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Original Research Article

A Hospital-Based Assessment of the Thyroid Function Test in Severity of Preeclampsia: A Comparative Study

Arafat Ahmad

Assistant Professor Department of Biochemistry, ICARE Institute of Medical Sciences & Research & Dr. Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

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Corresponding Author: Dr. Arafat Ahmad
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Abstract

Aim: The aim of the present study was to estimate thyroid function tests i.e. TSH, fT3 and fT4 levels in women with mild Preeclampsia and severe Preeclampsia.

Methods: It was a cross sectional study carried out in the Department of Biochemistry. Total 90 pregnant women between 18 to 35 years visiting the gynecology and obstetrics OPD were included under study.

Results: The mean values of maternal age in all three are not statistically significant. Mean values Group I was 24.72±2.48, Group II: 24.26±2.88, Group III: 23.47±2.38. Mean gestational age at the time of serum sampling in normal pregnant women was 35.15±1.45 and it decreases in mild (34.36±2.58) and severe PE (32.12±1.69) having highly significant P value. While SBP and DBP increases with severity of PE as compared to normal pregnant women having highly significant P value (<0.0001). Urine protein was nil in group I and it increases with severity of PE. Proteinuria and blood pressure are used as parameters for severity of PE. The mean value of birth weight is normal in healthy pregnant women 2.76±0.14 but it decreases in mild PE (2.55±0.05) to more decrease in severe PE (2.36±0.04) having highly significant p-value <0.0001. In our study, the mean level of TSH within normal level in normal pregnant women was 2.36±0.52 while in mild PE was 3.97± 0.63 and in severe PE was 5.75±1.00 with highly significant P value<0.0001.

Conclusion: Evaluating thyroid screening during pregnancy might be of help in preventing the occurrence of low birth weight and instituting timely intervention and appropriate measures in terms of possible thyroid hormone administration in preterm infants in future.

Keywords: Thyroid Function Tests, Pre-Eclampsia, Women.

Introduction

Preeclampsia complicates 2–8% of pregnancies and is one main cause of maternal and neonatal mortality and morbidity worldwide. [1,2] The American College of Obstetricians and Gynecologists (ACOG) defined preeclampsia in 2017 as having a blood pressure of more than 140/90 mmHg at intervals of four hours after the 20th week of pregnancy, as well as proteinuria greater than or equal to 300 mg in 24 h of urine collection. [3] Preeclampsia is a multi-systemic disorder. [4] During pregnancy, the physiological changes of the thyroid gland are completely normal and incompatibility with these changes leads to dysfunction of the thyroid gland. [5] Naturally, thyroid hormones increase by 40-100% to meet the needs of both mother and fetus. [6]

Maternal hypothyroidism is the most common disorder of thyroid function in pregnancy and is associated with fetal effects such as fetal loss, preterm birth, low birth weight, increased neonatal respiratory distress, low intelligence quotient (IQ) of off-springs and adverse maternal outcomes such as pregnancy induced hypertension, postpartum haemorrhage and placental abruption. [7] Although pregnancy is usually associated with mild hypothyroidism, preeclamptic patients have higher incidence of hypothyroidism that might correlate with the severity of the condition. [8] Reduced thyroid hormones in preeclampsia have been explained to be due to the loss of thyrotropin and protein bound hormones in the urine. [9] Hypothyroidism can cause vascular smooth muscle contraction in systemic and renal vessels leading to increased diastolic pressure and peripheral vascular resistance thereby decreasing tissue perfusion. [10]

The aim of the present study was to estimate thyroid function tests i.e. TSH, fT3 and fT4 levels in women with mild Preeclampsia and severe Preeclampsia.

Materials and Methods

It was a cross sectional study carried out in the Department of Biochemistry ICARE Institute of Medical Sciences & Research & Dr.Bidhan Chandra Roy Hospital , Haldia, West Bengal, India for one year . Total 90 pregnant women between 18 to 35 years visiting the gynecology and obstetrics OPD were included under study.

Inclusion Criteria:

1. Healthy normotensive pregnant women in their 3rd trimester.
2. Mild PE and severe PE women in their 3rd trimester.

Exclusion Criteria:

1. H/O Diabetes, renal disease, chronic hypertension, any thyroid disease, dyslipidemia, bad obstetric history and PE.
2. H/O any chronic inflammatory disease, systemic lupus erythematosus and cardiovascular disease.
3. H/O any metabolic disorder before or during pregnancy.
4. H/O any medication that might affect thyroid function.
5. H/O any acute illness or any addiction.
6. Cases in study group which are in labour or having multiple pregnancy.

Study was approved by ethical committee of the institute. A valid written consent was taken from patients after explaining study to them. Out of 90 subjects, 30 were the cases of newly diagnosed PE patient and 30 were normal pregnant women. Cases were subdivided into separate groups comprising of 30 cases of mild PE and 30 cases of severe PE. This classification of PE patient based upon guidelines given by National High Blood Pressure Education Programme (NHBPEP) working group on high blood pressure in pregnancy. [11] The study groups are shown below:

Group I: 30 Healthy normotensive pregnant women as a control.

Group II: 30 cases of mild PE .

Group III: 30 cases of severe PE.

All cases and controls were evenly matched for parity and maternal age. Participants were selected on the basis of detailed history, clinical examination and laboratory investigations. While recording Blood pressure either in left lateral or sitting position of the right arm roughly horizontal position at heart level. Detailed history of participants including age, sex, history of any medications, addictions and complete obstetric history was taken. Birth weight of babies recorded.

After written informed consent, 12 hour fasting venous blood samples were collected from all pregnant women at least 6 hr before delivery. In preeclamptic group, blood sample is collected when patient presented for evaluation before initiation of medical therapy in plain bulbs. Serum was separated after 1 hour by centrifugation at 3000 rpm for 10 minutes and was tested for Thyroid function tests fT3 , fT4, TSH.

Results

Table 1: Demographic parameters in studied groups

Parameters	Group I	Group II	Group III	P Value
Maternal age(yrs)	24.72 ± 2.48	24.26 ± 2.88	23.47± 2.38	0.12
Gestation age at serum sampling (wks)	35.15 ± 1.45	34.36 ± 2.58	32.12± 1.69	0.01
Systolic BP (mm of Hg)	118.62±5.25	148.58±4.56	166.4± 4.06	<0.0001
Diastolic BP (mm of Hg)	76 ± 4.86	97.83 ± 3.47	116.4± 3.77	<0.0001
Urine protein	Nil	1+	2+	<0.0001
Birth weight (kg)	2.76 ± 0.14	2.55 ± 0.05	2.36 ± 0.04	<0.0001

The mean values of maternal age in all three are not statistically significant. Mean values Group I was 24.72 ± 2.48, Group II: 24.26 ± 2.88, Group III: 23.47± 2.38. Mean gestational age at the time of serum sampling in normal pregnant women was 35.15 ± 1.45 and it decreases in mild (34.36 ± 2.58) and severe PE (32.12± 1.69) having highly significant P value. While SBP and DBP increases with severity of PE as compared to normal pregnant women having highly significant P value (<0.0001). Urine protein was nil in group I and it increases with severity of PE. Proteinuria and blood pressure are used as parameters for severity of PE. The mean value of birth weight is normal in healthy pregnant women 2.76 ± 0.14 but it decreases in mild PE (2.55 ± 0.05) to more decrease in severe PE (2.36 ± 0.04) having highly significant p value <0.0001.

Table 2: Thyroid Function Tests in studied groups

Parameters	Group I	Group II	Group III	P Value
TSH(µIU/ml) (0.3-5.0)	2.36 ± 0.52	3.97± 0.63	5.75 ± 1.00	< 0.0001
fT3(pg/ml) (1.5-4.2)	3.44 ± 0.36	3.07± 0.36	2.78 ± 0.42	0.001
fT4(ng/ml) (0.7-1.8)	2.24 ± 0.40	2.27± 0.23	2.32 ± 0.28	0.19

In our study, the mean level of TSH within normal level in normal pregnant women was 2.36 ± 0.52 while in mild PE was 3.97± 0.63 and in severe PE was 5.75 ± 1.00with highly significant P value<0.0001. In our study, fT3 level was significantly higher (P <0.0001) in normal pregnant women (3.44 ± 0.36) than PE women and it significantly decreases (p <0.0001) with severity of PE with mean level in mild PE was 3.07± 0.36 and in severe PE was 2.78 ± 0.42. Mean fT4 level was not statistically significant among three groups (mean level normal pregnant: 2.24 ± 0.40, mild PE: 2.27± 0.23 and severe PE: 2.32 ± 0.28).

Table 3: Correlation coefficient(r value) in group II (Mild PE)

Parameters	r value	P value
TSH vs SBP	0.55	< 0.000
TSH vs DBP	0.52	0.000
TSH vs Birth wt	-0.46	0.007

Table 4: Correlation coefficient(r value) in group III (severe PE)

Parameters	r value	P value
TSH vs SBP	0.38	0.02
TSH vs DBP	0.34	0.03
TSH vs Birth wt	-0.42	0.01

In our study, TSH is correlated positively with systolic B.P. in both mild PE and severe PE(r=0.55, r=0.38).It is also correlated positively with diastolic B.P. in both mild and severe PE (r=0.52, r=0.34). TSH is correlated negatively with birth weight in both mild and severe PE(r=-0.46, r=-0.42).

Discussion

Pregnancy induced hypertension can be a serious and life threatening obstetric complication and is one of the most common cause of both maternal and neonatal morbidity resulting in an estimated 35-300 deaths per 1000 births. [12] PE may be further categorized as mild or severe. The patients with blood pressure >140/90 mmHg but <160/110 mmHg and proteinuria of > 0.3 gm in 24 hrs which corresponds with 1+ or greater on a urine dipstick test without evidence of end-organ damage were included in mild PE. [13] A woman is considered to have severe PE when her blood pressure reading is >160 mm Hg systolic or >110 mm Hg diastolic; her proteinuria is ≥5 g of protein in the urine per 24 hours or 3+ or greater on two random urine samples collected at least 4 hrs apart or other organ systems are involved. She may have headache, visual disturbances, other CNS symptoms, pulmonary edema, cyanosis, abdominal pain or other cardiovascular symptoms. [14] PE is associated with increased risks of placental abruption, acute renal failure, cerebrovascular and cardiovascular complications, disseminated intravascular coagulation and maternal death. Hence, early diagnosis of PE and close observation are imperative. [15] During pregnancy, there is an increased thyroid demand and increased iodine uptake and synthesis of thyroid hormones. [16]

The mean values of maternal age in all three are not statistically significant. Mean values Group I was 24.72 ± 2.48, Group II: 24.26 ± 2.88, Group III: 23.47± 2.38. Mean gestational age at the time of serum sampling in normal pregnant women was 35.15 ± 1.45 and it decreases in mild (34.36 ± 2.58) and severe PE (32.12± 1.69) having highly significant P value. While SBP and DBP increases with severity of PE as compared to normal pregnant women having highly significant P value (<0.0001). Urine protein was nil in group I and it increases with severity of PE. Proteinuria and blood pressure are used as parameters for severity of PE. The mean value of birth weight is normal in healthy pregnant women 2.76 ± 0.14 but it decreases in mild PE (2.55 ± 0.05) to more decrease in severe PE (2.36 ± 0.04) having highly significant p value <0.0001. In our study, the mean level of TSH within normal level in normal pregnant women was 2.36 ± 0.52 while in mild PE was 3.97± 0.63 and in severe PE was 5.75 ± 1.00with highly significant P value<0.0001. In our study, fT3 level was significantly higher (P <0.0001) in normal pregnant women (3.44 ± 0.36) than PE women and it significantly decreases (p <0.0001) with severity of PE with mean level in mild PE was 3.07± 0.36 and in severe PE was 2.78 ± 0.42. Dhananjaya BS and his associate (2012) [17] found that Thyroid profile values (T3 and T4) in normal and pre-eclampsia groups were within normal limits. Patients with pre-eclampsia showed significantly increased TSH levels (p< 0.042) compared to normal. The relation between changes in thyroid function and preeclampsia may be reciprocal. [18] This means that the thyroid disorder is one of the predisposing causes for pre-eclampsia [19] and hypothyroidism is one of the pathophysiologic causes of pre-eclampsia.. Hypothyroidism can play an important role in smooth muscle contraction in the renal and systemic arteries, leading to increased peripheral vascular resistance, diastolic blood pressure, and decreased tissue perfusion. [19,20] Therefore, the identification of thyroid abnormalities and their proper management can affect the incidence of preeclampsia. [20] It was suggested that evaluation

of thyroid function could be useful in predicting preeclampsia. [21] In this regard, TSH plays a central role in screening and diagnosis of many thyroid disorders. [22] On the other hands, preeclampsia can be a key cause in the pathogenesis of hypothyroidism. Effects of preeclampsia in thyroid function is not yet elucidated, but increased levels of endothelin as a vasoconstrictor produced by vascular endothelium are involved in the pathogenesis of subclinical hypothyroidism in preeclampsia. [23]

Mean fT4 level was not statistically significant among three groups (mean level normal pregnant: 2.24 $\pm$ 0.40, mild PE: 2.27$\pm$ 0.23 and severe PE: 2.32 $\pm$ 0.28). In our study, TSH was correlated positively with systolic B.P. in both mild PE and severe PE(r=0.55, r=0.38).It is also correlated positively with diastolic B.P. in both mild and severe PE (r=0.52, r=0.34). TSH was correlated negatively with birth weight in both mild and severe PE(r=-0.46, r=-0.42). The mean TSH level for PE woman was even higher than in either other the other two groups and the mean TSH level in PE were significantly higher than that in normal pregnant women ($p < 0.001$). However, fT4 levels did not significantly differ between women with normal pregnancies and those with PE. Subjects with PE had significantly higher fT3 than non-pregnant women but a significantly lower mean level than women with normal pregnancies. [24]

Conclusion

Evaluating thyroid screening during pregnancy might be of help in preventing the occurrence of low birth weight and instituting timely intervention and appropriate measures in terms of possible thyroid hormone administration in preterm infants in future.

References

1. Sadek A, Baban R, Al-Habib M, Khazaali E. Serum vitamin D3 levels in pregnant women with preeclampsia at third trimester of pregnancy. Baghdad Journal of Biochemistry and Applied Biological Sciences. 2021 Jul 26;2 (03):160-6.
2. Nasser N, Baban R, Al-Habib M, Jameel R. The association between urinary placental protein 13 and soluble fms-like tyrosine kinase-1 in preeclamptic women in the third trimester of pregnancy. Baghdad Journal of Biochemistry and Applied Biological Sciences. 2020 Dec 28; 1(01):49-55.
3. Sattar R, Ahmed E, Abbasi SQ. Thyroid Hormones Pattern in Preeclampsia. Annals of King Edward Medical University. 2018 Oct 25;24 (S):863-6.
4. Popovski N, Nikolov A. Practice Bulletin of the American College of Obstetrics and Gynaecologists 2019 on Magement of Hypertensive Disorders in Pregnancy-A Short Review of the Current Recommendations. Biomed J Sci Tech Res. 2019;23(2):17198–201.
5. Dashe JS, et al. Williams obstetrics. New York: McGraw-Hill Professional; 2018.
6. Saki F, Dabbaghmanesh MH, Ghaemi SZ, Forouhari S, Omrani GR, Bakhshayeshkaram M. Thyroid function in pregnancy and its influences on maternal and fetal outcomes. International journal of endocrinology and metabolism. 2014 Oct;12(4).
7. Casey BM, Dashe JS, Wells CE, McIntire D, Leveno KJ, Cunningham FG. Subclinical hypothyroidism and pregnancy outcomes. Obstetrics & Gynecology. 2005 Jul 1;106(1):198-9.
8. Sunanda K, Sravanthi P, Anupama H. Evaluation of thyroid function in pre-eclampsia. J Evolution Med Dent Sci. 2016;5(19):942-6.
9. Kaya E, Sahin Y, Ozkececi Z, Pasaoglu H. Relation between birth weight and thyroid function in preeclampsia eclampsia. Gynecol Obstet Invest. 1994; 37:30-3.
10. Negro R, Mestman JH. Thyroid disease in pregnancy. Best Prac Res: Clin Endocrinol Metab. 2011;25(6):927-43.
11. Stagnaro-Green A, Abalovich M, Alexander E, Azizi F, Mestman J, Negro R, Nixon A, Pearce EN, Soldin OP, Sullivan S, Wiersinga W. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy and postpartum. Thyroid. 2011 Oct 1;21(10):1081-125.
12. Sachdeva PD, Patel BG, Bhatt MV. A study of incidence and management of PIH in central Gujarat, India. Ijupls. 2011 Nov-Dec; 1(3):61-70.
13. Ashok K, Ghosh BK, Murthy NS. Maternal thyroid hormonal status in preeclampsia. Indian journal of medical sciences. 2005 Feb; 59 (2):57-63.
14. Diagnosis and management of PE and eclampsia. ACOG Practice Bulletin no.33.Clinical management guidelines for obstetrician-gynecologist. 2002 Jan; 33:159-167.
15. Wagner LK. Diagnosis and Management of PE. Am Fam Physician.2004 Dec15; 70(12):2317-24.
16. Sardana D, Nanda S, Kharb S. Thyroid hormones in pregnancy and PE. J Turkish-German Gynecol Assoc. 2009; 10:168-71.
17. Dhananjaya BS, Sendil Kumaran D, Venkatesh G, Niranjan M, Shashiraj HK. Thyroid stimulating hormone (TSH) level as a possible indicator of pre-eclampsia. J Clin Diagn Res. 2011;5(8):1542-3.
18. Sogani S, Varma V, Sarkar PD. Estimation of thyroid hormones levels in preeclamptic pregnant women: an early predictor of the disease. Al Ameen J Med Sci. 2015;8(4):266-70.

19. Satyanarayan AK, Chandregowda VH, Hemberal M, Taklikar RH. Maternal thyroid profile in pre-eclampsia. Int J Med Sci Public Health. 2015 Oct 1;4(10):1401-3.
20. Bayejid M, et al. Association of maternal hypothyroidism with preeclampsia in Bangladeshi population. BioJ Sci Technol. 2014;1 (1):1-7.
21. Elhaj ET, Adam I, Alim A, Elhassan EM, Lutfi MF. Thyroid function/antibodies in Sudanese patients with preeclampsia. Frontiers in endocrinology. 2015 Jun 11; 6:87.
22. Dashe JS, Bloom SL, Spong CY, Hoffman BL. Williams obstetrics. McGraw Hill Professional; 2018 Jun 1.
23. Grammatikakis I, Zervoudis S, Fotopoulos S, BOTHOU A, Badiu C. Prevalence of maternal hypothyroidism complicated with preeclampsia: a retrospective analysis of 60 cases. The Medical-Surgical Journal. 2017 Jun 30;121 (2):253-7.
24. Pasupathi P, Deepa M. Evaluation of serum lipids and thyroid hormone changes in non-pregnant, pregnant, and preeclampsia women. Lipids. 2009; 3:4.