

**CORRELATION BETWEEN FIRST TRIMESTER URIC ACID LEVEL AND ITS  
ASSOCIATION WITH GESTATIONAL DIABETES MELLITUS.**

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**ABSTRACT**

**BACKGROUND AND OBJECTIVES :**

**Objective(s) :** We aimed to evaluate the predictive value of the elevated serum uric acid level in first trimester of pregnancy for the development of gestational diabetes mellitus. **Method(s) :** This was a prospective study of 100 antenatal women booked at RMMCH, during the years 2012 to 2014 belonging to all gestational ages. The women's history, clinical examination and serum uric acid in first trimester were recorded and the development of gestational diabetes mellitus was recorded. **Result(s) :** Elevated uric acid levels & risk factors show statistical significance in development of gestational diabetes mellitus ( $p < 0.01$ ,  $p < 0.01$ ). **Conclusion:** Serum uric acid elevation in first trimester has a significant correlation with development of gestational diabetes mellitus

**Keywords:** Uric Acid, Spot Test, GTT, Risk Factors, GDM

**1.INTRODUCTION**

Gestational diabetes mellitus is defined as carbohydrate intolerance of varied severity with onset or first recognition during the present pregnancy. Abnormalities of carbohydrate metabolism occur frequently during pregnancy and between 3 and 5% of all pregnant patients will show glucose intolerance. The causes of gestational diabetes mellitus are: 1) insulin resistance due to production of human placental lactogen, increased production of cortisol, estriol & progesterone and increased insulin destruction by kidney and placenta 2) increased lipolysis 3) changes in gluconeogenesis. The effects of gestational diabetes mellitus on the mother are: preeclampsia affecting 10-25% of all pregnant diabetics, infection with high incidence of chorioamnionitis and postpartum endometritis, postpartum bleeding due to exaggerated uterine distention, high incidence of cesarean section of pregnant diabetics. Women with gestational diabetes are at high risk of developing type 2 diabetes mellitus. The effects of gestational diabetes mellitus on the fetus are: congenital abnormalities, hypoglycemia, hyperviscosity syndrome, hyaline membrane disease, macrosomia, hypocalcemia, apnea and bradycardia, traumatic delivery.

Uric acid: it is a heterocyclic compound of carbon, nitrogen, oxygen and hydrogen with formula  $C_5H_4N_4O_3$ . Uric acid is

created when the body breaks down purine nucleotides. High concentration of uric acid in blood serum can lead to a type

of arthritis known as gout. Uric acid is the final breakdown product of purine metabolism and is excreted in urine. In humans the reference range is 2.0 mg/dl and 7.2 mg/dl, considered normal by American medical association. Uric acid concentration in blood plasma above and below the normal range are known, respectively, as hyperuricemia and hypouricemia. Adult female's normal uric acid level is 2.0 - 6.5 mg/dl. In early pregnancy uric acid levels fall by about one third but rise to non-pregnant state by term. Renal plasma flow and glomerular filtration rate begin to increase progressively during first trimester. At term, both are 50-60% higher than in non-pregnant state. This parallels the increase in blood volume and cardiac output. The elevation in plasma flow and glomerular filtration result in an elevation in creatinine clearance. So blood urea and serum creatinine are reduced by 40%.

**2.MATERIALS AND METHODS**

The present study was a prospective study conducted in the department of obstetrics and gynaecology of RMMCH, Chidambaram. The study participants included 100 booked antenatal women registered at RMMCH with gestational age less than 13 weeks, over a period of 2 years from 2012 to 2014. The inclusion criteria is all antenatal women in their

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first trimester of pregnancy (<13 weeks of gestation). Women with renal & liver disease, pregestational diabetes, chronic hypertension, gout, smoking & alcohol intake, drugs known to increase uric acid levels in blood were excluded from study. On admission a detailed history was taken, and a clinical examination was performed and gestational age assessed. After getting informed and written consent from the patient, maternal plasma uric acid was measured before 13 weeks using colorimetric assay. Cut off taken for this study is 3.6 mg/dl (AJOG Oct 2009). Following this all the patients will be subjected to a oral glucose challenge test between 22-24 weeks. (50g glucose load is administered, irrespective of the time of the last meal, and plasma glucose is measured one hour later). If values are more than 200mg/dl, patient is considered to have gestational diabetes mellitus. If plasma blood glucose levels are between 140-200mg/dl, patient will undergo 100g glucose tolerance test (procedure: for atleast three days prior to the test, the patient should consume her normal unrestricted diet containing a minimum of 150g of carbohydrate. After an overnight fast of 8 to 14 hours, a fasting sample is drawn, following which she drinks a solution of 100g glucose dissolved in a glass of about 300ml of water. Thereafter plasma glucose levels are estimated every hour for 3 hours).

#### CARPENTER AND COUSTAN VALUES

	Carpenter and Coustan
Fasting	95 mg/dl
1 hour	180 mg/dl
2 hour	155 mg/dl
3 hour	140 mg/dl

Patient is considered to have impaired glucose tolerance test (IGTT) if any one value exceeds the normal & gestational diabetes mellitus (GDM) if 2 or more values exceed (Ada 2009).

#### 3.RESULTS

Out of the 100 women, 89 patients with normal uric acid levels, 12 women developed gestational diabetes mellitus and 1 woman had impaired glucose tolerance test. Out of the 100 women in the study, 11 women with abnormal uric acid levels, 9 women developed gestational diabetes mellitus and 1 woman had impaired glucose tolerance test. (p<0.01).

Uric acid		IGTT	GDM
Normal (<3-6 mg/dl)	89	1	12
Abnormal (>3-6 mg/dl)	11	1	9

Of the 89 women with normal uric acid levels, 78 of them had no risk factors and 11 of them had risk factors. And among the 11 abnormal uric acid levels, 8 of them had risk factors and 3 of them had no risk factors. (p<0.01).

Uric acid		Risk factors	No risk factors
Uric Acid - Normal	89	11	78
Uric Acid - Abnormal	11	8	3

Out of the 89 women with normal uric acid levels, 11 women with risk factors and 1 woman without risk factor, developed gestational diabetes mellitus. (p<0.01)

Uric acid Normal	Risk factors	No risk factors
89	11	78
GDM in this group	11	1

Out of the 11 patients with abnormal uric acid concentration, 7 out of 8 women with risk factors and 2 out of 3 of them with no risk factors developed gestational diabetes mellitus.

Uric acid Abnormal	Risk factors	No risk factors
11	8	3
GDM	7	2

Risk factor stratification in the total population studied showed the main reason for development of GDM was Diabetic mothers and previous history of GDM, compared to the other risk factors.

	GDM	
No risk	81	3
Mother DM	8	8
Previous GDM	7	7
Father DM	2	2
Obesity	1	1
PCOD	1	-

#### 4.DISCUSSION

In the present study, a total of 100 patients have been analysed and their relationship with uric acid, gestational diabetes mellitus and risk factors have been studied, similar studies were also done by :

- Ajog, oct 2009 did the study on a total of 1570 patients.
- Assuit et al analysed 812 patients.
- Helmy motawe et al analysed 1200 patients.

Cut off taken in my study was 3.6 mg/dl (ajog, vol 201, issue 4, oct 2009)

Out of 100 women :

Uric acid < 3.6 mg/dl (normal) - 89%

Uric acid > 3.6 mg/dl (abnormal) - 11%

- Assuit et al had 133 patients with raised uric acid concentration.
- Helmy motawe et al had 312 patients with raised uric acid concentration.

The main reason for development of gestational diabetes mellitus as per my study was :

1. H/o diabetes mellitus in mother.
  2. H/o gestational diabetes mellitus in previous pregnancy - similar findings were observed in studies done by torloni et al, 2009: proceedings of the 4<sup>th</sup> international workshop conference on gestational diabetes mellitus - chicago, 1998.
- According to hollander et al, 2007 - advanced maternal age and increased bmi was the main reason for development of gestational diabetes mellitus.
  - Poly cystic ovary syndrome was the main reason for development of gestational diabetes mellitus according to toulis et al, 2009.
  - Essential hypertension was the main reason for development of gestational diabetes mellitus according to tamas et al, 2001.
  - Monozygotic twins 70% and dizygotic twins 20-30% were reasons for development of gestational diabetes mellitus according to kaprio et al, 1992; lebtovirta et al, 2010.

- No risk factors in 50% based on the findings of cook et al, 2003.

## 5.CONCLUSION

In present study , first trimester hyperuricemia is associated with a significant risk of developing gestational diabetes mellitus and it was observed that risk factors play a major role in the development of gestational diabetes mellitus.

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