East African Scholars Journal of Medical Sciences
Abbreviated Key Title: East African Scholars J Med Sci
ISSN 2617-4421 (Print) | ISSN 2617-7188 (Online) |
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

DOI: 10.36349/easms.2019.v02i06.009 Volume-2 | Issue-6| Jun -2019 |

Original Research Article

Hypothyroidism: how does it affect the mother & the baby?

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Abstract: **Background**: Thyroid dysfunction is a common endocrinological disorder in pregnancy. It is important for normal development of placenta & early stages of neurodevelopment of foetus. Any deviation from normal activity of thyroid gland is known to be associated with adverse foetomaternal outcome. **Aims & Objectives**: The study aims to find out thyroid hormonal status in pregnancy and thereafter to determine prevalence of hypothyroidism. Moreover, it aims to find out difference in fetomaternal outcome according to the thyroid hormonal status. **Materials & Methods**: The study included the estimation of TSH of 142 women in 3rd trimester of pregnancy. On the basis of values of TSH, the patients were divided into 2 groups, without hypothyroidism (n=101) & with hypothyroidism (n=41) respectively. Maternal outcome was measured in terms of ante partum & postpartum haemorrhage and maternal anemia. Foetal outcome was measured in terms of low APGAR score & birth weight of baby. The data was tabulated & analysed using standard statistical method. **Result:** Prevalence of hypothyroidism was 28.87%. The incidence of adverse outcome was statistically significant in hypothyroidism for maternal anaemia [p value 0.0096], low birth weight [p value <0.05] and a Low APGAR score [p value < 0.05] of baby. **Conclusion:** Feto-maternal outcome was found to be adverse in women with hypothyroidism. Ante partum &post-partum haemorrhage was found to be more in hypothyroid mothers. Low birth weight & low APGAR score were observed more in cases of babies born to mothers with hypothyroidism.

Keywords: Hypothyroidism, Pregnancy, Thyroid autoimmunity, Ante partum haemorrhage, Post-partum haemorrhage, APGAR score.

INTRODUCTION:

Thyroid gland is an important endocrine gland in the human body. It is important for maintaining homeostasis & basal metabolic rate. Thyroid dysfunction is the second most common endocrinal disorder after diabetes complicating pregnancy throughout the world (Vanderpump, M. P. 2011). India is a country where nutritional deficiency in pregnancy is more frequent than the developed countries. Iodine deficiency, one of the common nutritional deficiency is known to result thyroid dysfunctions especially hypothyroidism. This dysfunction is found to be more prevalent in pregnancy. Not only subclinical variety but the overt cases of hypothyroidism are found to be present in pregnancy. The disease may be pre-existing or present during pregnancy. Both the conditions remain neglected and undetected. The disease gets worsened with advancement of pregnancy in patients, who were hypothyroid before conception and remain undetected and untreated. Even some euthyroid women are often seen to develop hypothyroidism in the advanced weeks of pregnancy, especially in third trimester. The outcomes vary and could be fatal as the thyroid hormones affect almost all systems in our body. After conception, the thyroid hormones are very important for maintaining the reproductive hormonal status (especially beta HCG and oestrogen) & growth & neurodevelopment of fetus (Greenman, G.W. *et al.*, 1962).

Both subclinical and overt hypothyroidism though often pre-exists before conception but can sometimes develop during pregnancy. Various studies have shown an increased incidence of obstetric complications in pregnant women with untreated hypothyroidism. These include preterm birth, low birth weight (mostly related to preterm delivery), perinatal death, pregnancy induced hypertension, pre-eclampsia,

Quick Response Code

Journal homepage:
http://www.easpublisher.com/easjms/

Article History
Received: 15.05.2019
Accepted: 02.06.2019
Published: 24.06.2019

placental abruption, anaemia and postpartum haemorrhage (Haddow, J. E. *et al.*, 1999).

Maternal hypothyroidism during pregnancy raises the risk of insufficient placental transfer of maternal thyroid hormone to the developing fetus and so there may be long lasting effects on neuropsychological system (Haddow, J. E. *et al.*, 1999). Important causes of hypothyroidism in pregnancy include chronic autoimmune thyroid diseases & iodine deficiency (Sapana, C. 2014). If the iodine deficiency is severe in utero, infants of such hypothyroid mothers appear to be suffering from neonatal hypothyroidism. The major circulating hormones are thyroxin (T4) and triiodothyronin (T3). Most T4 & T3 molecules are bound to the thyroid binding globulin (TBG) & only a little fraction of T4 &T3 are in the free form (fT4 & fT3) which is important for biological action. Thyroid stimulating hormone (TSH) is secreted from the anterior aspect of the pituitary gland. It plays an important role in stimulating thyroid gland to synthesise & secrete thyroid hormones in the peripheral circulation when there is deficiency of thyroid hormones (hypothyroidism). Thus it is important for the thyroid balance. So, in hypothyroidism, TSH level is increased.

Studies have shown that despite sufficient iodine intake during pregnancy, the women are still having hypothyroidism as the pregnancy advances. The most important cause of it is autoimmune thyroid diseases. Elevated levels of thyroid autoantibodies are detected in the peripheral circulation in autoimmune thyroid diseases. Anti-thyroid peroxidase (anti TPO) antibody and anti-thyroglobulin (anti TG) antibodies are most frequently found to be elevated.

Thyroid peroxidase (TPO) is an enzyme that is present in the colloid of the thyroid gland, catalyzes in all the steps of thyroid hormone production inside the thyroid follicle. Anti-thyroid peroxidase antibody is found in the autoimmune thyroid diseases. This antibody hampers the TPO action and thus causing defective iodination & thyroid hormone production. The presence of elevated thyroid autoantibody (anti-thyroid peroxidase antibody) might be a marker of underlying subtle alteration in thyroid reserve. A reduction in the functional reserve of the thyroid gland is associated with reduced capacity to adapt with the physiological changes of pregnancy frequently causes imbalance in thyroid hormonal homeostasis. As the result of it there is often increase in thyroid stimulating hormone concentrations seen in pregnant women who are having increased levels of thyroid autoantibodies in circulation (Gayathri, R. *et al.*, 2009). Thyroid hormones can directly stimulate the angiogenic growth factor and cytokine production as well as trophoblast proliferation, survival, and invasion. The presence of elevated levels of thyroid autoantibodies reflect a generalised activation of the immune system and specifically an activity of the immune system at the fetal-maternal interface (Gayathri, R. *et al.*, 2009).

It is very important to find out the extent of adverse fetomaternal outcomes in those women who are having hypothyroidism. Early diagnosis and proper management of the above mentioned conditions can prevent or reduce fetomaternal demise in future. So, there is a need of further study to address these issues. There is very little data available on these conditions in West Bengal and our study is aimed to fill some part of that gap.

Aims & Objectives:

- To measure serum TSH and fT4 levels of the samples taken from the women of 3rd trimester of pregnancy & find out the prevalence of hypothyroidism .
- To find out fetomaternal outcome of hypothyroidism in terms of antepartum &postpartum haemorrhages, maternal anaemia, low birth weight babies & low APGAR score.

MATERIALS & METHODS:

The study was carried out in the Department of Biochemistry of a tertiary care Hospital after obtaining necessary permission from Institutional Ethics Committee. The study period was from January 2017 to December 2017. A total of 142 pregnant women were included in the study. All women irrespective of their parity who were admitted for delivery were included in the study. Women under antithyroid medication or having other endocrinal disorders like diabetes mellitus, or known to suffer from any autoimmune disease or malignancy, or giving any history of pregnancy induced hypertension or preeclampsia were excluded from the study.

An amount of 5 ml blood was collected from the median cubital vein of all study subjects by disposable plastic syringe. The needle was detached from the Nozzle & 2ml blood was immediately transferred into an EDTA vial and the vial was shaken gently twice and kept in a stand. The rest 3ml of blood was transferred in a clotted vial and was allowed to clot. Then the clotted vials were centrifuged. Separated serums were labelled appropriately and were stored in -20 degree & analysed within 7 days.

Serum fT4 &TSH levels of maternal blood samples were measured by ELISA method using standardized kits & blood haemoglobin levels were measured from EDTA vials by Cyanmethaemoglobin method.

Statistical Analysis

The results obtained were tabulated in excel sheet & analysed by standard statistical methods using SPSS 20.

RESULT:

The present study was conducted in the Department of Biochemistry in collaboration with the department of Obstetrics and Gynaecology in N.R.S. Medical College, Kolkata, India. Total 142 pregnant women admitted for delivery in the labour room of NRS Medical College & Hospital were taken as study subjects by applying inclusion and exclusion criteria after clearance of Institutional Ethics Committee (NMC/6543, Dated 26/12/2016). The patients were enrolled in the study after obtaining informed consent. The patients were divided according to their thyroid hormone status into 2 groups: mother with and without hypothyroidism. The prevalence of hypothyroidism is shown in Fig 1.

Among total 142 pregnant women 41 patients were revealed to be hypothyroid. Hypothyroidism was considered when TSH level ≥3µIU/ml. Rest 101 patients were without hypothyroidism. Thus prevalence of hypothyroidism was found to be 28.87%.

Maternal outcomes for hypothyroid patients were compared to those of euthyroid patients in terms of ante partum hemorrhage, postpartum hemorrhage, mode of delivery and maternal anemia (reduced haemoglobin concentration below 10 mg/dl). Fetal outcomes were compared in terms of birth weight (IUGR/ prematurity applying Ballard score) and APGAR score (for birth asphyxia).

The incidence of adverse maternal outcome was found to be statistically significant in hypothyroid state for maternal anaemia (Hb% <10mg/dl) [odds ratio 2.32, p value = 0.0096]. The incidence of adverse fetal outcome was found to be statistically significant in hypothyroid state for the following parameters:

- Low birth weight (<2.5 kg) [odd ratio 2.37, p value= 0.026]
- Low APGAR score [odd ratio 14.25, p value < 0.0001]

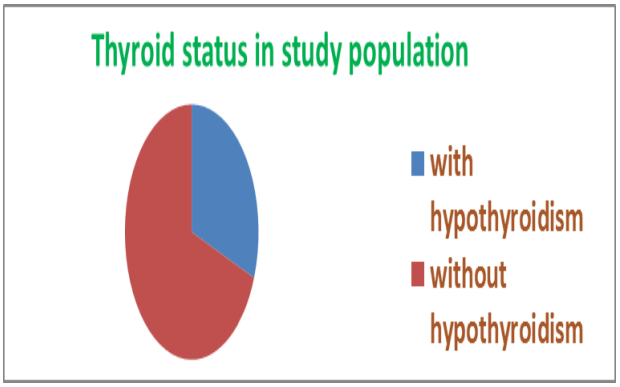

Fig 1: Thyroid status in study population

Table 1: Fetomaternal outcomes in hypothyroidism

Fetomaternal outcome	Women with hypothyroidism (n=41)	Women without hypothyroidism (n=101)	Odds ratio	P value
Antepartum hemorrhage	12.4%	6%	2.06	0.243
Postpartum hemorrhage	4.7%	3.6%	1.7	0.63
Anemia (Hb%<10 gm/dl)	67.5%	29%	2.32	0.0096
Low birth weight (<2.5 kg)	38%	24%	2.37	<0.05
Low APGAR score (<6 at 5 minutes of birth)	42%	5%	14.25	<0.05

DISCUSSION

India is having high prevalence of hypothyroidism among the pregnant women through last few decades. Though several etiological factors have been well explained for this non-communicable disease, a number of recent literatures suggest that autoimmune thyroid disease is an important factor for complicating pregnancy, resulting adverse fetomaternal outcome.

In pregnancy there are significant changes in the steroid hormonal metabolism and function which in turn affects the synthesis & metabolism of thyroid hormones. Changes in maternal thyroid function during pregnancy result from a combination of increased metabolic demands, increased serum TBG concentrations, stimulation of the TSH receptor by human chorionic gonadotropin (hCG) (Glinoer, D. 1997). Moreover, placental transfer of thyroxin results into increased maternal renal clearance of iodine and changes in thyroid binding globulin disturb thyroid homeostasis in pregnancy. Thyroid hormone production which is iodine dependant gradually declines if the increase on iodine demand placed by the pregnant state is not met. The reference range for serum thyroid stimulating hormone (TSH) and free thyroxin (fT4) are different during pregnancy, reflecting the physiological changes. The reference range for TSH is lower than non-pregnant state, while FT4 levels are high due to the stimulatory effect of serum beta hCG on the TSH receptors.

Maternal TSH is usually within normal limits during pregnancy but it can be decreased in the first trimester due to the increased hCG levels and the cross-reactivity of this hormone on TSH receptors (Ballabio, M. *et al.*, 1991); both are glycoprotein hormones with a common α subunit and a considerable homology between their β subunits. Therefore hCG has a weak thyroid stimulating activity (Banerjee, S. 2011). As the gestational age increases, the percentage of women with subclinical hypothyroidism is doubled. Hence there is a need for screening subclinical hypothyroidism and

thyroid autoimmunity in pregnancy (Banerjee, S. 2011). The role of routine screening becomes relevant in these patients as they are asymptomatic and symptoms if any, are ascribed to pregnancy itself. There is a wide range in the prevalence of thyroid dysfunction worldwide. In the USA which is considered an iodine replete country, 2%–3% of apparently healthy, non-pregnant women of childbearing age have an elevated serum TSH with the majority in the subclinical range as per the study done by Negro R. *et al.*, (2010).

In Southern Iran, in a study done by Saki F *et al.*,, the prevalence of hypothyroidism among pregnant women was shown to be 13.7% (Saki, F. *et al.*, 2014). In a study carried in South India, the prevalence of thyroid dysfunction was high with subclinical hypothyroidism found in 6.47% and overt hypothyroidism found in 4.58 % of pregnant women (Sahu, M. T. *et al.*, 2010). There are also other studies which reported that upto 20% incidence of perinatal mortality and congenital malformations associated with maternal hypothyroxinemia (Greenman, G.W. *et al.*, 1962; Niswander, K.R. *et al.*, 1972). Study done by La Franchi SH *et al.*, shows that untreated hypothyroidism in pregnancy has been associated with miscarriage, pre-eclampsia, post-partum hemorrhage (LaFranchi, S.H. *et al.*, 2005).

In another study done by Devis LE *et al.*, there is 40% incidence of anemia, preeclampsia, placental abruption and post-partum haemorrhage, 30% of neonates were small for gestation and 10% incidence of perinatal mortality and congenital abnormalities were noted in untreated or inadequately treated overtly hypothyroid women. Women with untreated subclinical hypothyroidism (elevated TSH only) had approximately one third the incidence of this problem and in both groups the maternal and fetal outcomes improved with thyroxin therapy (Davis, L.E. *et al.*, 1990).

CONCLUSION:

The prevalence of hypothyroidism in pregnancy in our study population was found to be 28.87%. The incidence of adverse maternal outcome was found to be statistically significant in hypothyroid state so far anaemia is concerned. The incidences of adverse fetal outcome in terms of low birth weight and low APGAR score were found to be statistically significant in hypothyroid state. Other maternal complications like antepartum and postpartum haemorrhages are also found to be more prevalent in hypothyroidism than euthyroid state but the finding was not significant statistically.

Though the study population is less in respect to an epidemiological study, and most of the patients were from apparently low socio economic status, which did not represent the whole population, still it can be inferred that, early identification of maternal hypothyroidism is crucially important for proper growth and development of fetus.

Acknowledgement

The authors sincerely acknowledge the guidance and necessary support of Dr. Chandana Das, Prof. & Head, Department of Gynaecology & Obstetrics, NRS Medical College.

REFERENCES

1. Vanderpump, M. P. (2011). The epidemiology of thyroid disease. *British medical bulletin*, *99*(1).
2. Greenman, G.W., Gabrielson, M.O., Howard-Flanders, J., & Wessel, M.A. (1962). Thyroid dysfunction in pregnancy. Fetal loss and follow- up evaluation of surviving infants. N Eng J of Med, 267, 426-31.
3. Haddow, J. E., Palomaki, G. E., Allan, W. C., Williams, J. R., Knight, G. J., Gagnon, J., ... & Faix, J. D. (1999). Maternal thyroid deficiency during pregnancy and subsequent neuropsychological development of the child. *New England Journal of Medicine*, *341*(8), 549-555.
4. Haddow, J. E., Palomaki, G. E., Allan, W. C., Williams, J. R., Knight, G. J., Gagnon, J., ... & Faix, J. D. (1999). Maternal thyroid deficiency during pregnancy and subsequent neuropsychological development of the child. *New England Journal of Medicine*, *341*(8), 549-555.
5. Sapana, C. (2014). International Journal of Basic and Applied Medical Sciences,2277 (3), 130-134
6. Gayathri, R., Lavanya, S., & Raghavan, K. (2009). Subclinical Hypothyroidism and Autoimmune Thyroiditis in Pregnancy-A Study in South Indian. *JAPI*, *57*, 691.
7. Glinoer, D. (1997). The regulation of thyroid function in pregnancy: pathways of endocrine adaptation from physiology to pathology. Endocr Rev, 18, 404–33.
8. Ballabio, M., Poshychinda, M., & Ekins, R.P. (1991). Pregnancy-induced changes in thyroid function: role of human chorionic gonadotropin as putative regulator of maternal thyroid. J Clin Endocrinol Metab, 73, 824–31
9. Banerjee, S. (2011). Thyroid disorders in pregnancy. J Assoc Physicians of India, 59(4), 32-4.
10. Negro R, Schwartz A, Gismondi R, TinelliA, Mangieri T, Stagnaro-Green A 2010 Increased pregnancy loss rate in thyroid antibody negative women with TSH levels between 2.5 and 5.0 in the first trimester of pregnancy. J Clin Endocrinol Metab. 2010; 95(8):44.
11. Saki, F., Dabbaghmanesh, M. H., Ghaemi, S. Z., Forouhari, S., Omrani, G. R., & Bakhshayeshkaram, M. (2014). Thyroid function in pregnancy and its influences on maternal and fetal outcomes. *International journal of endocrinology and metabolism*, *12*(4).

12. Sahu, M. T., Das, V., Mittal, S., Agarwal, A., & Sahu, M. (2010). Overt and subclinical thyroid dysfunction among Indian pregnant women and its effect on maternal and fetal outcome. *Archives of gynecology and obstetrics*, *281*(2), 215.
13. Greenman, G.W., Gabrielson, M.O., Howard-Flanders, J., Wessel, M.A., (1962). Thyroid dysfunction in pregnancy. Fetal loss and follow- up evaluation of surviving infants. N Eng J of Med, 267, 426-31.
14. Niswander, K.R., Gordon, M., & Berendes, H.W. (1972). The women and their pregnancies: In the collaborative perinatal study of the National Institute of Neurological Disease Stroke. Philadelphia. WB Saunders, 246-49.
15. LaFranchi, S.H., Haddow, J.E., & Hollowell, J.G. (2005). Is thyroid inadequacy during gestation a risk factor for adverse pregnancy and developmental outcomes? Thyroid, 15 (1), 60-71.
16. Davis, L.E., Levono, K.J., & Cunningham, F.G. (1990). Hypothyroidism complicating pregnancy. Obst Gynaecology, 97, 536-39.