

Analysis of Increased First Trimester Serum Uric Acid as a Predictor of Gestational Diabetes Mellitus at a Tertiary Care Hospital

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ABSTRACT

Background: Gestational Diabetes Mellitus (GDM) is one of the most important complications during pregnancy which is associated with both maternal and fetal morbidity and mortality. The aim of this study was to determine the accuracy and clinical value of first trimester maternal serum uric acid concentration in predicting gestational diabetes mellitus.

Materials and Methods: The present prospective cohort study was conducted among 160 antenatal women in first trimester attending OPD in a tertiary care centre. Venous blood sample were taken, and serum uric acid was measured. Venous samples were measured after fasting, one hour and two hours and assessed for GDM using ADA criteria.

Results: In the present study 160 antenatal women in first trimester attending OPD in a tertiary care centre were included. Among the study population, 53.12% were Primi and 46.87% were multi parity. Elevated (>4.2 mg/dl) uric acid level was present in 40% and Normal (<4.2 mg/dl) uric acid level was present in 60% antenatal women. According to the ADA criteria, 11.25% were positive for gestational diabetes mellitus in the study. Among the elevated serum uric acid category, 8 (19.0%) were positive in GTT and among the normal serum uric acid category, 6(6.25%) were positive in GTT.

Conclusion: The present study concluded that among the elevated serum uric acid category, 19.0% were positive for GDM. Therefore, there is increase in the risk of development of GDM with increased levels of serum uric acid in the first trimester.


Keywords: Serum Uric Acid, Glucose Tolerance Test, Gestational Diabetes Mellitus.

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INTRODUCTION

World Health Organization and American Diabetes Association define GDM as "any degree of glucose intolerance with onset or first recognition during pregnancy".¹ Globally 7% of all pregnancies are complicated by gestational Diabetes Mellitus with a prevalence ranging from 1-14% based on the population studied and the diagnostic tests employed and in India, it is 15% in the age group of 15-19 years and 32% in the age group of women >30 years.^{2,3} Several studies have now shown that, compared to their peers, women who go on to develop GDM later in pregnancy have biochemical abnormalities that can be detected in the first trimester including increased levels of uric acid.^{4,5} Normal value of serum uric acid is between 2 to 6.5 mg/dl.⁶ In early pregnancy, there is decreased serum uric acid due to increased GFR. Uric acid is a product of metabolism of purines and is formed by xanthine oxidase enzyme. Hypoxia and ischemia of the placenta and cytokines such as interferon induce the expression of xanthine oxidase and therefore, increase the production of uric

acid and also reactive oxygen species. Serum uric acid is interlinked with hypertension, obesity, hyperinsulinemia and dyslipidemia indicating that it could be a part of the group of factors of metabolic syndrome.⁷ The aim of this study was to determine the accuracy and clinical value of first trimester maternal serum uric acid concentration in predicting gestational diabetes mellitus.

MATERIALS AND METHODS

The present prospective cohort study was conducted among 160 antenatal women in first trimester attending OPD in Department of Obstetrics & Gynaecology, Rama Medical College Hospital and Research Centre, Hapur, Uttar Pradesh, India. Before the commencement of the study ethical approval was taken from the ethical committee of the institute and informed consent was taken from the antenatal women. All non-diabetic antenatal women in their first trimester of pregnancy less than 12 weeks of gestation

were included in the study. Antenatal women who were having Hypertension, Renal disease, Liver disease, Gout, Smoking and alcohol intake, Drugs known to cause increased serum uric acid levels. eg: Aspirin, phenothiazines, diuretics were excluded from the study. Venous blood sample was taken from antenatal women of less than 12 weeks of gestation. The samples were centrifuged, and serum uric acid were measured by colorimetric assay with detection limit of 0.2-20 mg/dl and these women will be followed

up at 24-28 weeks to do oral glucose tolerance test. After overnight fasting of 8-10 hours, blood sugar in the fasting state was collected. Later 75 grams oral glucose is given dissolved in plain or lime water to improve patient compliance. Venous sample is measured after fasting, one hour and two hours and assessed for GDM using ADA criteria. Statistical analysis of data was conducted, using SPSS Version 16.0 (Chicago Illinois, USA.) program.

Table 1: Distribution according to Parity

Parity	N(%)
Multi	75(46.87%)
Primi	85(53.12%)
Total	160(100%)

Table 2: Serum uric acid category

Serum uric acid category	N(%)
Elevated (>4.2)	64(40%)
Normal (<4.2)	96(60%)
Total	160(100%)

Table 3: Glucose Tolerance Test results

Glucose Tolerance Test results	N(%)
Normal	142(88.75%)
Positive	18(11.25%)
Total	160(100%)

Table 4: Association between the serum uric acid level categories and GTT values

Serum Uric Acid Category	Glucose Tolerance Test		Total
	Normal	Positive	
Elevated	52(81.25%)	12(18.75%)	64(40%)
Normal	90(93.75%)	6(6.25%)	96(60%)
Total	142(88.75%)	18(11.25%)	160(100%)

RESULTS

In the present study 160 antenatal women in first trimester attending OPD in a tertiary care centre were included. Among the study population, 53.12% were Primi and 46.87% were multi parity. Elevated (>4.2 mg/dl) uric acid level was present in 40% and Normal (<4.2 mg/dl) uric acid level was present in 60% antenatal women. According to the ADA criteria, 11.25% were positive for gestational diabetes mellitus in the study. Among the elevated serum uric acid category, 8 (19.0%) were positive in GTT and among the normal serum uric acid category, 6(6.25%) were positive in GTT.

DISCUSSION

Uric acid is the final product of the oxidation step of purine catabolism and is an important marker for insulin resistance and the future development of metabolic syndrome. The prevalence of GDM is rising across the globe and the benefits of broad screening for GDM has not yet been proven.^{8,9}

In the present study 160 antenatal women in first trimester attending OPD in a tertiary care centre were included. Among the study population, 53.12% were Primi and 46.87% were multi parity. Elevated (>4.2 mg/dl) uric acid level was present in 40% and Normal (<4.2 mg/dl) uric acid level was present in 60% antenatal women. According to the ADA criteria, 11.25% were positive for gestational diabetes mellitus in the study. Among the elevated serum uric acid category, 8 (19.0%) were positive in GTT and among the normal serum uric acid category, 6(6.25%) were positive in GTT.

Rajakumar et al study included 63.5% Primigravida and 36.4% multigravida.¹⁰

Statement given by Laughon KS et al., that although uric acid was strongly associated with body mass index, the risk of gestational diabetes was increased among women with elevated first trimester uric acid independent of BMI.¹¹

Wolak T et al., also have shown that UA levels in the highest quartile of the normal range during the first 20 weeks of pregnancy

are associated with higher risk for the development of GDM and mild preeclampsia.¹²

El-Gharib MN et al concluded that the cut-off level of maternal serum uric acid of 4 mg/dl in the first trimester was associated with developing GDM. Therefore, suggest that serum uric acid level should be done as routine test during the first antenatal care visit.¹³

CONCLUSION

The present study concluded that among the elevated serum uric acid category, 19.0% were positive for GDM. Therefore, there is increase in the risk of development of GDM with increased levels of serum uric acid in the first trimester.

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