

Blood lead concentration during pregnancy and the health implication to the mothers and their babies

Abstract

Lead toxicity affects mainly the haematopoietic system, the central nervous system and the excretory system. Blood lead levels of ≥ 10.0 mg/dL can lower intelligence quotient (IQ), impair hearing ability and retard growth in children. Blood lead can also be transferred directly from pregnant mothers to their foetuses. The main objective of this prospective epidemiological study was to investigate the implications of blood lead concentrations among mothers in their third trimester of pregnancy and their infants on the mothers' neurobehavioral status as well as on the mental and physical development of their infants. The Neurobehavioral Core Test Battery (NCTB) was used to assess the neuropsychological status of the pregnant mothers, while the Bayley Scales of Infant Development (BSID) was used to assess the mental, psychomotor and behavioural development of infants at 6 month of age. The study samples comprise 202 mothers in their third trimester of pregnancy and 195 infants born by them. The results of this study showed that the arithmetic mean for mothers' venous blood lead concentration was 7.78 mg/dL and its geometric mean was 6.19 mg/dL, while the arithmetic mean for the cord blood lead concentration was 14.05 mg/dL and its geometric mean was 12.44 mg/dL. The arithmetic mean for infants' capillary blood lead concentration was 2.80 mg/dL and its geometric mean was 2.33 mg/dL. The mean mothers' venous blood lead concentration (9.2 mg/dL) and cord blood lead concentration (15.5 mg/dL) among Indians were the highest in comparison with the Malays and Chinese. The cord blood lead concentration showed direct and significant relationships with mothers' venous blood lead concentration and with the capillary blood lead concentration of infants at the age of 6 months. All of the NCTB test scores showed significant ($p < 0.001$) inverse relationships with mothers' venous blood lead concentration, except for the Pursuit Aiming test and the Santa Ana Manual Dexterity test; whereas all scales of the BSID tests showed significant ($p < 0.001$) inverse relationships with infants' capillary blood lead concentration, except for the Emotional Regulations Scale which is a sub-test for

the Behavioural Rating Scale (BRS). Mothers who delivered their babies abnormally were found to have a higher (19.0 mg/dL) mean cord blood lead concentration than mothers who delivered normally (13.6 mg/dL). After adjustment for the confounding factors that also influenced NCTB and BSID scores, each increment of 1 mg/dL in mothers venous blood lead concentration will decrease their mean NCTB scores by 0.56 point, while every increment of 1 mg/dL in infants' capillary blood lead concentration will decrease the PDI, BRS and MDI scores by 9.16, 6.77 and 4.64 points, respectively. In conclusion, low-level lead toxicity at below 10 mg/dL will result in more significant effects on the inhibition of psychomotor and behavioural development in infants as compared to their mental development. This also means that the blood lead guideline for children at 10 mg/dL may not be completely protective for infants against neurotoxin effects of lead.