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**ORIGINAL RESEARCH**

# Role of Serum uric acid as a predictor for the diagnosis of Gestational Diabetes Mellitus in first trimester

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## ABSTRACT

**Background:** Gestational diabetes mellitus (GDM) is common disorder affecting pregnancy. It is a disorder of carbohydrate metabolism which occurs during pregnancy. Indian women have increased risk of developing GDM, and leads to adverse Maternal and neonatal outcomes. Womenwith raised serum uric acid also termed hyperuricemia in pregnancy are interlinked with high incidence of unfavorable outcomes in pregnancy such as GDM. Hence this study is done to prove the utility of serum 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 DIPSI test is done and evaluated for GDM . **Results:** In our study, serum uric acid cut–off of 4.2 mg/dl had a positive association with the DIPSI values with p valueless than 0.05 (p=0.018). In this study, in the raised serum uric acid category, 8 (19%) were positive for DIPSI and among the normal serum uric acid category, 3 (4.4%) were positive for DIPSI. Thus, we observe from our study that elevated levels of uric acid during the first trimester is interlinked with the development 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, DIPSI, 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 intolerance resulting in hyperglycaemia of variable severity with onset or first recognition during pregnancy. GDM comprises of hereditary and environmental factors, by defective production or insulin resistance.[2] In India, the prevalence of GDM in percentage ranges from 10% to 14.3%, accounting for 90% to 95% of all diabetes cases observed in pregnant women..[3] Identifying GDM during prenatal visits is crucial due to the associated risks of substantial metabolic changes, increased mortality in perinatal and maternal cases, and lasting postpartum morbidity.

Normal value of serum uric acid in first trimester is 2.0-4.2 mg/dl. A large body of evidence supports the fact that uric acid could be an important risk factor for development of type 2 diabetes, especially in women. This evidence is more important in the first trimester of pregnancy since during that period, there is a natural decline in the uric acid by 25-35% value on account of increased glomerular filtration rate(GFR) . So, if some

women have high uric acid values in the first trimester, they show a heightened risk of development of GDM in the second or third trimester of pregnancy.

This study is to assess the role of serum uric acid concentration in early pregnancy as a predictor in the development of gestational diabetes mellitus (GDM), so that early steps can be taken for the management of the patients .

## METHODS

This hospital based study was conducted from April 2022 to March 2023 in a tertiary care hospital, Muzaffarnagar Medical college and Hospital, Uttar Pradesh, India. The study group consisted of 110

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antenatal women belonging to first trimester.

All the participants were provided adequate information in relation to the study and a duly informed written consent was obtained.

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

The exclusion criteria included women with Pre-gestational diabetes mellitus, chronic hypertension, obesity, renal disease, Cardiovascular disease, liver disease, gout, multiple gestation, smoking and alcohol intake, drugs known to cause increased serum uric acid levels e.g.:Aspirin, phenothiazines, diuretics.

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. GDM was diagnosed using DIPSI as the recommended method at 24-28 weeks of gestation. 75 gm glucose was given to patients irrespective of the fasting state and if after 2 hours blood glucose(PPBS) was(≥140-200)mg/dl, patient was diagnosed as Gestational Diabetes Mellitus.Overt diabetics were also excluded.

**Statistical analysis**

The data presentation is done in the tables and graphs after entering into "Microsoft EXCEL spreadsheet". and p value estimated.

**RESULTS**

In this study 110 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** | 21 | 18.9 |
| **26-30** | 51 | 46.2 |
| **31-35** | 23 | 20.8 |
| **36-40** | 13 | 12.3 |
| **41-45** | 2 | 1.9 |
| **Total** | 110 | 100 |

In our study, there were 62 primi (56.2%) and 48 multi (43.8%) antenatal women (Table 2).

**Table 2: Parity.**

| Obstetric code | Frequency | Percentage (%) |
|---|---|---|
| **Primi** | 62 | 56.2 |
| **Multi** | 48 | 43.8 |
| **Total** | 110 | 100 |

In our study, out of 110 antenatal women the serum uric acid level elevated (>4.2mg/dl) was present in 42 patients 37.9.% and normal uric acid level (<4.2mg/dl) was present in 68 patients 62.1% (Table 3).

**Table 3: Serum uric acid.**

| Serum uric acid (mg/dl) | Frequency | Percentage (%) |
|---|---|---|
| **Elevated (>4.2)** | 42 | 37.9 |
| **Normal (<4.2)** | 68 | 62.1 |
| **Total** | 110 | 100 |

According to DIPSI criteria to interpret GDM, two-hour PPBG of more than 140-200 mg/dl were considered positive for GDM. Overt diabetics were excluded.

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

**Table 4: DIPSI test results.**

| DIPSI results | Frequency | Percentage (%) |
|---|---|---|
| **Normal** | 99 | 90.1 |
| **Positive** | 11 | 9.9 |
| **Total** | 110 | 100 |

In our study, among the elevated serum uric acid category, 8 (19.0%) were positive for DIPSI and among the normal serum uric acid category, 3 (4.4%) were positive for DIPSI. The increased proportion of positive DIPSI among elevatedserum uric acid group is statistically significant (Table 5).

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

| Variables | | | DIPSI results | | Total |
|---|---|---|---|---|---|
| | | | Normal | Positive | |
| Serum uric acid category | Elevated | Count | 34 | 8 | 42 |
| | | Percentage (%) | 81 | 19 | 100 |
| | Normal | Count | 65 | 3 | 68 |
| | | Percentage (%) | 95.6 | 4.4 | 100 |
| Total | | Count | 99 | 11 | 110 |
| | | Percentage (%) | 90.1 | 9.9 | 100 |

P value-0.018 (Significant).

## DISCUSSION

We found that increase in serum uric acid levels may act as a good predictor for Gestational diabetes mellitus. GDM prediction and diagnosis are critical for ongoing pregnancies and have significant effect on the mother's and child's long-term health.[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 Ganta SJ et al. and Wolak et al.[5,6]

In the present study, 56.2% were primi which is identical to research done by Sharma B. et al where primi represented %. 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.[7,8]

In the present study, in the raised serum uric acid category, 8(19%) were positive for GDM and among the normal serum uric acid category, 3 (4.4%) were positive for DIPSI. Hence total of 11 (9.9%) were positive for DIPSI, and it is similar to the research by Sharma, B et al.[9]

In the present study, serum uric acid cut- off of 4.2mg/dl has a positive association with the DIPSI 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 and that 3.2mg/dl cut-off point of serum uric acid level predicts gestational diabetes mellitus with a good specificity and sensitivity ($p<0.05$).[10]

## CONCLUSION

The present study concludes that elevated levels of serum uric acid during the 1st trimester is interlinked with prediction of gestational diabetes. The use of first trimester serum uric acid as a predictor of GDM is hence simple, inexpensive, non invasive and easy to conduct.

This can be used as a screening test for the prediction of GDM..

Thus, in routine antenatal care with predictive test like first trimester serum uric acid can be applied as a screening test for all women for GDM screening.

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