

論文審査の要旨

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The Association between Prenatal Mercury Exposure with Birth Outcomes and Growth –
Development Status of Children Aged 6 Months: A Cohort Study in Semarang Indonesia

Exposure to mercury (Hg) during pregnancy is a significant concern since it can cross the placental blood barrier and have a negative impact on the fetus's health. Eating fish is thought to be one of the main ways that the general public gets exposed to Hg. The relationship between low-dose Hg exposure during pregnancy and fetal development and birth outcomes is controversial. The aim of this study was to investigate the variations in Hg concentrations between pregnant women residing in highland and lowland areas of Semarang, Central Java, Indonesia, and to assess the prenatal exposures to Hg among pregnant women. Furthermore, this study investigated the associations between the mother's hair Hg levels and the outcomes of childbirth as well as the growth and development of the infant at six months.

In 2018, six different community health clinics situated in Semarang, Central Java, Indonesia, were used to recruit 118 expectant mothers. Their children were followed up until the age of six months. The following information was collected; the mothers' characteristics during the pregnancy, birth outcomes and the growth and developmental status at six months of their children. A questionnaire was used to get data on fish consumption. The applicant and his research group measured the total Hg levels in maternal hair and blood ferritin levels.

The following are this study's major findings:

1. The median (range) of the hair Hg level in the study subjects was relatively low, 0.434 (0.146 – 8.105) ppm.
2. Pregnant women living in the lowland area, near the sea, showed a higher hair Hg level than those living in highland area [median (range): 0.465 (0.146 – 8.105) and 0.385 (0.150 – 1.956) ppm, respectively, $p = 0.043$].
3. The multivariable regression analyses showed a positive association between maternal hair Hg and birth weight (regression coefficient = 154.6; standard error = 115.0; $p = 0.182$), and no effect on birth length (regression coefficient = -0.089; standard error = 0.721; $p = 0.902$).
4. The multivariable regression analyses revealed a positive trend but not significant between maternal hair Hg and children's weight at 6 months (regression coefficient = 97.51; standard error = 270.8; $p = 0.719$), and a similar effect on children's height (regression coefficient = 0.067; standard error = 0.757; $p = 0.929$).
5. There was no association between maternal hair Hg and the developmental score of children at 6 months old.

This is the first study to evaluate maternal Hg exposure during pregnancy in Indonesia and to examine the association between prenatal Hg exposure and birth outcomes, as well as the growth and development of children. Indonesia is currently the second largest consumer of fish in the world, though, this study revealed that the Hg exposure level among pregnant women in Semarang was relatively low. Furthermore, the Hg concentration of the mother's hair was found to have no effect on the child's size at birth or on the infant's growth and development during the first six months of life. This may be due to low Hg exposure during pregnancy. Thus, at least in present-day Semarang, there is no need to caution pregnant mothers about their fish diet intake. This is one of the important findings in maternal and child health in Indonesia.

よって本研究は学位論文として十分な価値を有するものと判定した。