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Long-term neurocognitive outcomes of children prenatally exposed to low-dose methylmercury

Key Messages

1. It has been suggested that low-dose prenatal mercury exposure as measured by umbilical cord blood mercury concentrations of >29 nmol/L causes adverse long-term neurocognitive outcomes.
2. Of 608 children, 491 (81%) had umbilical cord blood mercury concentrations of >29 nmol/L. However, umbilical cord blood mercury concentrations were associated with only two out of 23 neurocognitive subtests.
3. There is no strong evidence to support restriction in fish consumption in pregnant women to reduce prenatal mercury exposure.

Introduction

It has been suggested that low-dose prenatal methylmercury exposure can give rise to long-term adverse health outcomes.[1] Two of the largest cohort studies have shown conflicting results.[1,2] Pregnant women are advised to regulate fish intake to limit fetal methylmercury exposure.[3] Using an umbilical cord blood mercury concentration cut-point of 29 nmol/L,[1] 78.4% of children in our locality were at risk of adverse neurocognitive outcomes.[4] Nonetheless, maternal seafood consumption has beneficial long-term neurocognitive effects in children.[5] Therefore, associations between long-term childhood neurocognitive outcomes and both prenatal mercury exposure and fish consumption behaviour are crucial for recommendations about fish consumption. We investigated whether there were any associations between low-dose prenatal mercury exposure and neurocognitive outcomes in Hong Kong children. We hypothesised that our local population was at risk of adverse neurocognitive effects from low-dose prenatal mercury exposure as a result of high fish consumption behaviour.

Methods

This study was conducted from October 2007 to September 2009. Subjects from our previous study[4] were recruited for neuropsychological tests. The tests were performed and interpreted by clinical psychologists who were blinded to the subjects' mercury exposure. The tests involved several standardised techniques to measure general intellectual function (verbal and non-verbal), learning and verbal memory, fine motor coordination, and attention. Associations between cord blood mercury concentration and neurocognitive outcomes were determined using multivariate analyses.

Results

Of 608 children assessed, 491 (81%) had umbilical cord blood mercury concentrations of >29 nmol/L and 117 had lower concentrations. Using the Student's *t* test, the two groups did not differ significantly in any of the neurocognitive subtests. In multivariate linear regression analyses for each subtest of each neurocognitive assessment, after adjusting for confounders, cord blood mercury concentration was positively associated with the Sky Search – time per target subtest of the TEACH and negatively associated with the Picture Arrangement subtest of the HK-WISC. Further in-depth analyses of the neurocognitive outcomes are required to identify any pattern of clustering of effects.

Discussion

Demographics and fish consumption characteristics were similar between those recruited and not recruited. The cord blood mercury concentrations differences between the two groups were small (50 vs 46 nmol/L), but statistically significant.

Although the follow-up rate in our study was only 58%, it was still adequately powered to detect the small effects demonstrated in the Faroese cohort (adverse effects).[1] Our results were consistent with those of the Seychelles cohort (no

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adverse effects).[2] In Hong Kong, mercury exposure occurs mainly as a result of high and steady fish consumption.[4] This pattern of fish consumption is similar to that of the Seychelles cohort.[2,3] In the Faroese cohort, the episodic consumption of pilot whales gave rise to a pattern of mercury exposure that was more erratic and interspersed with high spikes.[3] This may be part of the reason why the Hong Kong population did not show substantial adverse neurocognitive outcomes as a result of prenatal mercury exposure. Restriction of fish consumption during pregnancy may be undesirable as fish is a good source of many nutrients. In our previous study,[4] 78.4% of children had umbilical cord blood mercury concentrations of >29 nmol/L.[3] However, this study showed no strong evidence to support restriction in fish consumption during pregnancy, as the risks of reduced fish consumption may outweigh the benefits of reduced mercury exposure.

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