The Journal of Teachers Association

ISSN 1019-8555 (Print) & ISSN 2408-8854 (Online)
Frequency: Bi-Annual
DOI: https://doi.org/10.62469/taj.v037i02.026

OPEN ACCESS

Website: www.tajrmc.com
Email: editor@tajrmc.com
Volume-37 | Issue-2 | Jul-Dec 2024

TSH Level in Pregnancy: A Comparative Study in Rajshahi City

Swati Sarker[1]*, Gopa Sarker[2], Farhana Rahman[3], Shahin Mahmuda[4], Md. Jawadul Haque[5]

[1] Department of Community Medicine, Rajshahi Medical College, Rajshahi, Bangladesh
[2] Department of Obstetrics & Gynaecology, Barind Medical College, Rajshahi, Bangladesh
[3] Department of Physiology, Army Medical College, Jashore, Bangladesh
[4] Department of Physiology, Rajshahi Medical College, Rajshahi, Bangladesh
[5] Vice-Chancellor of Rajshahi Medical University, Bangladesh

Abstract: ***Background:*** One of the most prevalent endocrine problems in pregnant women is thyroid dysfunction which is linked to poor outcomes for both the mother and the fetus. It is obvious that overt hypothyroidism which is characterized by elevated TSH and low thyroid hormone levels in the mother, particularly in the early stages of pregnancy, may impact the development of the baby's brain or result in other pregnancy related complications. The aim of the study was to determine and compare the TSH status in pregnant and non-pregnant women in Rajshahi city. ***Methods*:** This cross-sectional comparative study was carried out in the Department of Physiology, Rajshahi Medical College, Rajshahi over a period of 1 year from July 2022 to June 2023 on 180 reproductive women aged 20-35 years in Rajshahi city. Data from 90 pregnant and 90 non-pregnant women were gathered using a pre-designed, validated and semi-structured questionnaire. ***Results:*** The mean ages of the pregnant and non-pregnant women were 25.26 ± 4.44 years and 27.66 ± 4.45 years, respectively. The mean TSH value in pregnant women was higher than non-pregnant women and it was statistically highly significant ($p < 0.001$). Trimester specific analysis showed that serum TSH level was increased in 3rd trimester than other trimester of pregnancy and it was statistically highly significant ($p < 0.001$). ***Conclusions:*** Therefore, it is imperative to check the TSH level regularly during pregnancy. Early identification of hypothyroidism may prevent difficulties and provide a good life for the unborn child and mother.

Keywords: Thyroid stimulating hormone and pregnancy.

Original Research Article

Correspondence:
Dr. Swati Sarker
Lecturer, Department of Community Medicine Rajshahi Medical College, Rajshahi, Bangladesh.
E-mail: swati_sarker@yahoo.com

How to cite this article:
Sarker S, Sarker G, Rahman F, Mahmuda S, Haque MJ; TSH Level in Pregnancy: A Comparative Study in Rajshahi City. Taj 2024;37 (2): 198-203.

Article history:
Received: August 16, 2024
Revised: October 15, 2024
Accepted: November 12, 2024
Published: December 01, 2024

Article at a glance:

Study Purpose: *The purpose of this study was to estimate and compare the TSH level in pregnant and non-pregnant women of reproductive age in Rajshahi city.*

Key findings: *The present study had showed an increased level of TSH in pregnant women than non-pregnant women and it was statistically highly significant.*

Newer findings: *A trimester-specific analysis revealed that the third trimester of pregnancy had higher serum TSH levels than the other trimesters.*

Abbreviations: *hCG: Human chorionic gonadotrophin, SD: Standard deviation, SPSS: Statistical package for social sciences, TBG: Thyroxine binding globulin, TSH: Thyroid stimulating hormone.*

Copyright: © 2024 by the authors. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

During the course of pregnancy, a woman's uterus develops one or more offspring known as a fetus or embryo and numerous changes in physiology, hormones and metabolism accompany it.[1] Among the hormones, estrogen, progesterone, β-hCG, prolactin, human placental lactogen, parathyroid hormone, cortisol, aldosterone and thyroid hormones are raised during pregnancy. The most frequent endocrine illnesses that afflict women during their reproductive years and pregnancy are thyroid abnormalities.[2] Therefore, to avoid pregnancy-related difficulties, it is crucial to recognize these diseases and treat them effectively.

The prohormone T_4 and a little quantity of the bioactive hormone T_3 are the main hormones produced by the thyroid gland and are involved in normal growth, energy metabolism and reproduction.[3,4] TSH is a physiological marker of the effects of thyroid hormones and is secreted by the thyrotrophic cells of the anterior pituitary gland. It controls the synthesis and secretion of T_3 and T_4 by thyroid glands. TSH is generally inhibited by increased blood levels of thyroid hormones, whereas a drop in serum thyroid hormone levels has the reverse effect.[5]

Thyroid function changes during pregnancy as a result of the combined effects of hCG and estrogen, the primary hormone in women. A somewhat low TSH may arise from the first trimester's high amounts of circulating hCG which can mildly activate the thyroid. However, following the first trimester, the hCG concentration decreases, reaches a plateau in the middle of pregnancy and continues until delivery. Increased TBG caused by high estrogen levels led to an increase in the bound fraction of thyroid hormones, a trend toward a decrease in the free fraction and a rise in TSH secretion which in turn induces additional thyroid hormone production.[6]

The fetus depends on the mother's T_4 hormone, which crosses the placenta, until it can produce its own thyroid hormones.[7,8] Because of the increased metabolism of the mother and fetus during pregnancy, there is also an increased need for iodine.[9] Maternal hypothyroidism is the most common thyroid condition during pregnancy. It is linked to preterm delivery, placental abruptions, preeclampsia, fetal death and diminished intellectual function in the progeny. Although there is a low rate of hyperthyroidism in pregnancy[10], Graves' hyperthyroidism has serious negative effects on both the fetus and the mother, including miscarriage, placenta abruption, premature delivery and preeclampsia.[11] The mother's and the unborn child's health depends on early detection and treatment of thyroid disorders before and throughout pregnancy.[12]Pregnancy is associated with profound modifications in the regulation of thyroid function. These changes are the result of various factors like an increase of TBG, increase renal losses of iodine, modifications in the peripheral metabolism of maternal thyroid hormones and modifications in iodine transfer of placenta.[13] These physiological changes may turn into pathologic processes in many pregnancies. So, it is very important to know the changes in thyroid function status specially TSH level of pregnant women. Early diagnosis and appropriate treatment of thyroid dysfunctions in pregnancy is important to avoid both fetal and maternal complications.

METHODS

This study was a cross-sectional comparative study and conducted in the Department of Physiology, Rajshahi Medical College, Rajshahi during the period July 2022 to June 2023. Reproductive women aged 20-35 years with and without pregnancy were enrolled in this study. Before the starting of the study, a questionnaire was prepared according to the objectives of the study and data were collected by using the semi-structured questionnaire. 90 pregnant women aged 20 to 35 years were included in one group and similar numbers of women aged 20 to 35 years without pregnancy were included in another group purposively.

Data were collected from different hospitals of Rajshahi city. At first on the basis of inclusion and exclusion criteria history were taken from respondents. Individuals who were matched according to the selection criteria of the study, they were informed about the purpose of the study. After knowing the purpose of the study individuals who gave consent to participate in the study, were finally selected as a study subject. The data were collected based on variables of interest. Then blood sample were obtained from median cubital vein in antecubital fossa making the subject to sit comfortably in a chair. Through a sterile DISPOVAN syringe under sterile precautions, about five milliliters of blood were collected in EDTA coated vaccutainers. Then the sample was analyzed for the TSH using auto-analyzer machine. All data were analyzed by using the 'Statistical Package for Social Sciences (SPSS)' software, version-24. Categorical variables were summarized by using number and percentage while continuous variables were summarized by mean ± standard deviation (SD). An independent t-test was used to compare TSH between pregnant and non-pregnant women. ANOVA test was used to compare TSH among three trimesters of pregnancy. A p-value <

0.05 was considered statistically significant for all tests.

RESULTS

Table 1: Comparison of age and occupational status between the two groups (n=90 in each group)

Variables	Group		p-value
	Pregnant women	Non-pregnant women	
Mean age (Years)	25.26 ± 4.44 years	27.66 ± 4.45 years	< 0.001#
Occupational status			
Housewife	69 (76.70%)	71 (78.90%)	> 0.05*
Day labour	12 (13.30%)	8 (8.90%)	
Businessman	9 (10.00%)	11 (12.20%)	

#Data were analyzed using **Unpaired t-Test** and were presented as **mean ± SD**. ***Chi-squared Test (χ^2)** was done to analyze the data and were presented as frequency (%)**.**

The mean age of the non-pregnant women (27.66 ± 4.45 years) was higher than pregnant women (25.26 ± 4.44 years) and it was statistically highly significant (p < 0.001) and there was no statistically significant difference between the two groups in terms of occupational status (p > 0.05) (Table 1).

Table 2: Comparison of TSH level between the pregnant and non-pregnant women group (n=90 in each group)

Group	TSH (mIU/L)		t-value	p-value
	mean ± SD	Range		
Pregnant women	1.86 ± 1.18	0.35 to 5.00	4.23	< 0.001
Non-pregnant women	1.22 ± 0.78	0.16 to 3.49		

(Data were analyzed by **Unpaired t-Test** and were presented as **mean ± SD**. p value < 0.05 was considered as significant.)

TSH level among the pregnant women was 1.86 ± 1.18 mIU/L and the non-pregnant women was 1.22 ± 0.78 mIU/L and it was statistically highly significant (p < 0.001) (Table 2).

Table 3: Trimester specific comparison of TSH level in the pregnant women group (n=90)

Groups	TSH level (mIU/L) (mean±SD)	df F-value	p-value
1st trimester	1.29±0.93	2	< 0.001
2nd trimester	1.74±1.22	10.59	
3rd trimester	2.54±1.04		

(Data were analyzed by ANOVA-Test and were expressed as mean ± SD.)

Serum TSH level was 1.29±0.93 mIU/L in 1st trimester, 1.74±1.22 mIU/L in 2nd trimester and 2.54±1.04 mIU/L in 3rd trimester of pregnancy. TSH level was significantly increased in 3rd trimester in comparison to 1st trimester (p < 0.001) and 2nd trimester (p < 0.05) of pregnancy. But there was no statistically significant difference of serum TSH level between 1st and 2nd trimester of pregnancy (p > 0.05) (Table 3).

DISCUSSION

Thyroid hormones are a crucial physiological factor in the development and maturation of the fetus throughout pregnancy. The second most prevalent endocrine illnesses affecting women throughout their reproductive years are thyroid problems. Thus, aberrant thyroid function is not rare to find during a standard laboratory assessment performed on pregnant women. In this study, the mean ages were 25.26 ± 4.44 years and 27.66 ± 4.45 years in the pregnant and non-pregnant women, respectively. Similar findings were found with the studies done by Singh and Reddy[14] and Banik et al.[15] where mean ages were 23.15 ± 3.52 years and 24.23±1.83 years in pregnant group, respectively. Greater mean age in pregnant women

was reported by Dulek et al.[16] and Aboelroose[17] where age were 28.53± 4.90 years and 27.8±5.7 years, respectively. Geographical variation could be the cause of these differences. Women in industrialized nations tend to have higher levels of education and give birth later in life. However, early marriage causes women in poorer nations to become pregnant at a young age.

In the current study, occupational status of the women revealed that majority (76.70%) of the women were housewife, 13.30% were day labour and only 10.00% were businessman. Similarly, in the non-pregnant women group, majority (78.90%) of the women were housewife, 12.20% were businessman and remaining 8.90% were day labour. In both groups, housewife women were proportionately higher. In this study, TSH level were 1.86 ± 1.18 mIU/L and 1.22 ± 0.78 mIU/L among the pregnant and non-pregnant women, respectively and it was statistically highly significant ($p < 0.001$). Similar findings were found with the study done by Nepalia and Lal[18]. But dissimilar findings were found with the study done by Yeasmin et al.[19] where TSH levels were 0.96 ± 0.96 mIu/L in pregnant women and 1.27 ± 0.86 mIu/L in non-pregnant women group and it was statistically non-significant ($p > 0.05$). Study to study variations of TSH level might be due to sample size variation. Yeasmin et al.[19] conducted the study on 50 women. Among them 30 were pregnant women and 20 were non-pregnant women of child bearing age.

The placenta secretes HCG during pregnancy, which stimulates the thyroid gland because of its homologous structure with TSH. This results in a slight increase in free thyroid hormones early in the pregnancy, which in turn produces a slight decrease in pituitary TSH output. During the first trimester, the concentration of HCG rises, declines and then plateaus until the conclusion of the pregnancy. As a result, during the first trimester, TSH levels are lowered but they progressively rise for the remainder of the pregnancy. The current study also found a similar trend in TSH during pregnancy. In this study, serum TSH level were 1.29±0.93 mIU/L, 1.74±1.22 mIU/L and 2.54±1.04 mIU/L among the 1st, 2nd and 3rd trimester of pregnancy, respectively. Serum TSH level was significantly increased in 3rd trimester in comparison to 1st trimester ($p < 0.001$) and 2nd trimester of pregnancy ($p < 0.05$). But there was no statistically significant difference of serum TSH level between 1st and 2nd trimester of pregnancy ($p > 0.05$). Nearly similar findings were found in a study done by Banik et al.[15] where mean serum TSH level was 1.42 ± 1.47 mIU/L in 1st, 2.16 ± 1.13 mIU/L in 2nd and 2.82 ± 0.71 mIU/L in 3rd trimester of pregnancy. Again, it was gradually higher from 1st to 3rd trimesters of pregnancy and the difference was statistically significant ($p < 0.05$, $p < 0.001$ and $p < 0.01$) in between the groups. Nearly similar findings were also found with the studies done by Memon et al.[20], Shahid and Ferdousi[21], Girling and Martineau[22], Awede et al.[23], Khandakar et al.[24] and Rajput et al.[25]. But contradictory findings were found with the study done by Manjunatha et al.[26] where mean serum TSH level was gradually decreased from 1st to 3rd trimester of pregnancy. Dissimilar findings were also found with the studies done by Nepalia and Lal[18], Pramanik et al.[27] and Zarghami et al.[28]. This discrepancy might be due to variation of study design and sample size. The study was cross-sectional comparative study but some of these studies were longitudinal and some were case-control studies. Shahid and Ferdousi[21] performed the study on 749 pregnant women and Pramanik et al.[27] on 229 pregnant women.

The exact mechanism that is involved in alteration of serum TSH level during different trimesters of pregnant women are not yet clearly established. However, it has been suggested that higher concentration of serum human chorionic gonadotropin (hCG) during 1st trimester has thyrotropic activity due to it's structural similarity with serum TSH by sharing of common alpha subunit with TSH & thereby directly stimulates maternal thyroid gland by binding with TSH receptor and ultimately causes higher thyroid hormone (FT_4 and FT_3) concentration and lower TSH concentration on that period. Again, it has been stated that, serum hCG concentration gradually lower in 2nd and 3rd trimester of pregnancy and thereby causes rising in TSH level. However, serum TSH level deceases during 1st trimester and gradually increases during 2nd and 3rd trimester as a result of negative feedback mechanism. Again, increase in plasma volume (approximately 50%) as well as changes in

deiodinase activity in the placenta leads to a decrease in thyroid hormone concentration as pregnancy advances.

CONCLUSIONS

Thyroid dysfunction in pregnancy is associated with adverse pregnancy outcomes. So, antenatal thyroid screening should be judiciously offered. Appropriate diagnosis, care and management of thyroid dysfunction in the pre-pregnancy, pregnancy and post-pregnancy periods are important to minimize the risk of complications, long-term effects of the mother and fetus.

Acknowledgements

The author is grateful to Institute of Nuclear Medicine & Allied Sciences, Rajshahi for helping in data collection by their laboratory facility.

Authors' contributions

SS, GS, SM and MJH: Concept and design, data acquisition, interpretation, drafting and final approval. SS, FR, SM and MJH: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

Declarations

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

Conflict of interest

Authors declared no conflict of interest.

Ethical approval

Ethical approval of the study was obtained from the Ethical Review Committee, Rajshahi Medical College, Rajshahi. Informed consent was taken from all participants. All the study methodology was carried out following the relevant ethical guidelines and regulations.

Consent for publication: Taken.

REFERENCES

1. Alemu A, Terefe B, Abebe M, Biadgo B. Thyroid hormone dysfunction during pregnancy: A review. Int J Reprod Biomed (Yazd). 2016 Nov;14(11):677–686.
2. Stagnaro-Green A. Thyroid antibodies and miscarriage: where are we at a generation later? Journal Thyroid Research. 2011 Mar; 841949:1-7.
3. Bjergved L, Jørgensen T, Perrild H, Laurberg P, Krejbjerg A, Ovesen L, et al. Thyroid function and body weight: a community-based longitudinal study. PLoS One. 2014 Apr 11;9(4):e93515.
4. Ortega E, Pannacciulli N, Bogardus C, Krakoff J. Plasma concentrations of free triiodothyronine predict weight change in euthyroid persons. Am J Clin Nutr. 2007 Feb 1;85(2):440–445.
5. Nillni EA, Vaslet C, Harris M, Hollenberg A, Bjørbak C, Flier JS. Leptin regulates prothyrotropin-releasing hormone biosynthesis. Evidence for direct and indirect pathways. J Biol Chem. 2000 Nov 17;275(46):36124–36133.
6. Lazarus JH. Thyroid function in pregnancy. Br Med Bull. 2011;97:137–148.
7. Negro R, Mestman JH. Thyroid disease in pregnancy. Best Pract Res Clin Endocrinol Metab. 2011 Dec;25(6):927–943.
8. American College of Obstetrics and Gynecology. ACOG practice bulletin. Thyroid disease in pregnancy. Number 37, August 2002. American College of Obstetrics and Gynecology. Int J Gynaecol Obstet. 2002 Nov 1;79(2):171–180.
9. Soldin OP, Tractenberg RE, Hollowell JG, Jonklaas J, Janicic N, Soldin SJ. Trimester-specific changes in maternal thyroid hormone, thyrotropin, and thyroglobulin concentrations during gestation: trends and associations across trimesters in iodine sufficiency. Thyroid. 2004 Dec;14(12):1084–1090.
10. Chandrasekhara P, Aslam M, Kala K, Sultana F. A study of thyroid disorder during pregnancy. J Inter Med. 2015 July; 5(2):21-25.
11. Marx H, Amin P, Lazarus JH. Hyperthyroidism and pregnancy. BMJ. 2008 Mar 22;336(7645):663–667.
12. Lambert-Messerlian G, McClain M, Haddow JE, Palomaki GE, Canick JA, Cleary-Goldman J, et al. First- and second-trimester thyroid hormone reference data in pregnant women: a FaSTER (First- and Second-Trimester Evaluation of Risk for aneuploidy) Research

Consortium study. Am J Obstet Gynecol. 2008 Jul;199(1):62.e1–6.
13. Deshpande S, Yelikar K, Patil S, Andurkar S. Maternal thyroid hormone status in pre-eclampsia: a tertiary care hospital based study. Int J Reprod Contracept Obstet Gynecol. 2015;1853–1857.
14. Singh A, Reddy M. Prevalence of thyroid dysfunction in pregnancy and its implications. Int J Med Sci Public Health. 2015;4(9):1247.
15. Banik SC, Begum M, Ahmed F, Shamsuzzaman M. Thyroid function status during different trimesters in Bangladeshi women. Parameters. 2022 July; 34(1):47-50.
16. Dulek H, Vural F, Aka N, Zengin S. The prevalence of thyroid dysfunction and its relationship with perinatal outcomes in pregnant women in the third trimester. North Clin Istanb. 2019 Sep 2;6(3):267–272.
17. Issue V. Assessment of thyroid function in pregnant women attending Suez Canal University Hospitals. International Journal of Pregnancy & Child Birth. 2019;
18. Nepalia R, Lal RZ. Comparison of Level of thyroid hormone between pregnant and non-pregnant women. Inter Jour of Clin Bio and Res. 2016;3(2):214.
19. Yeasmin S, Hossain AA, Yeasmin T, Amin MR. Study of serum FT3, FT4 and TSH levels in pregnant women. Med Today. 2016 Oct 22;27(2):1.
20. Memon A, Shaikh A, Dodani A. Effects of pregnancy on thyroid hormone levels. PJMHS. 2011 Jul – Sep; 5 (3):524-528.
21. Shahid MM, Ferdousi S. Prevalence and incidence of thyroid disorder during pregnancy in Bangladesh - a tertiary care hospital based study. Sri Lanka J Diabetes Endocrinol Metab. 2021 Apr 8;11(1):26.
22. Girling J, Martineau M. Thyroid and other endocrine disorders in pregnancy. Obstetrics, Gynaecology & Reproductive Medicine. 2010 Sep;20(9):265–271.
23. Awede B, Hounnou MS, Tshabu-Aguemon C, Adehan G, Djrolo F, Amoussou-Guenou M, et al. Thyroid Function in Pregnant Women from a West-African Population. Open J Mol Integr Physiol. 2018;08(01):1–11.
24. Khandakar MAR, Ali MS, Kahtun M. Thyroid status of normal pregnant women in Dhaka City. Mymensingh Med J. 2002 Jan;11(1):1–5.
25. Rajput R, Singh B, Goel V, Verma A, Seth S, Nanda S. Trimester-specific reference interval for thyroid hormones during pregnancy at a Tertiary Care Hospital in Haryana, India. Indian J Endocrinol Metab. 2016 Dec;20(6):810–815.
26. Manjunatha S, Basavraja GN, Veena HC, Ramesh SP. Thyroid status in non-Pregnant and pregnant Women. Scholars Journal of Applied Medical Sciences (SJAMS). 2014 Jun; 2(6G):3349-3352.
27. Pramanik S, Mukhopadhyay P, Bhattacharjee K, Bhattacharjee R, Mukherjee B, Mondal SA, et al. Trimester-Specific Reference Intervals for Thyroid Function Parameters in Indian Pregnant Women during Final Phase of Transition to Iodine Sufficiency. Indian J Endocrinol Metab. 2020 Apr 30;24(2):160–164.
28. Zarghami N, Rohbani-Noubar M, Khosrowbeygi A. Thyroid hormones status during pregnancy in normal Iranian women. Indian J Clin Biochem. 2005 Jul;20(2):182–185.

The Journal of Teachers Association
Abbreviated Key Title: TAJ
Official Journal of Teachers Association Rajshahi Medical College

Publish your next article in TAJ
For submission scan the QR code
E-mail submission to: tajrmc8555@gmail.com