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Original Article

Assessment of TSH, FT_4 and TPO-Ab Status During 1st Trimester of Pregnant Women in Dhaka City

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Abstract

Background: Thyroid dysfunction may occur in pregnancy.

Objective: To measure serum TSH, FT4 & TPO-Ab levels during 1st trimester of normal pregnant women.

Method: This cross sectional study was carried out in the Department of Physiology, Sir Salimullah Medical College (SSMC), Dhaka from July 2016 to June 2017. The ethical permission was taken from Institutional Ethics Committee (IEC) of SSMC. Total 60 female subjects, age ranged from 20 to 35 years were included in this study, among them 30 were apparently healthy pregnant women of 1st trimester (study group) and 30 were apparently healthy non-pregnant nulliparous women (control group). Serum TSH, FT4 and TPO-Ab levels were measured. The statistical analysis was done by Unpaired t-test.

Results: In this study, mean serum TSH level was significantly ($p<0.01$) lower and serum FT4 level was significantly ($p<0.01$) higher in 1st trimester than that of non-pregnant group. However, among the 1st trimester of pregnant women 13.33% were TPO-Ab positive and 10% were subclinical hypothyroid (SCH).

Conclusion: The present study reveals that subclinical hypothyroidism occurs in 1st trimester of pregnant women. So, thyroid screening should be done routinely during this period.

Key words: TSH, FT_4, TPO-Ab, 1st trimester, pregnancy.

Introduction

Pregnancy is the physiological process in which fertilization of ovum produce a new sequence of events & the fertilized ovum eventually develops into a full term fetus.[1] The average duration of pregnancy is about 40 weeks where 1st trimester is considered as 1st 12weeks.[2] During pregnancy several physiological & biochemical changes occur like hormonal changes, increase nutritional requirements & metabolic demand to adjust the internal environment of mother and also to meet the extra demand of the growing fetus.[3,4] Among the hormones, thyroid hormone change is a predominant one.[5] Thyroid hormone is a calorigenic hormone which increases metabolic activities of almost all cells of the body and also essential for proper development, maturation & myelination of central nervous system during fetal life and first few years of post natal life.[6]

First trimester of pregnancy which is up to 12 weeks of gestation is the most important period, as organogenesis of fetus takes place at this stage.[7] During 1st trimester the fetus solely depends on transplacental passage of maternal thyroid hormone as fetal thyroid gland is not functional until 12 weeks of gestation.[8] So, normal thyroid function of mother during 1st trimester is very important for fetal development.[9] Thyroid disorder is the most common endocrine disorder during pregnancy. So assessment of thyroid function is very important during this period.[10]

Pregnant women have a higher chance to develop TPO-Ab positivity especially in 1st trimester. Usually, TPO-Ab positivity causes increase in TSH & decrease in FT_4 level. This altered thyroid function may cause severe obstetrical complications & also causes severe effects on fetal neuropsychological development.[11,12] Mothers are more vulnerable to develop thyroid disease & subsequently maternal morbidity in later life if they have positive TPO-Ab during early pregnancy.[13] So,

TPO-Ab screening test can be an important tool in early pregnancy, but little work is known on this regard in our country and for that reason this study was undertaken.

Materials and Methods

This cross sectional study was carried out in the Department of Physiology, Sir Salimullah Medical College (SSMC), Dhaka from July 2016 to June 2017. The study protocol was approved by the Institutional Ethics Committee of SSMC. A total number of 60 women age ranged from 20 to 35 years were recruited in this study and they were divided into two groups. Study group (group B) was consisted of 30 apparently healthy pregnant women of 1st trimester. They were selected from Out Patient Department (OPD) of Obstetrics & Gynaecology of SSMC and Mitford Hospital by consecutive purposive sampling. For comparison, age matched 30 apparently healthy non-pregnant nulliparous (NPN) women were also included as control group (group A). They were selected by personal contact. All the subjects were belonged to middle socioeconomic status. Subjects having history of any chronic or systemic diseases (hypertension, diabetes mellitus, cardiac disease, renal disease and tuberculosis), known thyroid abnormalities, other endocrine abnormalities, goitre, hyperemesis gravidarum, twin pregnancy, psychiatric illness etc. were excluded from the study.

After selection the aim, benefits, risks and the procedure of the study were explained to each subjects and a written consent was taken. Detailed personal, family, medical and occupational histories were taken and thorough physical examination of all subjects were done and recorded.

With all aseptic precautions, seven (7) ml of venous blood was drawn from antecubital vein. Serum TSH, FT_4 and TPO-Ab levels were measured by chemiluminescent microparticle immunoassay (CMIA) method in the laboratory of Department of Biochemistry, BSMMU, Dhaka. Data were expressed as mean ± SD. Statistical analysis was done by Unpaired t-test by using SPSS version 22. p value ≤0.05 was considered as level of significance.

Results

All the groups (subjects) were age matched (Table-I). Table-I shows the mean age of non-pregnant nulliparous women & pregnant women during 1st trimester of gestation.

In this study, the mean (±SD) serum TSH level was significantly lower in group B ($p<0.01$) in comparison to that of group A (Table-II).

Again, Table-II depicts that the mean (±SD) serum FT_4 level was higher in group B in comparison to that of group A and the difference was statistically significant($p<0.01$).

In this study, the number of TPO-Ab positive pregnant women was found 4 (13.33%) and TPO-Ab negative pregnant women was found 26 (86.67%) during 1st trimester of normal pregnant women (Figure-1).

Again, among the 1st trimester of pregnant women, 10% were subclinical hypothyroid (SCH) and 90% were euthyroid (Figure-2).

Table-I: Age of the subjects in different groups (N=60)

Parameters	Group		
	Group A (n=30)	Group B (n=30)	p-value (A vs B)
Age	24.23 ± 1.83	24.70 ± 2.34	0.393ns
(years)	(21 - 28)	(21 - 31)	

Data are expressed as mean ± SD. Figure in parentheses indicate ranges. Group A: Control group (Non-pregnant nulliparous), Group B: Study group (1st trimester of gestation), Unpaired t-test was performed to compare between two groups. N= Total number of subjects, ns= Not significant.

Table-II: Serum thyroid stimulating hormone (TSH) and free thyroxine (FT_4) levels of the subjects in different groups (N=60)

Parameters	Group		
	Group A (n=30)	Group B (n=30)	p-value (A vs B)
TSH	2.33 ± 0.56	1.42 ± 1.47	0.003**
(mIU/L)	(0.56 - 3.35)	(0.52 - 6.02)	
FT_4	14.44 ± 2.07	16.14 ± 1.45	0.001**4
(pmol/L)	(9.85 - 17.75)	(12.96 - 19.75)	

Data are expressed as mean ± SD. For statistical analysis, Unpaired t-test was performed to compare between two groups. Figure in parentheses indicate ranges. Group A: Control group (Non-pregnant nulliparous), Group B: Study group (1st trimester of gestation). **= Significant at $p<0.01$, N= Total number of subjects.

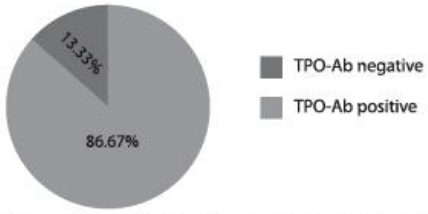

Figure-I: Distribution of pregnant women by the level of TPO-Ab during 1st trimester (n=30)

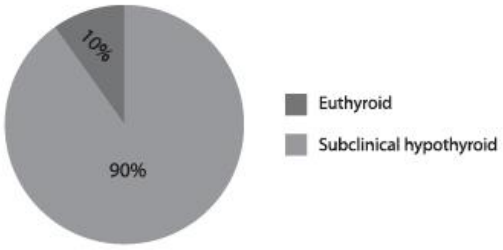

Figure-II: Distribution of thyroid dysfunction in pregnant women during 1st trimester (n=30)

Discussion

In this study, the mean serum TSH level was significantly lower in 1st trimester in comparison to that of non pregnant women. These findings are in almost consistent with that of some other researchers of different countries.[14] On the contrary, mean serum TSH level was higher in 1st trimester as compared to that of non pregnant women.[15] This discrepancy might be due to variation of methodology implied, maternal age, number of non pregnant women, etc.

In this study, the mean (±SD) serum FT_4 level was significantly ($p<0.01$) higher in 1st trimester in comparison to that of non pregnant women. Almost similar finding was also reported by different researchers.[16] On the contrary, the mean serum FT_4 level was lower during 1st trimester in comparison to that of non pregnant women.[17]

In the present study, TPO-Ab positivity was found 13.33% during 1st trimester. On the other hand, the prevalence rate of TPO-Ab positivity during 1st trimester was something similar in other country by various researchers such as 11.81% in Malaysia.[18]

In the present study, among the 1st trimester of pregnant women, the subclinical hypothyroidism was found 10%. On the other hand the rate of subclinical hypothyroidism was different in other country such as 12% in India.[19]

The several investigators of different countries proposed various suggestions on these aspects. It has been suggested that, higher concentration of serum human chorionic gonadotropin (hCG) during 1st trimester has thyrotropic activity & thereby directly stimulates maternal thyrocytes and ultimately causes higher FT_4 level and lower TSH level on that period.[20] On the other hand, the presence of TPO-Ab positivity can cause a decrease in FT_4 & increase in TSH and thereby causes hypothyroidism.[21]

Conclusion

From this study it can be concluded that, thyroid hyper functional state usually observed during 1st trimester of normal pregnancy which is essential for fetal development. This hyper functional state of thyroid gland can decrease in TPO-Ab positive pregnant women which may cause severe pregnancy complications. So, routine screening of these parameters is very much important during 1st trimester of gestation.

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References

1. Bernstein HB, Vanburen G. Normal pregnancy. In: Decherney AH, Nathan L, Laufer N, Roman AS. Lange Current Diagnosis & Treatment Obstetrics & Gynecology. 11th ed. McGraw Hill companies; 2013.p.141-53.
2. Cunningham FG, Gant NF, Leveno KJ, Gilstrap LC, Hauth JC, Wenstrom KD. Williams Obstetrics. 21st ed. USA: Mcgraw-Hill Company; 2001.
3. Keele CA, Neil E, Joels N. Samson Wright's Applied Physiology. 13th ed. New Delhi: Oxford University Press; 1982.
4. Burrow GN, Fisher DA, Larsen PR. Maternal and fetal thyroid function. The New England Journal of Medicine 1994; 331(16): 1072-8.
5. Barrett KE, Barman SM, Baitano S, Brooks HL. Review of Medical Physiology. 23rd ed. India:McGraw-Hill companies; 2012.
6. Hall JE. Textbook of Medical Physiology. 12th ed. Elsevier India Private Limited; 2016.
7. Sadler TW. Langman Medical Embryology. 9th ed. Philadelphia, USA: Lipincott Willias and Wilkin; 2003.
8. Casey BM, Leveno KJ. Thyroid disease in pregnancy. CME 2006; 108(5): 1283-92.
9. Springer D, Zima T, Limanova Z. Reference intervals in evaluation of maternal thyroid function during the first trimester of pregnancy. European Journal of Endocrinology 2009; 160(5): 791-7.

10. Fantz CR, Dagogo-Jack S, Ladenson JH, Gronowski AM. Thyroid function during pregnancy. Clinical Chemistry 1999; 45(12): 2250-8.

11. Negro R, Schwartz A, Gismondi R, Tinelli A, Mangieri T, Stagnaro-Green A. Thyroid antibody positivity in the first trimester of pregnancy is associated with negative pregnancy outcomes. Journal of Clinical Endocrinology Metabolism 2011; 96(6): 920-4.

12. Pop VJ, Kuijpens JL, Baar ALV, Verkerk G, Vijlder JJD, Vulsma T, et al. Low maternal free thyroxine concentrations during early pregnancy are associated with impaired psychomotor development in infancy. Journal of clinical Endocrinology 1999; 50: 149-55.

13. Mannisto T, Vaarasmaki M, Pouta A, Hartikainen AL, Ruokonen A, Surcel HM, et al. Thyroid dysfunction and autoantibodies during pregnancy as predictive factors of pregnancy complications and maternal morbidity in later life. Journal of Clinical Endocrinology and Metabolism 2010; 95(3): 1084-94.

14. Memon AS, Shaikh AW, Dodani AL. Effects of pregnancy on thyroid hormone levels. PJMHS 2011; 5(3): 524-8.

15. Mujawar SA, Patil VW, Daver RG. Human chorionic gonadotropin and thyroid hormones status during normotensive pregnancy. Journal, Indian Academy of Clinical Medicine 2011; 13(1): 33-6.

16. Elhaj ET, Adam I, Ahmed MA, Lutfi MF. Trimester-specific thyroid hormone reference ranges in Sudanese women. BMC Physiology 2016; 16(5): 1-8.

17. Sekhri T, Juhi JA, Wilfred R, Kanwar RS, Sethi J, Bhadra K, et al. Trimester specific reference intervals for thyroid hormone in normal Indian pregnant women. Indian Journal of Endocrinology Metabolism 2016; 20(1): 101-7.

18. Thevarjah M, Yean CY, Chin LS, Sabir N, Sickan J. Prevalence of abnormal maternal TPO-Ab and TSH levels in pregnant women in the Malaysian population. Asian Biomedicine 2008; 2(5): 403-7.

19. Nusrat N, Prabha P, Banoo H, Nabi N. Prevalence of thyroid hormone disorder in pregnant females at a tertiary care hospital in the rural area of Mandhana-Kanpur. Rama Univ. J. Med. Sci. 2015; 1(4): 8-17.

20. Hershman JM. The role of Human Chorionic Gonadotropin as a thyroid stimulator in normal pregnancy. Journal of Clinical Endocrinology and metabolism 2008; 936(9): 3305-6.

21. Terraz JPB, Alvarez SI, Flores JLB, Lahuerta RA, Sauca AA, Lopez ER, et al. Thyroid hormones according to gestational age in pregnant Spanish Women. BMC Research Notes 2009; 237(2): 1-9.