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Placental transfer of essential micronutrients and toxic metals in occupationally exposed pregnant women- Implications in the pathogenesis of Autism spectrum disorders

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Background: Autism Spectrum Disorders (ASD) is a neurodevelopmental abnormality. In spite of genetic mappings and investigation of environmental toxicants, aetiogenesis of this disorder remains a medical challenge. This work investigated placental transfer of some trace metals (Cu, Zn, Ca, Mg, Se, Cd, Pb) in occupationally vulnerable pregnant mothers as possible basis of ASD in children.

Method: 105 third trimester pregnant women comprising 50 occupationally exposed (cases) (27.68±5.57 years) and 55 non-occupationally exposed age-matched (28.84±5.37 years) (controls) were recruited for this study. Blood (including cord blood) was collected from all participants. Trace metal levels were determined in the blood samples using Induction-Coupled Plasma-Mass Spectroscopy (ICP-MS); anthropometric and sociodemographic data of the women including developmental milestone indices of the baby at infancy were also recorded.

Results: Levels of trace elements were 328.02±109.99mg/L, 370.82±192.97umol/L, 8.61±0.89mg/dl, 1.52±0.26mg/dl and 10.17±1.22mg/L; 348.27±150.61mg/L, 416.80±276.73umol/L, 8.61±0.86mg/dl, 1.46±0.35mg/dl and 8.96±1.15 mg/L for Cu, Zn, Ca, Mg and Se in cases and controls respectively. The differences were not significant. Less than 10% of participants samples (maternal and cord blood) had detectable toxic metal levels. However, cord blood trace metals concentrations were 125.07±24.66mg/l, 525.38±45.86umol/L, 8.44±0.15mg/dl, 1.51±0.31mg/dl and 7.02±0.72mg/dl in fetuses of cases and 91.05±13.27mg/l, 591.22±44.62umol/l, 1.63±0.15mg/dl and 8.19±0.78mg/L in fetuses of control for Cu, Zn, Ca, Mg and Se respectively. Only cord blood Mg level was significantly different (p=0.013). Baby weight and head circumferences also correlated significantly with cord Zn and Cu levels (r=0.293, p=0.039), (r=0.478, p=0.010) respectively.

Discussion: Reduction in Mg and Se levels may have depleted the antioxidant pool overwhelming the protective roles of glutathione and zinc as antioxidants in the fetuses thereby precipitating abnormal genetic configurations in the developing baby. Our hypothesis is that given the role of Se, Cu and Mg in neurodevelopment, imbalance of these metals from in-utero may be the aetiological basis of ASD in children.

Recent Publications

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