Heavy metal contamination and nutritional status of lactating mothers and their children in Kenjeran, Surabaya, Indonesia

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Abstrak

A cross sectional survey was conducted to determine the prevalence of heavy metal contamination and nutritional status of lactating women and children living in a low socio economic urban coastal community. The study was carried out in Kenjeran, Surabaya, East Java, Indonesia. Socio-economically-linked parameters and nutritional status were assessed using a standardized questionnaire. Anthropometric measurements were collected from all mothers and children, 94 venous blood and 86 breast milk samples were collected from the mothers and 10 blood samples were obtained from the children. Blood and breast milk samples were analyzed at BATAN1 in Jakarta, BLK2 in Surabaya and at SEAMED laboratory.

The median age of the children was 15 months (range: 2-50 months). Median age of mothers and fathers was 26 and 30 years, respectively. The fathers? main occupation was in the private sector (33%) followed by fishermen (24%). Most mothers remained at home (80%). Stunting in children was 25.3% (HAZ<-2 SD), wasting was 9.9% (WHZ<-2 SD) and underweight was 30.8% (WAZ<-2 SD). Anemia was prevalent in 60% of the children (Hb<11g/dL) and 56.4% of the mothers (Hb<12g/dL). High levels of lead (71.3%), cadmium (33%) and mercury (8.5%) were found in the blood of the mothers and high levels of lead (94.2%), cadmium (77.9%) and mercury (34.9%) were found in the breast milk. Levels used to determine "high" Pb, Cd and Hg in blood were 300µg/L, 5gglL and 15µg/L, respectively. Levels used to determine "high" Pb, Cd and Hg in breast milk were 201.tg/L, 5 µgfL and 3.5 µg/L, respectively. Median levels of Pb-B, Cd-B and Hg-B were 416.7µg/L, 22.5 1411, and 6.3 µgfL, respectively. Median levels of Pb-M, Cd-M and Hg-M was 537.6 µg/L, 36µg/L and 0.7 µg/L, respectively. All children exceeded the level of concern for lead in blood recommended by the Centers for Disease Control (10µg/dL). High lead in breast milk was associated with low hemoglobin concentrations in the mothers' blood, and a high mercury concentration in blood was associated with the frequency of fresh fish intake.

As a consequence of high heavy metal exposure in the environment, the population of Kenjeran is suffering from adverse health effects. Contaminated breast milk is a major public health concern for the future of the child's mental development and growth. Heavy metal contamination may endanger the health and well-being of the population, reduce work productivity and raise national health costs. Further studies are needed to monitor the extent of heavy metal contamination in coastal communities surrounding urban areas. Improving the micronutrient status of the population, raising public awareness on the negative health effects of metal toxicity, developing strategies to prevent further exposure, improving the quality of drinking water, identifying alternative sources of income and implementing industrial waste control laws are recommended.

Notes :
1) BATAN : Badan Tenaga Atom National (National Institute for Atomic Energy) in Jakarta.

2) BLK : Balai Laboratorium Kesehatan (Laboratory of the Department of Health) in Surabay.