

Levels of Heavy Metals in Pregnant Women with Fetal Central Nervous System Anomalies Using ICP-OES

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Central nervous system (CNS) anomalies are the second most common type of fetal anomaly. Heavy metal toxicity and deficiency of trace elements can be a cause for fetal anomalies. This work aimed to assess the possible association between Al, Cd, Co, Cu, Fe, Mn, Pb, Se, Zn and fetal CNS anomalies. Research was conducted in Kasr Alainy Maternity Hospital, Cairo University in the period between March 2021 and October 2022 and included 40 pregnant women, which were divided into two groups (20 women in each group). The first group included pregnant women with normal fetal anatomy sonographic scan and the second group included pregnant women with confirmed sonographic fetal CNS anomalies. Pregnant women with known risk factors for fetal anomalies were excluded. From each woman four grams of hair were collected. In both groups content of Al, Cd, Co, Cu, Fe, Mn, Pb, Se, Zn in all samples was assessed using Inductively Coupled Plasma Optical Emission spectroscopy.

There was no significant statistical difference in the mean age between the two groups. The levels of Al, Cd, Co, Cu, Fe, Mn, Pb, Se, Zn in group 2 (Patients) were 385 ± 3.44 mg/kg, 0.68 ± 0.01 mg/kg, 0.63 ± 0.02 mg/kg, 51 ± 0.4 mg/kg, 152 ± 1.3 mg/kg, 9.2 ± 0.09 mg/kg, 7.5 ± 0.084 mg/kg, 1.8 ± 0.3 mg/kg, 356 ± 3.1 mg/kg, respectively while in the group 1 (control) their levels were 373 ± 2.0 mg/kg, 0.16 ± 0.002 mg/kg, 0.26 ± 0.02 mg/kg, 67 ± 0.4 mg/kg, 92 ± 0.8 mg/kg, 4.4 ± 0.04 mg/kg, 5.4 ± 0.05 mg/kg, 1.3 ± 0.15 mg/kg, 273 ± 2.5 mg/kg, respectively. Mann-Whitney U test proved highly significant statistical difference between the two groups ($p < 0.001$) just for three elements, Cd, Co and Se. ROC curves showed that the best cut off level for the association of Al, Cd, Co, Fe, Mn, Pb, Se, Zn and fetal CNS anomalies were $> 260 > 0.13 > 0.322 > 68 > 3.7 > 4.2 > 1.4 >$ and 151, respectively.

Our study is a red flag. Thus, during pregnancy high levels of Cd, Co and Se can be responsible for fetal CNS anomalies. Further studies on a larger number of cases and with extensive studies of the environmental factors are strongly needed.