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Original Research Article

STUDY OF SERUM TSH AND URIC ACID LEVELS IN PREECLAMPSIA OF PREGNANCY

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ABSTRACT

Background: Preeclampsia - a major hypertensive disorder due to pregnancy is significantly associated with fetal and maternal morbidity. Alterations in thyroid function and purine metabolism have been implicated in its pathophysiology, reflected by changes in hormone serum thyroid-stimulating hormone and levels of serum uric acid. **Objective:** To estimate and compare serum TSH and levels of serum uric acid in women with pre-eclampsia and age-matched normal pregnant womens as controls, and to determine the correlation between these parameters.

Materials and Methods: The study was conducted at a tertiary level hospital center including 61 pre eclamptic women and 61 normotensive pregnant controls. The serum TSH and serum uric acid levels were analyzed from venous blood samples collected of study participants. Urine samples were assessed for proteinuria. Statistical analysis included Chi-square test, unpaired t-test, correlating using Pearson's correlation.

Results: The cases and controls were comparable with respect to age ($p > 0.05$). Levels of serum uric acid were highly significant in cases of pre-eclamptic women than in controls, both in categorical distribution and mean values (5.48 ± 1.40 mg/dL vs.4.01±1.00 mg/dl; $p<0.05$). Although the categorical distribution of TSH levels did not significantly different between groups ($p>0.05$), Mean of serum TSH level was significantly higher in pre-eclamptic group (3.11± 0.98 µIU/mLvs.2.50 ± 1.06µIU/mL; $p<0.05$). Statistically significant but mild positive correlation was seen between serum TSH levels and levels of serum uric acid in cases group that is pre-eclamptic women ($r = 0.30$, $p<0.05$), while in the control group no significant correlation was found ($p>0.05$).

Conclusion: Preeclampsia condition showed significantly elevated serum uric acid and mean TSH levels, along with a positive correlation between these parameters. Estimation of serum uric acid and TSH may serve as useful biochemical markers in the evaluation and monitoring of preeclampsia.

Keywords: Pregnancy, Preeclampsia, TSH, Uric Acid, Complication in pregnancy, Eclampsia**.**

INTRODUCTION

Preeclampsia is a multi-system disorder that affecting 2%−4% pregnant women worldwide, and especially when the condition is of early onset, pre-eclampsiais the leading causes of perinatal mortality and morbidity & maternal mortality and morbidity. Globally, 5,00,000 babies and 76,000 women die from this disorder each year. Furthermore, women's in high-resource countries due to abundant resources are at less risk of developing pre-eclampsia as compared to women those in low-resource countries.[1] The pathogenesis of pre-eclampsia involves abnormal placenta formation in uterus and

maternal syndrome development as two stages. Pathological findings in pre-eclamptic placentae commonly include fibrin deposition, sclerotic narrowing of arteries, infarcts which are seem to correlate with the severity of preeclampsia all consistently leading to placental hypo-perfusion and ischaemia.[2]

High risk of pre-eclampsia contributed by several maternal and clinical risk factors. Factor such as maternal preexisting conditions (like diabetes, chronic hypertension, and infections), maternal genetics, maternal age, diet, parity, twin pregnancy, gestational weight gain, previous history of pre-eclampsia, They may play role either alone or in combination considered to play influential role in the normal pregnancy leading to pre-eclampsia.[3] Common maternal and obstetrical complications of preeclampsia are antepartum haemorrhage, postpartum haemorrhage, eclampsia, maternal mortality while still birth, IUGR, low birth weight, prematurity, perinatal or neonatal death are newborn complications.[4] In development of preeclampsia Serum PIGF and sFlt obtained promising results as single biomarker but other biomarker having conflicting results. However, formation of battery with radiological diagnostic modalities such as maternal history, MAP and uterine artery Doppler etc. perform efficiently.[5] For predicting this pregnancy related disease, currently there are no reliable, valid and economic screening tests available. So it is essential to study biomarker changes in preeclampsia and pathophysiology of preeclampsia.

In pregnancy, increased metabolism and placental transfer of thyroid hormones raise TSH levels, particularly in thyroid dysfunction. In preeclampsia, hepatic and renal involvement reduces formation of T3 from T4 by peripheral conversion and increases urinary loss of protein-bound hormones, leading to low T3 levels. Hypothyroxinemia may reflect disease severity, with studies showing lower FreeT3 and higher TSH and FreeT4 and levels in mild and severe pre-eclampsia.[6] Sub-clinical hypothyroidism is shows a higher risk of association with hypertensive disorders in pregnancy, making TSH a potential predictor.[7] In pre-eclamptic women changes have been observed as mean serum TSH shows significant increase and mean serumT3 and T4 showed a significant decrease.[8]

Uric acid promotes vasoconstrictors and inflammatory markers.[9] It acts as a physiological antioxidant which is end product of purine metabolism.[10] Increased basal metabolic rate leads to greater ATP turnover and purine metabolism, making hyperuricemia an early and consistent finding in preeclampsia.[11] Increased BMR in preeclampsia raises TSH levels, and hyperuricemia from increased ATP turnover suggests a possible association between serum TSH and uric acid. ATP also acts as a pro-inflammatory mediator influencing immune activation.[12] serum uric acid linked to development of complicated condition like liver dysfunction and preterm delivery. So higher uric acid levels in severe making serum uric acid a useful marker severity of preeclampsia.[13]

In view of the above contentions, this study aims to estimate and assessment of changes in serum TSH and serum uric acid levels in pregnant women with preeclampsia condition and compare them with age-matched normal pregnant controls.

MATERIALS AND METHODS

The study was conducted at OPD of Obstetrics & Biochemistry department of hospital which is tertiary care hospital. Over a period of 1.5 year we conducted the study. By random sampling 122 patients fallowing inclusion and exclusion criteria were selected, before that Ethical clearance was obtained from the Institutional Ethics Committee.

Inclusion Criteria

All ANC of 24-36 weeks of gestation, having blood pressure ≥ 140/90 mm of mercury on more than two of clinical examination which are done six hours interval, proteinuria more than 1+ on at least more than two occasions six hours apart.

Exclusion criteria

Patients with known thyroid dysfunction, previous history of primary hypertension, on drugs affecting serum thyroid hormones, Cases with thyroid and parathyroid surgeries.

All antenatal cases presenting to the Obstetrics outpatient department of a tertiary care hospital, between 24 - 36-week gestation periods were screened for symptoms of preeclampsia blood pressure ≥ 140/90 mm of mercury on two of clinical examination which are done six hours interval, proteinuria more than 1+ on at least more than two occasions six hours apart as cases. Gestational age matched normal pregnancy patients were taken as controls in the study after given proper consent.

The study was stated before in their local day today language to all study participants, and written informed consent was taken. ANC clinical examination was done and documented in the presence of a female attendant, as per the study proforma. Fallowing aseptic precautions, up to mark on a plain collection tube blood was collected from the ante-cubital vein. The sample was kept to clot for 45 minutes and then serum obtained by using centrifuse at 3000 rpm for 15 minutes. Hemolysed, icteric, and lipemic samples were excluded. The separated serum was analysed for serum TSH and serum uric acid. Samples were processed immediately, and those not analysed at once were capped and stored at −20°C until further analysis.

Each subject was also asked to provide a 10 mL urine sample in a sterile, labelled container. Urine samples were analysed promptly using dipstick testing for albumin. All required facilities and

equipment were available in the Department of Biochemistry. Data was collected and processed using the SPSS version 25.0. For interpretation p-value < 0.05 was considered to be statistical significant.

RESULTS

Table 1: Distribution of age among the study participants.

Age	Case		Control		Value	df	P Value
	Frequency	Percent	Frequency	Percent			
19-23	22	36.1	23	37.7	0.045	3	0.997
24-28	22	36.1	21	34.4			
29-33	12	19.7	12	19.7			
>34	5	8.2	5	8.2			
Total	61	100	61	100			
Mean+/-SD	26.3+/-4.5		26.2+/-4.5				

Majority of beneficiaries in study belonged to the of 19-23 year's age amongst which 36.1% were from cases while 37.7% were from the control group. Only 10 participants were of more than 34 years of age with 8.2% cases each from case and control group.

Table 2: Comparison of serum uric acid level among the study participants

Uric Acid	Case		Control		Value	df	P Value
	Frequency	Percent	Frequency	Percent			
Low (<2.7mg/dl)	0	0	3	4.9	20.16	2	0.01
Normal (2.7-7.3 mg/dl)	39	63.9	55	90.2			
High (>7.3 mg/dl)	22	36.1	3	4.9			
Total	61	100	61	100			
Mean+/-SD	5.48+/-1.4		4+/-1				

In Table number 2, 39 (63.9%) study participants amongst case group had normal uric acid levels while 22 (36.1%) had high uric acid levels. While in the control group 3 (4.9%) participants had low uric acid levels, 55 (90.2%) participants had normal uric acid levels while 3 (4.9%) had high uric acid levels.

Table 3: Comparison of TSH level among the study participants.

TSH Levels	Case		Control		Value	df	P Value
	Frequency	Percent	Frequency	Percent			
Normal (0.5-4)	50	82	56	91.8	**2.59**	1	**0.11**
Abnormal (>4)	11	18	5	8.2			
Total	61	100	61	100.0			

Above table 3. shows that 50 (82%) study participants amongst case group had normal TSH level while 11 (18%) had abnormal TSH level. While in the control group 56 (91.8%) participants had normal TSH level and 5 (8.2%) had abnormal TSH level.

Table 4: Comparison of mean TSH level among the study participants.

TSH							
Type	**N**	**Mean**	**Standard Deviation**	**Standard Error of Mean**	**t**	**df**	**P value**
Case	61	3.11	0.98	0.13	3.296	120	0.001
Control	61	2.50	1.06	0.14			

Table.4 shows that the mean serum TSH among the cases was 3.11 while the same among the control group was 2.50. The mean of serum TSH levels among cases group and control group was showed highly significant difference as proved by unpaired t-test($p<0.05$).

Table 5: Comparison of mean uric acid level among the study participants

Uric Acid							
Type	**N**	**Mean**	**Standard Deviation**	**Standard Error of Mean**	**t**	**df**	**P value**
Case	61	5.48	1.40	0.18	6.699	120	0.00001
Control	61	4.01	1.00	0.13			

From the above Table.5, it was observed that mean uric acid level among the case group was 5.48 while the same among the control group was 4.01. The difference in the mean of serum uric acid

levels among cases and controls is very highly significant as proved by unpaired t-test ($p<0.05$).

Table 6: Correlation between TSH and Uric acid in cases.

Pre-eclampsia		
	TSH	**Uric acid**
Pearson Correlation	1	0.3
Sig. (2-tailed)		0.02
N	61	61

p value < 0.05

Table no.6 shows a statistically significant positive correlation of serum TSH levels with serum uric acid levels in preeclampsia women (r =0.30, p = 0.02), indicating that in pre-eclamptic patients increased TSH levels are positively correlate with higher uric acid levels.

Table 7: Correlation of TSH levels with Uric Acid Levels of controls

Normal		
	TSH	**Uric acid**
Pearson Correlation	1	0.131
Sig. (2-tailed)		0.86
N	61	61

Table.7 shows that in the case group TSH levels and uric acid levels show a mild positive correlation which is significant at 95% confidence level while in the control group we seen no Correlation of TSH levels with Uric Acid Levels of controls.

DISCUSSION

Pregnancy specific disease Preeclampsia is a characterized by an anti-angiogenic state. Preexisting blood vessel processed to new blood vessel formation by Angiogenesis. Angiogenic factors are responsible for tightly regulation of Angiogenesis. In preeclampsia pathogenisis alteration in the circulating angiogenic factors play important role.[14] In pregnancy, increased oxidative stress leads to decreased oxygen. ATP contain adenine a purine base is degraded to give adenine purine base; adenine get further degradation to xanthine. So, hypoxia gives xanthine as substrate. Additionally, it is a potentialy induce holoenzyme xanthine oxidase/dehydrogenase and causing increased formation of oxidase form isoenzyme. Uric acid is produced as a result of the enzyme oxidase and its production is associated with formation of free radicals. An increase in serum uric acid levels often predates preseclamptic clinical manifestation onset.[15]

The study evaluated serum TSH levels and serum uric acid in pre-eclamptic women and compared them with age-matched women with normal pregnancy. These two groups were comparable in age distribution , with no statistically significant difference, ensuring appropriate matching and minimizing confounding by age. Supports to the validity of intergroup comparison is showed consistency as per finding of previous studies by Anita Kumari Murmu et al,[16] and both in categorical distribution and in mean values. Serum uric acid levels were seen to be significantly higher in women with preeclampsia. A substantial proportion of cases had hyperuricemia compared to controls, and serum uric acid level mean was significantly increased in case group. These findings are in concordance with earlier studies by Razia Sultana et al,[17] Huda Abbas et al,[18] and Ramya Nemani et al,[19] all of which demonstrated significant increase in levels of serum uric acid of preeclampsia women group. This supports the role of serum uric acid as marker of disease severity in preeclampsia in terms grading oxidative stress generated and occurrence endothelial dysfunction.

With regard to thyroid function, although the categorical comparison of TSH levels did not show a statistically significant difference in cases group and control group, the mean of serum TSH level were significantly increased in pre-eclamptic women.This suggests a subtle but clinically relevant alteration in thyroid function associated with preeclampsia. These findings showed similarity in results with study conducted by Ramya Nemani et al,[19] and Sonali Deshpande et al,[20] who also showed significantly elevated TSH levels in pre-eclamptic women. However, these results differ from the study by Rabia Sattar et al,[21] which reported higher TSH levels in preeclampsia but without statistical significance, highlighting variability across populations and study designs.

Importantly, a mild but statistically significant positive correlation between levels of serum TSH and serum uric acid was observed in women with preeclampsia,whereas in control group no significant correlation was found . This suggests a possible interrelationship between thyroid dysfunction and altered purine metabolism in preeclampsia. The finding supports the hypothesis that increased basal metabolic rate, oxidative stress, and ATP turnover in preeclampsia may contribute simultaneously to elevated TSH and uric acid levels. This observation contrasts with the findings of Zhou J. et al,[22] who reported no correlation between TSH and uric acid levels in pre- eclamptic women, indicating the need for further research to clarify this association.

Overall, our study demonstrates that preeclampsia is condition with significantly elevated serum uric

acid levels and higher mean TSH levels, along with a positive correlation between these two parameters. These findings reinforce the potential usefulness of serum uric acid levels and TSH as supportive biochemical markers in the assessment and monitoring of preeclampsia and underscore the importance of thyroid and metabolic evaluation in preeclampsia of pregnancy.

CONCLUSION

From above results we concluded that serum uric acid levels show positive correlation with serum TSH levels in preeclamptic women, estimation of serum TSH levels and serum uric acid may helpful to determine the rate of progress of preeclampsia to severe eclampsia and scrutiny of preeclamptic pregnancy for management.

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