

Blood lead levels among children in Pohnpei: preliminary results

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Introduction

Pediatric lead poisoning results principally from the ingestion of lead from the environment, including paint chips, dust, soil, drinking water, ceramics, leaded gasoline, medications, and lead in canned foods and beverages^{1,2}. Lead is toxic to many organ systems, among them, developing erythrocytes, kidneys, and the central nervous system^{3,4,5,6}. Lead toxicity to the central nervous system causes delayed development, diminished intelligence, and altered behaviour^{7,8,9}. There is a sparsity of information on lead poisoning and the Pacific.

Pohnpei, in the Federated States of Micronesia (FSM) has a land mass of approximately 129 square miles and a population of about 35,000 people. The issue of childhood lead poisoning was raised in early 1970's when the Pohnpei sanitarians suggested possible environmental contamination. This concern was not followed up. This issue was raised again and was added to the 1993 Pohnpei Child Health Survey (PCHS). Preliminary results revealed 18% (n=63), of the children 24 to 47 months had elevated blood lead level (>10 mcg/dL)¹. This study was to examine the risk factors for elevated blood lead levels (BLL) among the PCHS cohort.

Methodology

This is a study of the children from the 1993 PCHS survey ages 24 to 47 months old who have high BLL (> 10 mcg/dL) and all the children with low BLL (< 4mcg/dL) from the same study. The PCHS 1993 survey sample was a community-

based stratified random sample. Blood samples were collected from all the children. Environmental samples (paint chips, soil, water, and dust) and blood samples family members of all participant were also collected. A questionnaire was used to find information on the source of lead exposure. The questionnaire was translated into Pohnpeian language and then retranslated back into English to ensure questionnaire consistency. EPI-6 software was used to analyse the data. Appropriate statistics were calculated with $P < 0.05$ as the level of significance.

Results

There were 128 children eligible for this study from the 1993 PCHS. Among the 63 cases, only 58 were accounted for and among 65 controls, only 63 were found. Among the cases, 37 are females (Table 1). Cases are twice (OR=2.40) more likely to be male than the controls ($P=0.02$). There was clearly a high prevalence rate of cases from the outer island (see Figure 1). Most of the exposure variables showed no association except for business using lead, exposure of children through putting paint chips and sinkers in their mouths, and a family member working at a gas station (Table 2). Children with high lead levels is about 5 times more likely to be exposed to a home business using leaded equipment ($P=0.03$). Children with high lead levels were about 6 times more likely to put sinkers in their mouths ($P=0.001$). The cases were much more likely to have a history of putting paint chips in their mouths compared to the controls ($P=0.001$). Cases were 5 times more likely to have a family member working at a gas station ($P=0.03$).

“Lead toxicity to the central nervous system causes delayed development, diminished intelligence, and altered behaviour.”

There following variables were found not to be significantly associated with high BLL: age of dwelling house; year of most recent painting of the house; type of paint used; peeling of house paint; gasoline storage at home; boat and car ownership; use of ceramic utensils; ownership and type of water tank; and use of motor oil or engine booster.

Discussion

The over representation of the males among the cases was probably due to the male child's tendency to play and roll

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Table 1. Distribution of cases and controls by municipality and Sex

Residence	Cases (n = 62)		Controls (n = 63)	
	Males	Females	Males	Females
Kitti	8	2	7	7
Kolonia	7	2	2	4
Madol	1	5	5	10
Nett	3	1	4	5
UH	1	1	1	8
Sokehs	5	9	5	5
Outer Islands	12	5	0	0
Total	37	25	24	39

around in the dirt more than females, and the greater access to the lead of lead sinkers because their fathers and brothers are the main fisherpeople in the household. The highest prevalence rate from the outer island was probably because most of these children have easier access to lead sinkers. The association between high BLL and exposure to business using lead and family member working in a gas station can be explained by leaded business (i.e. plumbing, welding, car shop, etc) exposing children directly or indirectly through a family member acting as a source of lead contamination to the household via working clothes or tools. Lead poisoning has a strong association with children putting paint chips or sinkers in their mouths. Lead sinkers for bottom fishing was very common among household in the outer islands. Paint may still be a source of lead contamination. Regulatory

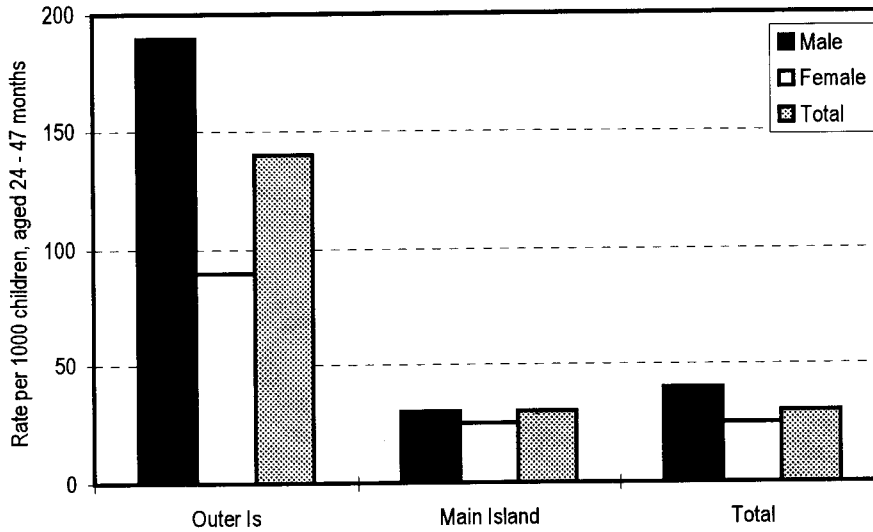
control of paint is weak and Pohnpei still import paint from all over the world without much attention to its content.

This project is incomplete because the results of the BLL and environmental samples have not arrived from the Centre for Disease Control, Atlanta, USA. This report is exclusively from the questionnaire findings. The study showed that cases were more likely to be males, and the highest prevalence rate for all cases by far were from the outer islands. Most variables of interest showed no strong association except for business using lead, children putting paint chips and sinkers in their mouths, and a family member working at a gas station. Paint is one of the well known source of contaminant for lead but not well regulated by many Pacific countries. Leaded sinkers pose an interesting problem especially given their wide use

Table 2: Factors significantly associated with high blood lead levels among children in Pohnpei

	Case (n = 58)	Control (n = 63)	Or	p value
Business using lead				
Yes	8	2	4.88	0.03
No	50	61		
Paint chips				
Yes	9	0	Undefined	0.001
No	49	63		
Sinkers				
Yes	10	2	6.35	0.01
No	48	61		
Members work at gas station				
Yes	4	2	4.88	0.03
No	54	61		

Table 3. Prevalance of lead levels > 10ug/dl, by sex and island, Pohnpei State, 1993



and availability in Pohnpei. When the results of the lead content are available the analysis of this study will be completed.

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“ Common sense is in medicine the master workman ”
Peter M. Latham (1789 - 1875)