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Original Research Article

Serum uric acid in first trimester as a predictor for the diagnosis of gestational diabetes mellitus-a prospective study

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is common worldwide. It is a disorder of carbohydrate metabolism. Indian women have increased risk of developing GDM, and leads to adverse Maternal and neonatal outcomes. Women with raised uric acid in pregnancy are interlinked with more incidence of unfavorable outcomes in pregnancy such as GDM. Hence this study is done to prove the utility of uric acid in early diagnosis of GDM by starting early treatment so as to reduce the complications in pregnant women.
Methods: The antenatal women are screened for GDM by serum uric acid levels with gestational age <12 weeks. These antenatal women are followed up around 24-28 weeks and oral glucose tolerance test is done and evaluated for GDM using ADA criteria.
Results: In our study, serum uric acid cut–off of 4.2 mg/dl had a positive association with the GTT values with p value less than 0.05 (p=0.018). In this study, in the raised serum uric acid category, 8 (19%) were positive for GTT and among the normal serum uric acid category, 3 (4.7%) were positive for GTT. Thus, we observe from our study that elevated levels of uric acid during the first trimester is interlinked with prediction of gestational diabetes.
Conclusions: The diagnosis of serum uric acid level in first trimester as a predictor of GDM is easy and economical and it can be used as a screening test for prediction of GDM.

Keywords: GDM, Glucose tolerance test, Serum uric acid, Gestational age, First trimester, Screening test

INTRODUCTION

Gestational diabetes is defined as intolerance of carbohydrates with varying severity with its onset or first time of recognition during the current pregnancy.[1] It is a disorder of carbohydrate metabolism. GDM comprises of hereditary and environmental factors, by defective production or insulin resistance.[2] Prevalence of GDM worldwide is about 1.4-14%.[3] It presents with few symptoms and is commonly picked up by screening only. By screening of GDM, antenatal complications can be prevented. We can diagnose women who are unnoticed pre-existing diabetes group so that we can stop micro vascular complications by early identification and follow up because these people are at 50% elevated risk of developing type 2 DM in ten to fifteen years. Normal value of serum uric acid in first trimester is 2.0-4.2 mg/dl. Uric acid level is higher in women with previous gestational diabetes irrespective of BMI.

METHODS

This prospective cohort study was conducted from April 2019 to March 2020 in a tertiary care hospital, Shri Sathya Sai medical college and research institute, Tamil Nadu, India. The study group consisted of 106 antenatal women belonging to first trimester.

The inclusion criteria are all non-diabetic antenatal women in their first trimester of pregnancy <12 weeks.

The exclusion criteria are women with hypertension, renal disease, liver disease, gout, smoking and alcohol intake, drugs known to cause increased serum uric acid levels e.g.: Aspirin, phenothiazines, diuretics. After getting informed and written consent, patient's demographic data, detailed history were obtained. General physical examination, per abdomen examination were done. Venous blood sample was withdrawn from antenatal women of gestational age<12 weeks. The samples are centrifuged to separate serum. Serum uric acid was measured using colorimetric assay, with cut off value of 4.2 mg/dl. These antenatal women were followed up around 24-28 weeks for oral glucose tolerance test. After overnight fasting of 8-10 hours, fasting blood sugar is collected. The 75 grams oral glucose is given. It was dissolved in plain water or lime water to improve palatability. Venous blood was drawn after fasting, one hour and two hours and evaluated for GDM using ADA criteria.

Statistical analysis

The data collected were analyzed using statistical package for the social sciences (SPSS) software version 23 and p value estimated.

RESULTS

In this study 106 antenatal women in first trimester were considered and the data were analyzed.

In our study the majority of the antenatal women were in the age category of 26-30 years (46.2%), followed by 31-35 years (20.8%) (Table 1).

Table 1: Age category.

Age (years)	Frequency	Percentage (%)
20-25	20	18.9
26-30	49	46.2
31-35	22	20.8
36-40	13	12.3
41-45	2	1.9
Total	106	100

In our study, there were 57 primi (53.8%) and 49 multi (46.2%) antenatal women (Table 2).

Table 2: Parity.

Obstetric code	Frequency	Percentage (%)
Primi	57	53.8
Multi	49	46.2
Total	106	100

In our study, out of 106 antenatal women the serum uric acid level elevated (>4.2) was present in 42 patients 39.6.% and normal uric acid level (<4.2) was present in 64 patients 60.4% (Table 3).

Table 3: Serum uric acid.

Serum uric acid (mg/dl)	Frequency	Percentage (%)
Elevated (>4.2)	42	39.6
Normal (<4.2)	64	60.4
Total	106	100

According to ADA criteria to interpret the OGTT values, any two of high values with fasting ≥95 mg%, one hour 180 mg% and two-hour 155 mg% were considered positive for GTT.

In our study, 11(10.4%) were positive for GTT according to the ADA criteria (Table 4).

Table 4: GTT results.

GTT results	Frequency	Percentage (%)
Normal	95	89.6
Positive	11	10.4
Total	106	100

In our study, among the elevated serum uric acid category, 8 (19.0%) were positive for GTT and among the normal serum uric acid category, 3 (4.7%) were positive for GTT. The increased proportion of positive GTT among elevated serum uric acid group is statistically significant (Table 5).

Table 5: Association between the serum uric acid level categories and GTT values.

Variables			GTT results		Total
			Normal	Positive	
Serum uric acid category	Elevated	Count	34	8	42
		Percentage (%)	81	19	100
	Normal	Count	61	3	64
		Percentage (%)	95.3	4.7	100
Total		Count	95	11	106
		Percentage (%)	89.6	10.4	100

P value-0.018 (Significant).

DISCUSSION

GDM presents with few symptoms and is commonly picked up by screening only. GDM in Indian women needs early identification by the OGTT between 24-28 weeks of the gestational age. In India GDM incidence is 3.9 to the 17%.[4]

In the present study, the majority of the antenatal women in first trimester were in the age group of 26-30 years which is similar to the studies done by Laughon et al and Wolak et al.[5,6]

In the present study, 53.8% were primi which is identical to research done by Rasika et al where primi represented 51.4%. This was also similar to the study by Ganta et al where primi represented 55.8%. In the research by EL-Gharib et al 24.8% were primi.[7-9]

In the present study, in the raised serum uric acid category, 8(19%) were positive for GTT and among the normal serum uric acid category, 3 (4.7%) were positive for GTT. Hence total of 11 (10.4%) were positive for GTT according to the ADA criteria, and it is similar to the research by Baliga et al.[10]

In the present study, serum uric acid cut- off of 4.2mg/dl has a positive association with the GTT values with p value less than 0.05 (p=0.018). This was also in accordance to Rao et al who observed an increased 1st trimester serum uric acid level had an larger risk for developing diabetes complicating pregnancy among South Indian mothers and that 3.2mg/dl cut-off point of serum uric acid level predicts gestational diabetes mellitus with a good specificity and sensitivity ($p<0.05$).[11]

CONCLUSION

The present study concludes that elevated levels of serum uric acid during the 1st trimester is interlinked with prediction of gestational diabetes. Hence it is mandatory to do serum uric acid levels at <12 weeks of gestation. The goal of implementing an antenatal screening test for GDM is to isolate pre-symptomatic women who develop adverse effects of pregnancy and to implement management at early gestation.

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