

Maternal Thyroid Disorders and Risk of Neonatal Seizure: Current Perspective

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HYPOTHESIS

The maternal hypothalamic-pituitary-thyroid axis (HPTA) is required for the development of all biological systems (Ahmed, 2011, 2012a,b, 2013, 2014, 2015a-c, 2016a-d, 2017a-u & 2018a,b; Ahmed et al., 2010, 2013a,b, 2014, 2015a,b & 2018a,b; Ahmed and Incerpi, 2013; Van Hercket et al., 2013; Ahmed and El-Gareib, 2014; Incerpi et al., 2014; Candelotti et al., 2015; De Vito et al., 2015; El-Ghareeb et al., 2016; Ahmed and El-Gareib, 2017), especially the developing nervous system (proliferation, differentiation and migration of neurons, astrocytes, oligodendrocytes, microglia, synaptogenesis, and myelination) (Zoeller et al., 2002; Zoeller, 2004; Pacheco-Rosado et al., 2005; Santisteban and Bernal, 2005; Gilbert and Sui, 2006; Hamanna et al., 2006; Zamoner et al., 2006; Hogan et al., 2007; Ahmed et al., 2008; Carlé et al., 2011; Andersen et al., 2013; Ahmed and El-Gareib, 2017).

On the other hand, numerous investigations illustrated the association of the maternal thyroid disorders with the neonatal neurocognitive maldevelopment (Haddow et al., 1999; Klein et al., 2001; Pop et al., 2003; Carlé et al., 2006 & 2011; Lazarus et al., 2012). Moreover, Andersen et al. (2013) reported that the risk of seizure (excessive discharge of a set of neurons) in the neonates and subtle changes in brain might be increased during the maternal hypothyroidism or hyperthyroidism. This observation is reinforced by Koromilas et al. (2010) who reported that there are several alterations in the structural and functional of developing hippocampus during the hypothyroid state, and Asami et al., (1998) who undertook that the congenital hypothyroidism can increase the risk of febrile seizures. More interestingly, there are several causes for the neonatal seizures such as hemorrhage, stroke,

perinatal hypoxia-ischemia, metabolic disorders, infections, hypernatremia, asphyxia, intracranial hemorrhage, hypocalcemia, and hypoglycemia (Scher, 2000 & 2003; Kawakami et al., 2002; Caravale et al., 2003; Zupanc, 2004; Manoel and Demelo, 2006; Eghbalian et al., 2007). More importantly, the discrepancy diagnosis for the seizure during the gestation includes the following (Jaigobin and Silver, 2000; EURAP Study Group, 2006; Lockhart and Baysinger, 2007; Contag et al., 2009; Allais et al., 2010; Banach et al., 2010; Noori and Dhanjal, 2011) eclampsia, electrolyte imbalances (hypocalcaemia and hyponatraemia), cerebral thrombosis, metabolic disorders (hypoglycaemia), stroke, and intracranial mass lesion. In general, the dysfunction in the maternal thyroid during the early pregnancy can alter the activities of ion channels (Ahmed and Incerpi, 2013), metabolic enzymes (Ahmed et al., 2008), neurotransmitter receptors (Ahmed et al., 2010) and transporters (Ahmed, 2012b & 2015b) in the developing brain. This can alter the characteristic of the nerve cells, decrease the synchronization and cause the neonatal seizure and several neurocognitive problems.

From the above considerations, the present observations suggested that the maternal THs show vital actions in the developing brain during the prenatal and postnatal periods. The maternal thyroid dysfunctions may directly or indirectly disturb the development (morphogenesis) of the brain. This disturbance may cause neonatal seizure and neurocognitive defects. Thus, the treatment can be required before the gestation to avoid these disorders. This would provide an earlier advantage to maximizing the neurological outcome. Several researches are desired to follow the impacts of maternal thyroid dysfunctions on the neonatal seizure, febrile seizure, and epilepsy before, during, and after the gestation.

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