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Dr. Lavee Mehrotra
Associate professor, Department of Obstetrics and Gynaecology, TS Misra Medical College and Hospital Lucknow, Uttar Pradesh, India

Dr. Seema Mishra
Professor, Department of Obstetrics and Gynaecology, Career Institute of Medical Sciences and Hospital Lucknow, Uttar Pradesh, India

Corresponding Author:
Dr. Seema Mishra
Professor, Department of Obstetrics and Gynaecology, Career Institute of Medical Sciences and Hospital Lucknow, Uttar Pradesh, India

Assessment of role of serum uric acid as a predictor of gestational diabetes mellitus

Dr. Lavee Mehrotra and Dr. Seema Mishra

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Abstract
Background: Gestational diabetes mellitus (GDM) is diabetes or glucose intolerance that is primarily detected during pregnancy. The present study was conducted to assess the role of serum uric acid as a predictor of gestational diabetes mellitus.
Materials & Methods: 78 antenatal women in first trimester were enrolled. Venous blood sample was taken from all patients and serum uric acid was measured by colorimetric assay with detection limit of 0.2-20 mg/dl and patients were followed up at 24-28 weeks to do oral glucose tolerance test.
Results: Age group 20-25 years had 14, 26-30 years had 26, 31-35 years had 18 and 36-40 years had 10 patients. Parity was multipara in 42 and primi in 36. Serum uric acid was elevated (>4.2) in 28 and normal (<4.2) in 50. GTT result was normal in 68 and positive in 10 patients. Among 28 elevated uric acid patients, 4 had positive GTT results and among 50 normal serum uric acid patients, 6 had positive GTT result.
Conclusion: There was increase in the risk of development of GDM with increased levels of serum uric acid in the first trimester.

Keywords: first trimester, uric acid, diabetes

Introduction
Gestational diabetes mellitus (GDM) is defined as either diabetes or glucose intolerance that is primarily detected during pregnancy [1]. This loose definition of GDM includes a category of "severe hyperglycaemia" lacks a strong evidence basis, from randomized controlled clinical trials (RCTs) [2]. Several trials investigated the association between the glycaemic status of the mother and the outcome in both mother and foetus. However, these trials did not include the category of "severe hyperglycaemia" in their design. For instance, in HAPO study mothers with fasting blood glucose > 5.8 mmol/L and 2-h post oral glucose load > 11.1 mmol/L were excluded [3].
The screening for GDM, that was established 50 years ago, demonstrates the increased risk of hyperglycaemia during pregnancy, and the evidence supporting that effective treatment may reduce hyperglycemia related adverse pregnancy outcomes [4]. Normal value of serum uric acid is between 2 to 6.5 mg/dl. 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 [5]. 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 [6]. The present study was conducted to assess the role of serum uric acid as a predictor of Gestational diabetes mellitus.

Materials & Methods
The present study comprised of 78 antenatal women in first trimester. Women with history of hypertension, liver disease, renal disease, gout etc. was excluded.
Demographic data related to each patient was recorded. Venous blood sample was taken from all patients. The samples were centrifuged and serum uric acid is measured by colorimetric assay with detection limit of 0.2-20 mg/dl and patients were 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. 75 grams oral glucose was given dissolved in plain or lime water to improve patient

compliance. Venous sample was measured after fasting, one hour and two hours and assessed for GDM using ADA criteria. Results were entered in MS excel sheet for statistical analysis, where appropriate tests were applied. P value less than 0.05 was considered significant.

Results

Table 1: Demographic data

Parameters	Variables	Number	P value
Age group (Years)	20-25	14	0.08
	26-30	26	
	31-35	18	
	36-40	10	
Parity	Multi	42	0.91
	Primi	36	
Serum uric acid	Elevated (>4.2)	28	0.01
	Normal (<4.2)	50	
GTT result	Normal	68	0.01
	Positive	10	

Table I, graph I shows that age group 20-25 years had 14, 26-30 years had 26, 31-35 years had 18 and 36-40 years had 10 patients. Parity was multipara in 42 and primi in 36. Serum uric acid was elevated (>4.2) in 28 and normal (<4.2) in 50. GTT result was normal in 68 and positive in 10 patients. The difference as significant ($P < 0.05$).

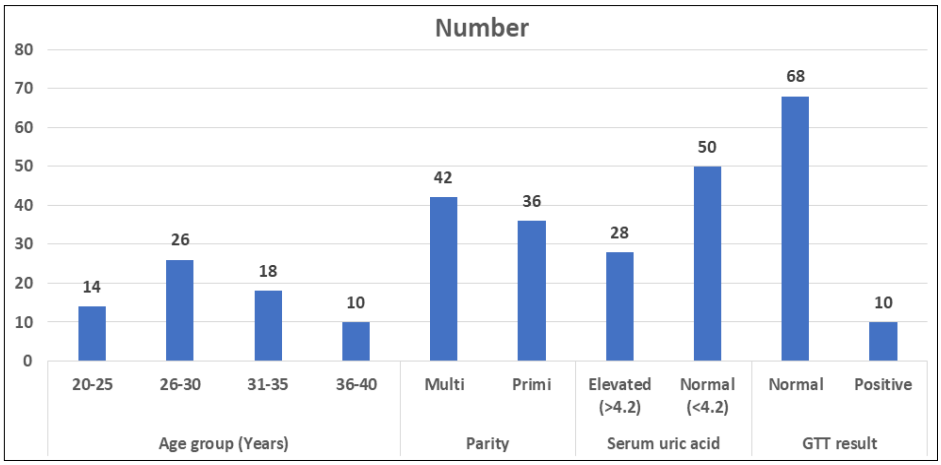

Fig 1: Demographic data

Table 2: Serum uric acid category with GTT results

Serum uric acid	GTT result		Total
	Normal	Positive	
Elevated	24	4	28
Normal	44	6	50
Total	68	10	78

Table II shows that among 28 elevated uric acid patients, 4 had positive GTT results and among 50 normal serum uric acid patients, 6 had positive GTT result.

Discussion

Several risk factors have been implicated in the development of GDM. These are similar to the factors associated with overt diabetes and include increased maternal age, obesity, ethnic background, family history of T2DM and a previous history of GDM [7]. In addition, other risk factors include previous history of a macrocosmic baby, previous adverse pregnancy outcome, glycosuria, polyhydramios or large foetus in present pregnancy [8]. Among these risk factors, increased maternal weight is the most commonly evaluated reversible risk factor. Wang *et al.* [9] showed that an independent significant relationship between reduced intake of polyunsaturated fat and development of GDM. In another study evaluating the effect of lifestyle behavior in white women, revealed a significant correlation of high consumption of saturated fat consumption and risk of GDM, whereas high consumption of polyunsaturated fat was associated with decreased risk for GDM [10]. The present study was conducted to assess the role of serum uric acid as a predictor of Gestational diabetes mellitus.

We found that age group 20-25 years had 14, 26-30 years had 26, 31-35 years had 18 and 36-40 years had 10 patients. Parity was multipara in 42 and primi in 36. Serum uric acid was elevated (>4.2) in 28 and normal (<4.2) in 50. GTT result was normal in 68 and positive in 10 patients. Sivasarupa *et al.* [11] assessed if elevated uric acid in first trimester of pregnancy is associated with subsequent development of gestational diabetes. All pregnant women less than 12 weeks were included. Blood samples were collected for serum uric acid analysis and all these patients were followed up with oral glucose tolerance test at twenty-four to twenty-eight weeks of gestation. The mean age of pregnant women was 29.84 ± 4.94 years. The mean height and weight was 151.52 ± 7.49 cms and 50.60 ± 6.88 kg respectively. The body mass index of patients was 22.13 ± 3.31 kg/m2. The mean gestational age of pregnant women was 11.14 ± 1.30 weeks. The mean uric acid level was 3.81 ± 1.24 mg/dl.

We found that among 28 elevated uric acid patients, 4 had positive GTT results and among 50 normal serum uric acid

patients, 6 had positive GTT result. Aker *et al.* [12] investigated the association of first trimester serum uric acid levels with the development of gestational diabetes mellitus (GDM) in low-risk pregnant women. The results of pregnant women who completed both first trimester biochemical panel and two-step GDM screening were compared with an age-, body mass index, and gestational age-matched control group. The women were grouped as either GDM or impaired glucose tolerance (IGT) according to 100-g oral glucose challenge results. Uric acid levels were compared between the groups and diagnostic utility was tested with receiver-operating characteristics curves. Sixty-six women in GDM group and 358 women in the IGT group were compared against 202 healthy pregnant women. The groups did not differ significantly in terms of parity, pre-gestational body mass index and gestational age. Serum samples for uric acid levels were obtained. The mean serum uric acid levels were significantly higher in the GDM and IGT groups (5.95 mg/dL (±0.97 mg/dL) and 4.76 mg/dL (±1.51 mg/dL), respectively) compared with the control group (3.76 mg/dL (±1.07 mg/dL) ($p< 0.001$). The area under the curve for uric acid levels was 0.92 (95% confidence interval 0.88-0.95) for diagnosis of GDM. At a diagnostic threshold of 3.95 mg/dL, uric acid levels predicted development of GDM with 60% specificity and 100% sensitivity.

Conclusion

Authors found that there was increase in the risk of development of GDM with increased levels of serum uric acid in the first trimester.

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