mean of two analyses of each sample. About 15–20 samples were analysed per batch.

This study was approved by the Muhimbili University of Health and Allied Sciences Ethics Committee and funded by the Ministry of Health and Social Welfare.

Results

A total of 150 mother–baby pairs were recruited for the study. Eighty-one percent of these mothers were housewives with primary education only. There were 70 (46.7%) male babies and 80 (53.3%) female babies, male to female ratio of 0.9 : 1.

There were 26 pre-term babies (17.3%) while term babies were 124 (82.7%), low birth weight babies were 18 (12%) and normal weight babies were 132 (88%). Birth weight ranged from 1400 to 4200 g with mean birth weight of 3200 g.

Lead poisoning was found in 15 (10%) of all babies, 95% CI (5.9–15.6%) and 135 (90%) had blood lead levels below 10 µg/dl. The range was 18.1–0.1 µg/dl, with mean level of 4.1 µg/dl.

There was no association of the levels with birth weight or gestational age at delivery.

Ninety-five (63%) mothers qualified as having heavy traffic exposure and 55 (37%) as light traffic exposure. Among the exposed group, 11.6% had lead poisoning compared with 7.3% of unexposed group. A positive association was found, between living near heavy traffic and lead poisoning, OR = 1.6, however, this association was not statistically significant with a *P*-value of 0.3. Likewise other exposure risk factors, e.g. use of tap water for cooking and drinking, and living in a painted house also showed a positive association with OR = 1.4 and 1.4, respectively, but this association was not statistically significant (*P*-value 0.4 and 0.5, respectively).

Cosmetics (black eye liner) was used by 58.7% of all mothers, however, there was no association between lead poisoning and use of cosmetics, OR = 1.

Discussion

It is well recognized that cord blood lead levels correlate closely with maternal blood lead levels and that this can be used as a community-screening procedure [7].

This study found that the overall prevalence of lead poisoning (defined as blood lead level $\geq 10\mu\text{g}/\text{dl}$) in cord blood among newborns is 10%. Given that, there is no naturally occurring level of lead in the human body, and that lead is unsafe at any level, therefore, a prevalence of 10% is of public health importance. Evidence is now emerging that, levels even below $10\mu\text{g}/\text{dl}$ can cause neurological damage; although a level of $10\mu\text{g}/\text{dl}$ is still an acceptable level of safety [8].

The correlation of cord blood lead level has been previously reported to be 70% of maternal level [7]. Thus, the 10% prevalence of lead poisoning in the cord blood would reflect about the same level of prevalence among mothers; and be considered to represent the prevalence of lead poisoning in the general population of Dar es Salaam where these mothers come from.

In this study, confounding factors such as severe anaemia, EPH gestosis, severe malnutrition and multiple pregnancies were considered. The effects of these potential confounders as effect modifiers were carefully studied. There was no correlation between these potential confounders and low birth weight or prematurity.

Although this study did not find significant correlations with recognized risk factors, it clearly indicates that there is about 10% prevalence. This report therefore augments the available reports in Tanzania, giving evidence that lead poisoning is indeed a problem [9].

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Acquired Methemoglobinemia Due to Contaminated Colours: A Preventable Disaster

To celebrate the beginning of spring in India, a traditional Hindu colour festival called 'Holi' is celebrated by people by throwing coloured powders or spraying coloured water on each other. On 7