

Original Research Article

DOI: <http://dx.doi.org/10.18203/2349-3933.ijam20163281>

Hypothyroidism and anemia in pregnancy

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Received: 10 September 2016

Received: 13 September 2016

Accepted: 16 September 2016

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ABSTRACT

Background: Hypothyroidism and anemia are widely prevalent in pregnant women. Due to better diagnostic facilities and increased awareness, more cases of hypothyroidism are seen. Using ATA trimester specific guidelines for diagnosis of hypothyroidism has also resulted in increased prevalence of hypothyroidism in pregnancy. This study was undertaken to evaluate the prevalence of hypothyroidism among pregnant women, and to study the correlation between the prevalence of hypothyroidism and anemia in pregnant women.

Methods: A total of 110 consecutive antenatal women attending the antenatal clinic were included in our study. A detailed clinical and obstetric history was obtained from them. The cases underwent routine clinical and obstetric examination. Blood samples were sent to lab for routine haematology and fasting serum TSH testing.

Results: Out of 110 cases, Raised S.TSH ($>2.5\text{ mIU/L}$) suggestive of thyroid dysfunction was seen in 35 (31.81%) cases. Hb $<11\text{ gm%}$ (suggestive of anemia) was seen in 21(19.09%) cases. Out of cases with Hb $<11\text{ gm%}$, 9 (42.86%) had S. TSH $>2.5\text{ mIU/L}$, whereas 12 (57.14 %) had S.TSH $<2.5\text{ mIU/L}$.

Conclusions: Thyroid disease has multiple deleterious impacts on pregnancy. In our study raised S.TSH ($>2.5\text{ mIU/L}$) was seen in 35 (31.81%) cases. Amongst the cases with anemia, 42.86% had S.TSH $>2.5\text{ mIU/L}$. Anemia and Hypothyroidism are very common in our country in pregnancy. It is likely, that hypothyroidism may add on to the severity of anemia. Early diagnosis and treatment of hypothyroidism during pregnancy will help in reducing anemia and adverse maternal and fetal outcomes.

Keywords: Anemia, S.TSH, 1st Trimester

INTRODUCTION

Thyroid hormone plays a critical role in fetal development. But, the thyroid physiology is modified during normal pregnancy. These modifications help to prepare the maternal thyroid gland to cope with the metabolic demands of pregnancy. These changes are usually reversible post-partum and the interpretation of these changes poses a challenge to the treating physician.

Hypothyroidism is widely prevalent in pregnant women. Maternal hypothyroidism occurs in 2-5% of women of child-bearing age and is associated with adverse pregnancy outcomes.¹ It is associated with fetal loss, placental abruptions, pre-eclampsia, preterm delivery and reduced intellectual function in the offspring.² The risk for miscarriage increased by 15% for each 1 mIU/L elevation of the TSH level on the basis of logistic regression analysis.³

Worldwide more than 20 million people develop neurological sequel due to intra uterine iodine deprivation.⁴ Thyroid function should be evaluated immediately after pregnancy is confirmed and at the beginning of the second and third trimesters. But, the rate of detection, especially in a developing country like India, has not kept pace with the magnitude of the problem. Since hypothyroidism is easily treated, timely detection and treatment of the disorder could reduce the burden of adverse fetal and maternal outcomes.

To validate the need of antenatal screening for maternal thyroid dysfunction, this study was undertaken to know the prevalence of hypothyroidism among pregnant women in central India.

The aim of the study was to evaluate the prevalence of hypothyroidism among pregnant women, and to study the correlation between the prevalence of hypothyroidism and anemia in pregnant women.

METHODS

A total of 110 consecutive antenatal women attending the antenatal clinic were registered for the study. A detailed clinical and obstetric history was obtained from them. The cases underwent routine clinical and obstetric examination. Blood samples were sent to lab for routine haematology and fasting serum TSH testing.

Inclusion criteria

Consecutive 110 pregnant women attending the antenatal clinic were included in the study.

For all participant patients requisition proforma was filled including their age, sex, gestational age, obstetric history and other medical complaints. All patients gave formal consent for the study.

Blood samples

Five (5) ml of blood was obtained from each patient and collected in EDTA and plain tubes. Aliquot of samples were kept for analysis. Blood samples were centrifuged and serum separated for the analysis to be carried out.

Biochemical analysis

Tests carried out were complete blood picture, random blood sugar, urine (routine and microscopic), S.TSH.

RESULTS

The age of the cases ranged between 15-60 years with a mean age of 26.34 years. The gestational age ranged between 5-16 weeks with a mean of 8.13 weeks. Thyroid dysfunction in the form of raised S.TSH (>2.5 mIU/L) was seen in 35 (31.81%) cases. Raised S.TSH in primigravida was seen in 23 (20.90%) cases and 12

(10.90 %) multigravida cases. Raised S.TSH in the age group 20-25 years was seen in 13 (11.81%) cases, in age group 25-30 years in 12 (10.90%) cases, age group >30 years in 10 (9.09%) cases.

Hb <11 gm% suggestive of anemia was seen in 21 (19.09%) cases. In the age group 20-25 years, 6 (5.45%) cases had Hb <11 gm%, whereas, in the age group 25-30 years 9 (8.18%) cases, and in the age group >30 years 6 (5.45%) cases had Hb <11 gm%.

Out of 21 cases with Hb <11 gm%, 9 (42.86%) had S.TSH >2.5 mIU/L, whereas 12 (57.14%) had S.TSH <2.5 mIU/L. Among 9 cases with S.TSH >2.5 mIU/L, 5 were primigravida and 4 were multigravida. In this subgroup with S.TSH >2.5 mIU/L, 2 were in the age group 20-25 years, 3 were in age group 25-30 years and 4 were of age >30 years.

Table 1: Cases with Hb <11 gm%.

Age group	TSH >2.5		TSH <2.5		p value
	Primi	Multi	Primi	Multi	
20-25	2	0	4	0	
25-30	2	1	5	1	
30 above	1	3	1	1	
Total	5	4	10	2	0.000

DISCUSSION

About 2 to 5% of pregnant woman suffer from any variety of thyroid disorders and timely intervention can be done if detected early.¹

Women with hypothyroidism have decreased fertility; even if they conceive, risk of abortion is increased, and risk of gestational hypertension, anemia, abruptio placenta and postpartum hemorrhage is increased.²

Thyroid disease has multiple deleterious impacts on pregnancy, the postpartum period, and the developing fetus. Complications include miscarriage, decreased intelligence quotient, visual-motor deficiencies in the offspring, preterm delivery, and postpartum thyroiditis.⁵⁻¹⁴

In this study we have used trimester-specific TSH cut offs of <2.5 mIU/L for the first trimester and <3.0 mIU/L for the second and third trimester as suggested by the American Thyroid Association (ATA).¹⁵

The prevalence of hypothyroidism in pregnancy is around 2.5% according to the Western literature.¹⁶ In a community-based large study involving over 500,000 pregnant women from the USA showed a 15.5% prevalence of hypothyroidism.¹⁷ There are a few reports of hypothyroidism during pregnancy from India with prevalence rates ranging from 4.8% to 11%.^{18,19} Previous studies conducted in Delhi reported a 14.3% prevalence

of hypothyroidism during the first trimester.²⁰ In most of these studies the upper normal limit of TSH <4.5 was being used. In our study raised S.TSH (> 2.5 mIU/L) was seen in 35 (31.81%) cases. Similar findings have been observed in other studies where trimester-specific TSH reference ranges as suggested by the American Thyroid Association (ATA) were being used. In a recent Indian study, the prevalence of hypothyroidism in pregnancy was 36.07% using trimester specific S.TSH values.²¹ In another recent study from India it was found that 49% of cases had S.TSH levels above the recommended guidelines in the first trimester.²² Newer studies have higher prevalence of hypothyroidism. It has been stated that lowering the threshold of S.TSH to 2.5 mIU/L would result in a nearly five-fold increase in the number of women being classified as hypothyroid.²³ Whereas, a message from the study of Vaidya et al commented that 30% women with thyroid dysfunction remain undiagnosed.²⁴

WHO has defined haemoglobin of less than 11g% as anemia in pregnancy. According to world Health Organization estimates, up to 56% of all women living in developing countries are anemic.²⁵ In our study 21 (19.09%) cases had anemia. In a recent Indian study 39.4% of pregnant women were found to have anemia.²⁶ Anemia is leading risk factor that is directly associated with maternal morbidity and mortality. It has been suggested that nutritional deficiencies are known to develop in hypothyroidism; the most recognized one is iron deficiency.²⁷ Anemia is estimated to affect up to 60% of patients with hypothyroidism and is not related to severity or duration of thyroid insufficiency.²⁷

There is a metabolic deceleration in hypothyroidism. All organ systems are affected. Hemopoietic system is the primary one among these affected systems resulting in anemia. Anemia in hypothyroidism can be normochromic normocytic, hypochromic microcytic, and macrocytic. Hypocellular structure of the bone marrow gives rise to thought that thyroid hormones play a role in hematopoiesis. The most frequent reason of this is the bone marrow repression due to thyroid hormone deficiency as well as lack of erythropoietin production arising from the reduction in need of O₂.²⁸

In our study, amongst the cases with anemia, 42.86% had S.TSH >2.5 mIU/L. In consistence to our study similar results were found in study of Fein and Rivlin they suggested that nutritional deficiencies are known to develop in subclinical hypothyroidism, the most recognized one is iron deficiency.²⁷ It is likely, that hypothyroidism may add on to the severity of anemia. Recently, attention is being focused on utility of poor maternal iron status in predicting high TSH and low total T4 concentrations during pregnancy, especially in areas of borderline iodine deficiency.²⁹ It is postulated that iron deficiency decreases the thyrotropic response to TRH, serum T3 and T4 levels, slows turnover of T3, and may reduce T3 nuclear binding.³⁰ Iron deficiency might cause

impairment of the heme-dependent enzyme thyroid peroxidase, thereby limiting synthesis of thyroid hormones, which can lead to a reduction in circulating levels of total T3 and total T4.³⁰ Iron repletion may reverse this hypothyroidism. Malabsorption and iron deficiency anemia are observed in hypothyroidism. In a study carried out by Cinemre H and colleagues, they showed that the efficacy and absorption of oral iron treatment in women with subclinical hypothyroidism improved after levothyroxine replacement.³¹

CONCLUSION

A total of 110 consecutive antenatal women attending the antenatal clinic were studied. Raised S.TSH (>2.5 mIU/L) was seen in 35 (31.81%) cases. It has been stated that lowering the threshold of S.TSH to 2.5 mIU/L would result in a nearly five-fold increase in the number of women being classified as hypothyroid. In our study 21 (19.09%) cases had anemia with haemoglobin of <11 gm%. In our study, amongst the cases with anemia, 42.86% cases had S.TSH >2.5 mIU/L. The observations from our study suggest a fairly high incidence of hypothyroidism in pregnancy. These observations are based on the TSH reference ranges as suggested by the American Thyroid Association (ATA). Anemia in pregnancy is common occurrence in our country. Presence of thyroid dysfunction in the form of hypothyroidism may affect the incidence and severity of anemia in pregnancy adversely. More work is needed to elucidate a link between anemia, iodine deficiency, thyroid disease, and adverse outcomes in the mother and the fetus.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Glinoer D, Soto MF, Bourdoux P. Pregnancy in patients with mild thyroid abnormalities: maternal and neonatal repercussions. *J Clin Endocrinol Metab.* 1991;73:421-7.
2. Abalovich M, Gutierrez S, Alcaraz G. Overt and subclinical hypothyroidism complicating pregnancy. *Thyroid.* 2002;12:63-8.
3. Negro R, Schwartz A, Gismondi R, Tinelli A, Mangieri T, Stagnaro-Green A. 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:E44-48.
4. Girling J. Thyroid disease in pregnancy. *Obstet, Gynec and Reprod Medicine.* 2008;18:10.
5. Stagnaro-Green A, Roman SH, Cobin RH, el-Harazy E, Alvarez-Marfany M, Davies TF. Detection of at-risk pregnancy by means of highly

- sensitive assays for thyroid autoantibodies. *JAMA.* 1990;264:1422-5.
6. Prummel MF, Wiersinga WM. Thyroid autoimmunity and miscarriage. *Eur J Endocrinol.* 2004;150:751-5.
 7. Allan WC, Haddow JE, Palomaki GE, Williams JR, Mitchell ML, Hermos RJ. Maternal thyroid deficiency and pregnancy complications: implications for population screening. *J Med Screen.* 2000;7:127-30.
 8. Haddow JE, Palomaki GE, Allan WC, Williams JR, Knight GJ, Gagnon J. Maternal thyroid deficiency during pregnancy and subsequent neuropsychological development of the child. *N Engl J Med.* 1999;341:549-55.
 9. Pop VJ, Kuijpers JL, van Baar AL, Verkerk G, van Son MM, de Vijlder JJ. Low maternal free thyroxine concentrations during early pregnancy are associated with impaired psychomotor development in infancy. *Clin Endocrinol (Oxf).* 1999;50:149-55.
 10. Zoeller RT, Rovet J. Timing of thyroid hormone action in the developing brain: Clinical observations and experimental findings. *J Neuroendocrinol.* 2004;16:809-18.
 11. Casey BM, Dashe JS, Wells CE, McIntire DD, Byrd W, Leveno KJ. Subclinical hypothyroidism and pregnancy outcomes. *Obstet Gynecol.* 2005;105:239-45.
 12. Stagnaro-Green A, Roman SH, Cobin RH, el-Harazy E, Wallenstein S, Davies TF. A prospective study of lymphocyte-initiated immunosuppression in normal pregnancy: Evidence of a T-cell etiology for postpartum thyroid dysfunction. *J Clin Endocrinol Metab.* 1992;74:645-53.
 13. Alvarez-Marfany M, Roman SH, Drexler AJ, Robertson C, Stagnaro-Green A. Long-term prospective study of postpartum thyroid dysfunction in women with insulin dependent diabetes mellitus. *J Clin Endocrinol Metab.* 1994;79:10-6.
 14. Nicholson WK, Robinson KA, Smallridge RC, Ladenson PW, Powe NR. Prevalence of postpartum thyroid dysfunction: A quantitative review. *Thyroid.* 2006;16:573-82.
 15. Stagnaro-Green A, Abalovich M, Alexander E, Azizi F, Mestman J, Negro R. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. *Thyroid.* 2011;21:1081-125.
 16. LeBeau SO, Mandel SJ. Thyroid disorders during pregnancy. *Endocrinol Metab Clin North Am.* 2006;35:117-36.
 17. Blatt AJ, Nakamoto JM, Kaufman HW. National status of testing for hypothyroidism during pregnancy and postpartum. *J Clin Endocrinol Metab.* 2012;97:777-84.
 18. Nambiar V, Jagtap VS, Sarathi V, Lila AR, Kamalanathan S, Bandgar TR. Prevalence and impact of thyroid disorders on maternal outcome in Asian-Indian pregnant women. *J Thyroid Res.* 2011;429097.
 19. Sahu MT, Das V, Mittal S, Agarwal A, Sahu M. Overt and subclinical thyroid dysfunction among Indian pregnant women and its effect on maternal and fetal outcome. *Arch Gynecol Obstet.* 2010;281:215-20.
 20. Dhanwal DK, Prasad S, Agarwal AK, Dixit V, Banerjee AK. High prevalence of subclinical hypothyroidism during first trimester of pregnancy in North India. *Indian J Endocrinol Metab.* 2013;17:281-4.
 21. Dhanwal DK, Bajaj S, Rajput R, Subramaniam K, Chowdhury S, Bhandari R. Prevalence of hypothyroidism in pregnancy: An epidemiological study from 11 cities in 9 states of India. *Indian J Endocrinol Metab.* 2016;20:387-90.
 22. Sahasrabuddhe A, Pitale S. Screening for thyroid dysfunction during pregnancy. *Thyroid Res Pract.* 2012;9:15-8.
 23. Dhanwal DK. Thyroid disease in pregnancy: Experience from a large Indian cohort. *Thyroid Res Pract.* 2013;10:18-9.
 24. Banerjee S. Thyroid disorders in pregnancy. *J Assoc Physicians India.* 2011;59:32-4.
 25. World Health Organization. The prevalence of anemia in women: A Tabulation of Available Information; second edition. Geneva: WHO, 1992. (WHO/MCH/MSM/92.2).
 26. Kumar KJ, Asha N, Murthy DS, Sujatha MS, Manjunath VG. Maternal anemia in various trimesters and its effect on newborn weight and maturity: An observational study. *Int J Prev Med.* 2013;4:193-9.
 27. Fein HG, Rivlin RS. Anemia in thyroid disease. *The Medical Clinics of North America.* W.B. Saunders Co., Philipines. 1975:59.
 28. Mehmet E, Aybike K, Ganidagli S, Mustafa K. Characteristics of anemia in subclinical and overt hypothyroid patients. *Endocrine Journal.* 2012;59(3):213-20.
 29. Sahay RK, Nagesh VS. Hypothyroidism in pregnancy. *Indian J Endocrinol Metab.* 2012;16:364-70.
 30. Zimmermann MB, Burgi H, Hurrell RF. Iron deficiency predicts poor maternal thyroid status during pregnancy. *J Clin Endocrinol Metab.* 2007;92:3436-40.
 31. Cinemre H, Bilir C, Gokosmanoglu F, Bahcebasi T. Hematologic effects of levothyroxine in iron-deficient subclinical hypothyroid patients: a randomized, double-blind, controlled study. *J Clin Endocrinol Metab.* 2009;94(1):151-6.

Cite this article as: Agrawal U, Shrivastava P, Shrivastava S. Hypothyroidism and anemia in pregnancy. *Int J Adv Med.* 2016;3:851-4.