**ARC Journal of Neuroscience**
*Volume 3, Issue 2 2018, PP 1-5*
*ISSN 2456-057X*
*DOI: http://dx.doi.org/10.20431/2456-057X.0302001*
*www.arcjournals.org*

# Congenital Hypothyroidism, Developmental Skills, and Voice-Speech Disorders

**Ahmed R.G***

*Division of Anatomy and Embryology, Zoology Department, Faculty of Science, Beni-Suef University, Beni-Suef, Egypt*

***Corresponding Author:** **Ahmed R.G,** *Division of Anatomy and Embryology, Zoology Department, Faculty of Science, Beni-Suef University, Beni-Suef, Egypt,* **Email:** *ahmedragab08@gmail.com*

## Short Communication

Maternal thyroid hormones (THs) regulate the developing brain during the perinatal period (El-bakry et al., 2010; Ahmed, 2011, 2012a,b, 2013, 2014, 2015a-c, 2016a-d, 2017a-v, 2018a-r; Ahmed and Ahmed, 2012; Ahmed et al., 2008; 2010; 2012; 2013a,b, 2014, 2015a,b, 2018a,b; Ahmed and Incerpi, 2013;Van Hercket 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), in particular the speech, voice, language and hearing processes (American Academy of Pediatrics/American Thyroid Association, 2006; Fisher, 2006; Wasserman et al., 2012; Muñoz et al., 2014; Dayal et al., 2016; Oliveira de Andrade et al., 2017). On the other hand, the elevation in the concentration of thyroid-stimulating hormone (TSH), primary hypothyroidism state, can increase the risk of voice disorders (Mohammadzadeh et al., 2011). Lack of thyroxine (T4) and 3, 5, 3’-triiodothyronine (T3) can cause a congenital hypothyroidism, the most common endocrine congenital disease, in childhood (Muñoz et al., 2014). Congenital hypothyroidism can cause several neurodevelopmental disorders such as slowness, dementia, memory deficiency, and depression (Kratzsch and Pulzer, 2008; Lass et al., 2008; Blum et al., 2015; Jia et al., 2015; Navarro et al., 2017; Salazar et al., 2017). Previously, Fuggle et al. (1991) reported that the levels of motor skills in children were severely diminished due to the congenital hypothyroidism. As well, the frequency of oral fluency in children with thyroid agenesis was also decreased (Kooistra et al., 1994; Muñoz et al., 2014). More importantly, severe congenital hypothyroidism can increase the phonologic, language, and voice disturbances (Bargagna et al., 2000), and cause more aberrations in mathematics than moderate congenital hypothyroidism and control groups (Simons et al., 1997). In patients with congenital hypothyroidism, there were deviations in the developmental skills (cognitive, motor, linguistic, adaptive, and social), in the socio-linguistics skills and in the self-care skills (Gejão et al., 2008 & 2009; Muñoz et al., 2014). These disorders can be attributed to the ability of congenital hypothyroidism to delay and disrupt the neuronal growth and differentiation, and diminish the synaptic transmission (Koromilas et al., 2010; Vanderpump, 2011; Yu et al., 2014; Salazar et al., 2017). These variations can impair the metabolic process (poor feeding), decrease the weight gain and growth (Salazar et al., 2017), and disturb the developmental skills, speech-language communications and hearing activity in children (Muñoz et al., 2014).

Thus, it is also worth asserting that THs can stimulate the development of the speech, voice, language, hearing, and all developmental skills. As well, any disruptions in the concentrations of THs during the development (congenital hypothyroidism) may perturb the speech-language axis, hearing activity, and several developmental skills in children. In utero hypothyroidism may impact the subsequent intellectual functioning, cognitive behaviors (visuoperceptual, neuromotor, and language comprehension), school learning, and generally quality-of-life. However, the clinical significance of these disorders still must be evaluated. Thus, screening the neonatal thyroid gland may be required to develop alternative diagnostic actions for identifying congenital hypothyroidism earlier, possibly in utero. This would diminish the risk of any consequent impairment that might adversely disturb these children later. Also, the developmental evaluations during the first 2 years of life are prognostic of the intelligence percentage and speech-language axis later in childhood. Further examinations are warranted to follow the association between children with congenital hypothyroidism the school progress.

## REFERENCES


[1] Ahmed, O.M., Abd El-Tawab, S.M., Ahmed, R.G., 2010. Effects of experimentally induced maternal hypothyroidism and hyperthyroidism on the development of rat offspring: I- The development of the thyroid hormones-neurotransmitters and adenosinergic system interactions. Int. J. Dev. Neurosci. 28, 437-454.

[2] Ahmed, O.M., Ahmed, R.G., 2012. Hypothyroidism. In A New Look At Hypothyroidism. Dr. D. Springer (Ed.), ISBN: 978-953-51-0020-1), In Tech Open Access Publisher, Chapter 1, pp. 1-20.

[3] Ahmed, O.M., Ahmed, R.G., El-Gareib, A.W., El-Bakry, A.M., Abd El-Tawaba, S.M., 2012. Effects of experimentally induced maternal hypothyroidism and hyperthyroidism on the development of rat offspring: II-The developmental pattern of neurons in relation to oxidative stress and antioxidant defense system. Int. J. Dev. Neurosci. 30, 517–537.

[4] Ahmed, O.M., El-Gareib, A.W., El-bakry, A.M., Abd El-Tawab, S.M., Ahmed, R.G., 2008. Thyroid hormones states and brain development interactions. Int. J. Dev. Neurosci. 26(2), 147-209. Review.

[5] Ahmed, R.G., 2011. Perinatal 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin exposure alters developmental neuroendocrine system. Food Chem. Toxicology, 49, 1276–1284.

[6] Ahmed, R.G., 2012a. Maternal-newborn thyroid dysfunction. In the Developmental Neuroendocrinology, pp. 1-369. Ed R.G. Ahmed. Germany: LAP LAMBERT Academic Publishing GmbH & Co KG.

[7] Ahmed, R.G., 2012b. Maternal-fetal thyroid interactions, Thyroid Hormone, Dr. N.K. Agrawal (Ed.), ISBN: 978-953-51-0678-4, In Tech Open Access Publisher, Chapter 5, pp. 125-156.

[8] Ahmed, R.G., 2013. Early weaning PCB 95 exposure alters the neonatal endocrine system: thyroid adipokine dysfunction. J. Endocrinol. 219 (3), 205-215.

[9] Ahmed, R.G., 2014. Editorial: Do PCBs modify the thyroid-adipokine axis during development? Annals Thyroid Res. 1(1), 11-12.

[10] Ahmed, R.G., 2015a. Chapter 1: Hypothyroidism and brain development. In advances in hypothyroidism treatment. Avid Science Borsigstr. 9, 10115 Berlin, Berlin, Germany. Avid Science Publications level 6, Melange Towers, Wing a, Hitec City, Hyderabad, Telangana, India. pp. 1-40.

[11] Ahmed, R.G., 2015b. Hypothyroidism and brain developmental players. Thyroid Research J. 8(2), 1-12.

[12] Ahmed, R.G., 2015c. Editorials and Commentary: Maternofetal thyroid action and brain development. J. of Advances in Biology; 7(1), 1207-1213.

[13] Ahmed, R.G., 2016a. Gestational dexamethasone alters fetal neuroendocrine axis. Toxicology Letters, 258, 46–54.

[14] Ahmed, R.G., 2016b. Neonatal polychlorinated biphenyls-induced endocrine dysfunction. Ann. Thyroid. Res. 2 (1), 34-35.

[15] Ahmed, R.G., 2016c. Maternal iodine deficiency and brain disorders. Endocrinol. Metab. Syndr. 5, 223. http://dx.doi.org/10.4172/2161-1017.1000223.

[16] Ahmed, R.G., 2016d. Maternal bisphenol A alters fetal endocrine system: Thyroid adipokine dysfunction. Food Chem. Toxicology, 95, 168-174.

[17] Ahmed, R.G., 2017a. Developmental thyroid diseases and GABAergic dysfunction. EC Neurology 8.1, 02-04.

[18] Ahmed, R.G., 2017b. Hyperthyroidism and developmental dysfunction. Arch Med. 9, 4.

[19] Ahmed, R.G., 2017c. Anti-thyroid drugs may be at higher risk for perinatal thyroid disease. EC Pharmacology and Toxicology 4.4, 140-142.

[20] Ahmed, R.G., 2017d. Perinatal hypothyroidism and cytoskeleton dysfunction. Endocrinol Metab Syndr 6, 271. doi:10.4172/2161-1017.1000271

[21] Ahmed, R.G., 2017e. Developmental thyroid diseases and monoaminergic dysfunction. Advances in Applied Science Research 8(3), 01-10.

[22] Ahmed, R.G., 2017f. Hypothyroidism and brain development. J. Anim Res Nutr. 2(2), 13.

[23] Ahmed, R.G., 2017g. Antiepileptic drugs and developmental neuroendocrine dysfunction: Every why has A Wherefore. Arch Med 9(6), 2.

[24] Ahmed, R.G., 2017h. Gestational prooxidant-antioxidant imbalance may be at higher risk for postpartum thyroid disease. Endocrinol Metab Syndr 6, 279. doi:10.4172/2161-1017.1000279.

[25] Ahmed, R.G., 2017i. Synergistic actions of thyroid-adipokines axis during development. Endocrinol Metab Syndr 6, 280. doi:10.4172/2161-1017.1000280.

[26] Ahmed, R.G., 2017j. Thyroid-insulin dysfunction during development. International Journal of Research Studies in Zoology 3(4), 73-75. DOI: http://dx.doi.org/10.20431/2454-941X.0304010.

[27] Ahmed, R.G., 2017k. Developmental thyroid diseases and cholinergic imbalance. International Journal of Research Studies in Zoology 3(4), 70-72. DOI: http://dx.doi.org/10.20431/2454-941X.0304009.

[28] Ahmed, R.G., 2017l. Thyroid diseases and developmental adenosinergic imbalance. Int J Clin Endocrinol 1(2), 053-055.

[29] Ahmed, R.G., 2017m. Maternal anticancer drugs and fetal neuroendocrine dysfunction in experimental animals. Endocrinol Metab Syndr 6, 281. doi:10.4172/2161-1017.1000281.

[30] Ahmed, R.G., 2017n. Letter: Gestational dexamethasone may be at higher risk for thyroid disease developing peripartum. Open Journal Of Biomedical & Life Sciences (Ojbili) 3(2), 01-06.

[31] Ahmed, R.G., 2017o. Deiodinases and developmental hypothyroidism. EC Nutrition 11.5, 183-185.

[32] Ahmed, R.G., 2017p. Maternofetal thyroid hormones and risk of diabetes. Int. J. of Res. Studies in Medical and Health Sciences 2(10), 18-21.

[33] Ahmed, R.G., 2017r.Association between hypothyroidism and renal dysfunctions. International Journal of Research Studies in Medical and Health Sciences 2(11), 1-4.

[34] Ahmed, R.G., 2017s.Maternal hypothyroidism and lung dysfunction. International Journal of Research Studies in Medical and Health Sciences 2(11), 8-11.

[35] Ahmed, R.G., 2017t.Endocrine disruptors; possible mechanisms for inducing developmental disorders. International journal of basic science in medicine (IJBSM) 2(4), 157-160.

[36] Ahmed, R.G., 2017u. Maternal thyroid hormones trajectories and neonatal behavioral disorders. ARC Journal of Diabetes and Endocrinology 3(2), 18-21.

[37] Ahmed, R.G., 2017v.Maternal thyroid dysfunction and neonatal cardiac disorders. Insights Biol Med. 1, 092-096.

[38] Ahmed, R.G., 2018a. Maternal hypothyroidism and neonatal testicular dysfunction. International Journal of Research Studies in Medical and Health Sciences 3(1), 8-12.

[39] Ahmed, R.G., 2018b. Maternal hypothyroidism and neonatal depression: Current perspective. International Journal of Research Studies in Zoology 4(1), 6-10. DOI: http://dx.doi.org/10.20431/ 2454-941X.0401002.

[40] Ahmed, R.G., 2018c. Non-genomic actions of thyroid hormones during development. App Clin Pharmacol Toxicol: ACPT-108. DOI: 10.29011/ACPT-109. 100008.

[41] Ahmed, R.G., 2018d. Maternal thyroid function and placental hemodynamics. ARC Journal of Animal and Veterinary Sciences 4(1), 9-13. DOI: http://dx.doi.org/10.20431/2455-2518.0401002.

[42] Ahmed, R.G., 2018e. Interactions between thyroid and growth factors during development. ARC Journal of Diabetes and Endocrinology 4(1), 1-4. DOI: http://dx.doi.org/10.20431/2455-5983.0401001.

[43] Ahmed, R.G., 2018f. Maternal thyroid hormones and neonatal appetite. ARC Journal of Nutrition and Growth 4(1), 18-22. DOI: http://dx.doi.org/10.20431/2455-2550.0401005.

[44] Ahmed, R.G., 2018g. Genomic actions of thyroid hormones during development. ARC Journal of Diabetes and Endocrinology 4(1), 5-8. DOI: http://dx.doi.org/10.20431/2455-5983.0401002.

[45] Ahmed, R.G., 2018h. Dysfunction of maternal thyroid hormones and psychiatric symptoms. American Research Journal of Endocrinology. 2(1), 1-6.

[46] Ahmed, R.G., 2018i. Is there a connection between maternal hypothyroidism and developing autism spectrum disorders? ARC Journal of Neuroscience 3(1), 5-8. DOI: http://dx.doi.org/10.20431/2456-057X. 030100 2.

[47] Ahmed, R.G., 2018j.Maternal thyroid dysfunctions and neonatal bone maldevelopment. American Research Journal of Endocrinology (in press) xx-xxx.

[48] Ahmed, R.G., 2018k. Maternal thyroid disorders and risk of neonatal seizure: Current perspective. ARC Journal of Neuroscience 3(1), 21-25. DOI: http://dx.doi.org/10.20431/2456-057X.0301004

[49] Ahmed, R.G., 2018l. Gestational dioxin acts as developing neuroendocrine-disruptor. EC Pharmacology and Toxicology 6.3, 96-100.

[50] Ahmed, R.G., 2018m. Maternal thyroid dysfunction and risk of neonatal stroke. ARC Journal of Animal and Veterinary Sciences 4(1), 22-26. DOI: http://dx.doi.org/10.20431/2455-2518.0401004

[51] Ahmed, R.G., 2018n. Maternal thyroid disorders and developing skin dysfunctions. ARC Journal of Dermatology 3(1), 13-17. DOI: http://dx.doi.org/10.20431/2456-0022.0301005

[52] Ahmed, R.G., 2018o. Maternal hypothyroidism-milk ejections: What is the link? ARC Journal of Nutrition and Growth 4(1), 29-33. DOI: http://dx.doi.org/10.20431/ 2455-2550.0401007

[53] Ahmed, R.G., 2018p. Does maternal antepartum hypothyroidism cause fetal and neonatal hyponatremia? ARC Journal of Diabetes and Endocrinology 4(1), xx-xxx. DOI: http://dx.doi.org/10.20431/2455-5983.0401004

[54] Ahmed, R.G., 2018q. Maternal hypothyroidism and rheumatoid arthritis. International Journal

of Research Studies in Medical and Health Sciences Volume 3(2), 1-5.

[55] Ahmed, R.G., 2018r. Developmental thyroid and skeletal muscle dysfunction. ARC Journal of Diabetes and Endocrinology 4(1), xx-xxx. DOI: http://dx.doi.org/10.20431/2455-5983.0401003

[56] Ahmed, R.G., Abdel-Latif, M., Ahmed F., 2015a. Protective effects of GM-CSF in experimental neonatal hypothyroidism. International Immunopharmacology 29, 538–543.

[57] Ahmed, R.G., Abdel-Latif, M., Mahdi, E., El-Nesr, K., 2015b. Immune stimulation improves endocrine and neural fetal outcomes in a model of maternofetal thyrotoxicosis. Int. Immunopharmacol. 29, 714-721.

[58] Ahmed, R.G., Davis, P.J., Davis, F.B., De Vito, P., Farias, R.N., Luly, P., Pedersen, J.Z., Incerpi, S., 2013a. Nongenomic actions of thyroid hormones: from basic research to clinical applications. An update. Immunology, Endocrine & Metabolic Agents in Medicinal Chemistry, 13(1), 46-59.

[59] Ahmed, R.G., El-Gareib, A.W. 2014. Lactating PTU exposure: I- Alters thyroid-neural axis in neonatal cerebellum. Eur. J. of Biol. and Medical Sci. Res. 2(1), 1-16.

[60] Ahmed, R.G., El-Gareib, A.W., 2017. Maternal carbamazepine alters fetal neuroendocrine-cytokines axis. Toxicology 382, 59–66.

[61] Ahmed, R.G., El-Gareib, A.W., Incerpi, S., 2014. Lactating PTU exposure: II- Alters thyroid-axis and prooxidant-antioxidant balance in neonatal cerebellum. Int. Res. J. of Natural Sciences 2(1), 1-20.

[62] Ahmed, R.G.,El-Gareib, A.W., Shaker, H.M., 2018a.Gestational 3,3′,4,4′,5-pentachlorobiphenyl (PCB 126) exposure disrupts fetoplacental unit: Fetal thyroid-cytokines dysfunction. Life Sciences 192, 213–220.

[63] Ahmed, R.G., Incerpi, S., 2013. Gestational doxorubicin alters fetal thyroid–brain axis. Int. J. Devl. Neuroscience 31, 96–104.

[64] Ahmed, R.G., Incerpi, S., Ahmed, F., Gaber, A., 2013b. The developmental and physiological interactions between free radicals and antioxidant: Effect of environmental pollutants. J. of Natural Sci. Res. 3(13), 74-110.

[65] Ahmed, R.G.,Walaa G.H., Asmaa F.S., 2018b. Suppressive effects of neonatal bisphenol A on the neuroendocrine system. Toxicology and Industrial Health Journal (in press).

[66] Alvarez, M., Carvajal, F., Renón, A., Pérez, C., Olivares, A., Rodríguez, G., 2004. Deferential effect of fetal, neonatal and treatment variable on neurodevelopment in infants with congenital hypothyroidism. Horm Res. 61, 17-20.

[67] American Academy of Pediatrics/American Thyroid Association, 2006. Lawson Wilkins Pediatric Endocrine Society. Update of newborn screening and therapy for congenital hypothyroidism. Pediatrics.117 (6), 2290-303.

[68] Bargagna, S., Canepa, G., Costagli, C., Dinetti, D., Marcheschi, M., Millepiedi, S., 2000. Neuropsychological follow-up in early-treated congenital hypothyroidism: a problem-oriented approach. Thyroid. 10(3), 243-9.

[69] Blum, M.R., Wijsman, L.W., Virgini, V.S., Bauer, D.C., den Elzen, W.P., Jukema, J.W., Buckley, B.M., de Craen, A.J., Kearney, P.M., Stott, D.J., Gussekloo, J., Westendorp, R.G., Mooijaart, S.P., Rodondi, N., 2015. Subclinical thyroid dysfunction and depressive symptoms among elderly: a prospective cohort study, Neuroendocrinology.

[70] Candelotti, E., De Vito, P., Ahmed, R.G., Luly, P., Davis, P.J., Pedersen, J.Z., Lin, H-Y., Incerpi, I., 2015. Thyroid hormones crosstalk with growth factors: Old facts and new hypotheses. Immun., Endoc. & Metab. Agents in Med. Chem., 15, 71-85.

[71] Dayal, D., Hansdak, N., Vir, D., Gupta, A., Bakshi, J., 2016. Hearing impairment in children with permanent congenital hypothyroidism: Data from Northwest India. Thyroid Res Pract. 13, 67-70.

[72] De Vito, P., Candelotti, E., Ahmed, R.G., Luly, P., Davis, P.J., Incerpi, S., Pedersen, J.Z., 2015. Role of thyroid hormones in insulin resistance and diabetes. Immun., Endoc. & Metab. Agents in Med. Chem., 15, 86-93.

[73] El-bakry, A.M., El-Ghareeb, A.W.,Ahmed, R.G., 2010. Comparative study of the effects of experimentally-induced hypothyroidism and hyperthyroidism in some brain regions in albino rats. Int. J. Dev. Neurosci. 28, 371-389.

[74] El-Ghareeb, A.A., El-Bakry, A.M., Ahmed, R.G., Gaber, A., 2016. Effects of zinc supplementation in neonatal hypothyroidism and cerebellar distortion induced by maternal carbimazole. Asian Journal of Applied Sciences 4(04), 1030-1040.

[75] Fisher, D.A., 2008. Disorders of the thyroid in the newborn and infant. In: Sperling M A. Pediatric Endocrinology. 3ª.ed. Philadelphia: W.B. Saunders; 198-226.

[76] Fuggle, P.W., Grant, D.B., Smith, I., Murphy, G., 1991. Intelligence, motor skills and behavior at 5 years in early-treated congenital hypothyroidism. Eur J Pediatr. 150(8), 570-4.

[77] Incerpi, S., Hsieh, M-T., Lin, H-Y., Cheng, G-Y., De Vito, P., Fiore, A.M., Ahmed, R.G., Salvia, R., Candelotti, E., Leone, S., Luly, P., Pedersen, J.Z., Davis, F.B., Davis, P.J., 2014. Thyroid hormone inhibition in L6 myoblasts of IGF-I-mediated glucose uptake and proliferation: new roles for integrin αvβ3. Am. J. Physiol. Cell Physiol. 307, C150–C161.

[78] Jia, Y., Zhong, S., Wang, Y., Liu, T. Liao, X. Huang, L., 2015. The correlation between biochemical abnormalities in frontal white matter, hippocampus and serum thyroid hormone levels in first-episode patients with major depressive disorder, J. Affect. Disord. 180, 162–169.

[79] Koromilas, C., Liapi, C., Schulpis, K.H., Kalafatakis, K., Zarros, A., Tsakiris, S., 2010. Structural and functional alterations in the hippocampus due to hypothyroidism, Metab. Brain Dis. 25, 339–354.

[80] Kratzsch, J., Pulzer, F., 2008. Thyroid gland development and defects, Best Pract. Res. Clin. Endocrinol. Metab. 22, 57–75.

[81] Lass, P. Slawek, J. Derejko, M. Rubello, D., 2008. Neurological and psychiatric disorders in thyroid dysfunctions. The role of nuclear medicine: SPECT and PET imaging, Minerva Endocrinol. 33, 75–84.

[82] Mohammadzadeh, A., Heydari, E., Azizi, F., 2011. Speech impairment in primary hypothyroidism. J Endocrinol Invest. 34(6), 431-3.

[83] Muñoz, M.B., Dassie-Leite, A.P., Behlau, M., Lacerda Filho, L., Hamerschmidt, R., Nesi-França, S., 2014.Speech language pathology disorders in children with congenital hypothyroidism: Critic review of literature. Rev. CEFAC. 16(6), 1-9.

[84] Navarro, P.V., Pinilla, E.A.I., Espãnab, A.G., Bravob, A.M.N., Pantojab, S.M., Acosta, A.M.S., 2017. Prevalence of hypothyroidism in major psychiatric disorders in hospitalised patients in Montserrat Hospital during the period March to October 2010. rev colomb psiquiat . 46(3), 140–146.

[85] Oliveira de Andrade, C.L., Machado, G.C., Fernandes, L.C., de Albuquerque, J.M., Casais-e-Silva, L.L., Ramos, H.E., Alves, C.A.D., 2017. Mechanisms involved in hearing disorders of thyroid ontogeny: a literature review. Arch Endocrinol Metab. 61(5), 501-505.

[86] Parazzini, M., Ravazzani, P., Medaglini, S., Weber, G., Fornara, C., Tognla, G., 2002. Click-evoked otoacoustic emissions recorded from untreated congenital hypothyroid newborns. Hear Res. 166(1-2), 136-42.

[87] Rovet, J.F., 1999. Long-term neuropsychological sequelae of early-treated congenital hypothyroidism: effects in adolescence. ActaPediatr Suppl. 88(432), 88-95.

[88] Rovet, J.F., Ehrlich, R.M., Sorbara, D.L., 1992. Neurodevelopment in infants and preschool children with congenital hypothyroidism: etiological and treatment factors affecting outcome. JPediatrPsychology. 17(2), 187-213.

[89] Salazar, P., Cisternas, P., Codocedo, J.F., Inestrosa, N.C., 2017. Induction of hypothyroidism during early postnatal stages triggers a decrease in cognitive performance by decreasing hippocampal synaptic plasticity. Biochimica et Biophysica Acta 1863, 870–883.

[90] Van Herck, S.L.J., Geysens, S., Bald, E., Chwatko, G., Delezie, E., Dianati, E., Ahmed, R.G., Darras, V.M., 2013. Maternal transfer of methimazole and effects on thyroid hormone availability in embryonic tissues. Endocrinol. 218, 105-115.

[91] Vanderpump, M.P., 2011. The epidemiology of thyroid disease, Br. Med. Bull. 99, 39–51.

[92] Wasserman, E.E., Pillion, J.P., Duggan, A., Nelson, K., Rohde, C., Seaberg, E.C., Talor, M.V., Yolken, R.H., Rose, N.R., 2012. Childhood IQ, hearing loss, and maternal thyroid autoimmunity in the Baltimore Collaborative Perinatal Project. Pediatric Res. 72(5), 525-30.

[93] Yu, J., Tang, Y.Y., Feng, H.B., Cheng, X.X., 2014. A behavioral and micro positron emission tomography imaging study in a rat model of hypothyroidism, Behav. Brain Res. 271, 228–233.

**Citation:** *Ahmed R.G. Congenital Hypothyroidism, Developmental Skills, and Voice-Speech Disorders. ARC Journal of Neuroscience. 2018; 3(2):1-5. doi:dx.doi.org/10.20431/2456-057X.0302001.*