

Original Article

Estimation of Thyroid Hormones in Pregnancy as an early predictor of Pre-eclampsia

Sonal Sogani^{1*}, Vandana Varma², Purnima Dey Sarkar³

1. Assistant Professor, Department of Biochemistry, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, India.

2. Assistant Professor, 3. Professor and Head Dept of Biochemistry, M.G.M. Medical College, Indore, M.P, India.

Abstract

Background: During normal pregnancy, changes in thyroid function is documented and these changes are physiological and have been considered as one of the pathophysiological causes of preeclampsia. The information regarding thyroid function in preeclampsia is scanty. **Aim:** To estimate the levels of thyroid hormones in preeclamptic pregnant women and to compare it with healthy normotensive pregnant women. **Materials and Methods:** Thirty five pregnant women clinically diagnosed as preeclampsia were enrolled and an equal age matched, parity matched and gestation age matched healthy normotensive pregnant women were taken as controls for the study. This is a case-control hospital based study carried at Department of Biochemistry, M.G.M. Medical College and associated M.Y. Hospital, Indore (M.P.) Blood samples collected were estimated for T3, T4 and TSH by a one step enzyme immunoassay sandwich method. Comparison between both the groups was done by Student's t-test. **Results:** There were no significant differences between the two groups in age and BMI but significantly higher differences in gestational age, systolic and diastolic blood pressure was observed. No significant levels of T3 and T4 between healthy normotensive pregnant and preeclamptic pregnant women was observed. The study shows highly significant increase in the TSH levels in preeclampsia as compared to normal pregnancy. **Conclusion:** The study concluded that the thyroid disorder is one of the predisposing causes for preeclampsia. Hence thyroid hormonal assay can be considered as a screening test for early diagnosis and treatment of preeclampsia to prevent further complications of it.

Key-words: Preeclampsia, Tri-iodothyronine(T3), Thyroxine (T4), Thyroid stimulating hormone (TSH).

Introduction

Preeclampsia, or toxemia in pregnancy, is characterized by new onset of hypertension (SBP >140 mm of Hg or DBP >90mm of Hg) and proteinuria (>0.3g protein in a 24 hour urine and associated with myriad other signs and symptoms, such as pitting edema visual disturbances, headache, and epigastric pain after 20th weeks gestation in a previously normotensive and non proteinuric patients.^[1,3] The clinical features are prominent in the latter part of pregnancy and progress until delivery.^[4] It is a common obstetric problem and a leading cause of maternal and fetal morbidity and mortality.^[5, 6] The major cause of fetal compromise

in preeclampsia is reduced utero-placental perfusion.^[7,8] This disorder which is unique to human pregnancy involves interaction of numerous genetic immunological and environmental factors.^[9] The liver, kidney and brain are commonly involved and due to auto-intoxication, functional disorders in these organs system are evidential.^[10] Among the physiological changes in pregnancy, there is an increased thyroid demand and increased iodine uptake and synthesis of thyroid hormones.^[11] The changes in thyroid function during pregnancy are accounted for by high circulating estrogens.^[12] maternal thyroid hormone. Either an excess or deficiency of can influence maternal and fetal outcome at all stages of pregnancy and can interfere with ovulation and fertility.^[13] Although pregnancy is usually associated with mild hypothyroidism, woman with preeclampsia are known to have higher incidence of hypothyroidism that might correlates with the severity of preeclampsia.^[14] Which has been associated with fetal loss, premature births, low birth weight and adverse maternal outcomes

*Corresponding Author

Sonal Sogani
Assistant Professor, Department of Biochemistry,
Pacific Institute of Medical Sciences,
Udaipur (Rajasthan), 313015
E-mail: sonalsogani2015@rediffmail.com
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such as pregnancy induced hypertension, post partum haemorrhage and placental abruption.^[15,16] Moreover hypothyroidism has been listed as one of the causes of high blood pressure i.e. the physiological changes in thyroid gland during pregnancy have been suggested as one of the pathophysiological cause of preeclampsia.^[17] Which may justify screening for thyroid function during pregnancy.^[18] It is suggested that there may be mutual influence between preeclampsia and thyroid function.^[19,20] The study was undertaken to estimate the levels of thyroid hormones in preeclamptic pregnant women and its comparison with normal pregnant women for predicting the severity of preeclampsia.

Material and Methods

Thirsty five pregnant mothers clinically diagnosed to have preeclampsia in the third trimester and in the age group of 18-35 years were considered as cases. Pregnant women in the third trimester without clinically evidence of preeclampsia were considered or controls for this study preeclampsia was diagnosed based on evidence of raise in blood pressure proteinases and process of pedal edema women with known diabetes, hypertension, renal disease, endocrinal disease, on anti-coagulants and consuming tobacco were included for study. This study was conducted on pregnant mothers the obstetrics department of a medical collage hospital in Indore. Serum thyroid hormone level of the participants was estimated by a one step enzyme immunoassay sandwich method with a final fluorescent detection (ELFA) (Biomérieux, Mini Vidas, France). Statistical analysis, The difference of the measured values between the two group was measured using student's t-test and considered statistically significance as $p < 0.05$. SPSS Version 20 was used for statistical analysis.

Results

The characteristics such as age and BMI were similar in the two groups in the study as shown in table 1. The mean systolic and diastolic BP

was higher among the pregnant preeclamptic Mothers, compared to the control group. This difference was statistically significant ($P < 0.001$). Table 2. showing the thyroid hormone values of the study group. The mean TSH level of the pregnant mothers with preeclampsia is 6.22 mIU/mL when compared to 3.35 among the control group. This difference was found to be highly statistically significant ($p < 0.001$).

Table 2. Thyroid profile in the study groups

Thyroid Profile	Control group (n=35) Mean \pm SD	Preeclamptic group (n=35) Mean \pm SD
Serum T3 (ng/ml)	1.38 \pm 0.45	1.39 \pm 0.35
Serum T4 (μ g/dl)	10.26 \pm 3.67	10.99 \pm 3.34
Serum TSH (mIU/mL)	3.35 \pm 1.36	6.22 \pm 1.37 *

* $p < 0.001$

Discussion

This case control study of on found significantly elevated TSH levels among pregnant mothers with Preeclampsia is a serious complication of pregnancy with unknown etiology. Although it is defined as triad of hypertension, edema and proteinuria, it can affect other maternal systems.^[21] The condition correlates with deficient intravascular production of prostacyclin, a vasodilator and excessive production of thromboxane, a platelet derived vasoconstrictor and stimulant of platelet aggregation.^[22] Though the effect of preeclampsia and thyroid dysfunction in pregnancy is very well studied, the relationship between the two is poorly established. As estrogen levels during normal pregnancy increases, the increased estrogen levels cause the increased production of proteins by the liver. As a result, hepatocytes increase their production of thyroid-binding globulin, the protein that transports T4 in the circulation. High estrogen due to oligosaccharide modification reduces peripheral

Table 1. Parameters measured in the pregnant mothers

Parameters	Control group (n=35) Mean \pm SD	Preeclamptic group (n=35) Mean \pm SD
Age (yrs)	23.17 \pm 2.61	22.94 \pm 3.25
BMI (Kg/m ²)	23.83 \pm 1.62	24.13 \pm 1.45
Gestational age (wks)	38.54 \pm 3.37	35.85 \pm 2.65 *
Systolic Bp (mm of Hg)	114.85 \pm 4.99	140.0 \pm 5.34 *
Diastolic Bp (mm of Hg)	75.42 \pm 5.52	92.28 \pm 7.50 *

* $p < 0.001$

degradation of thyroid binding globulin so the content of thyroid binding globulin in the serum increases. Due to the elevated serum level of thyroid binding globulin the binding capacity of the plasma increases so more hormones bind to the globulin. This increases the plasma content of the thyroid hormones. In addition, in pregnancy, the stimulatory effect of serum hCG of placental origin increased metabolic demand and mental stress may increase overall thyroid activity and elevate thyroid hormone levels.^[23] Preeclampsia is pregnancy-induced autointoxication with multisystem disorders; the most affected organs are brain, liver and kidneys where the functional disorders of these organs are evident. During preeclampsia, involvement of liver and kidney may lead on to decreased peripheral conversion of T4 to T3 hence the level of T3 decreases.^[24] Impaired placental function deprives the fetus from sufficient oxygen and nutrient supplies. This may lead to a compromised fetal condition and a "low T4 syndrome" may develop.^[25] It has been suggested that reduced concentration of thyroid hormones in preeclampsia may be due to the loss of protein and protein-bound hormones in the urine.^[26] Also faulty estrogen production due to placental dysfunction in preeclampsia accounts for the decreased levels of T3 and T4.^[27] Many investigators in their studies concluded that preeclamptic women may also be affected by a variety of conditions such as systemic illnesses, protein-energy malnutrition, starvation, Cushing's syndrome, excessive steroid therapy. When the women who developed such systemic disorders, the extrathyroidal deiodination of T4 to T3 has been reduced.^[28]

The significant elevation in the level of TSH in preeclampsia gives a good indicator that the preeclampsia is associated with an increased level of TSH in the serum, and also the level of increment in this hormone depends on the severity of disease. Elevated levels of TSH might be associated with risk for developing preeclampsia and these patients may have the tendency to have low birth weight babies.^[25] Endothelial activation/dysfunction is a central pathogenic feature in women with preeclampsia.^[29] Preeclampsia is associated with decreased circulating levels of VEGF and PlGF, which are angiogenic factors. This leads to an anti-angiogenic state and causes endothelial dysfunction.^[30] TSH can act as a tissue specific angiogenesis in physiological and pathological conditions.^[31] Other possible explanation might be the elevation of secretion of the placental thyrotropic like peptide and increased levels of pre-delivery soluble fms-like tyrosine-kinase level.^[32] Kaya E et al.^[26] Lao et al.^[27] and Kumar et al.^[33] Observed the similar findings in preeclamptic pregnant women with high TSH levels and low thyroid

hormones. Preeclamptic pregnancies are therefore associated with hypothyroidism (elevated TSH and low T3 and T4) which may cause vascular smooth muscle contraction both in systemic and renal vessels which leads to increased diastolic hypertension, peripheral vascular resistance and decreased tissue perfusion.^[34] Contradictory findings was observed by Qublan et al.^[35] Who reported no significant differences in TSH levels between two groups.

Conclusions

Thyroid hormone levels are elevated in pregnant women with preeclampsia. Performing thyroid screening in pregnancy may be useful in predicting preeclampsia.

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