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Research Paper

An Observational Study To Evaluate The Relationship Between Maternal Serum Uric Acid Levels With The Development Of Gestational Diabetes Mellitus In Early Pregnancy

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Abstract:
Objective: *The main objective of the current study was to evaluate the relationship between maternal serum uric acid levels with the development of Gestational Diabetes Mellitus in early pregnancy.*
Methods: *The current study was an observational prospective study conducted in accordance of both diabetic and gynaecology OPD at multidisciplinary hospital.A total of 210 antenatal women attending OPD at the first trimester were included in the study after satisfying inclusion and exclusion criteria.*
Results:*23.9 ± 4.2 were the mean average age of the participants. Among 210 subjects 38 patients were obese (BMI ≥ 30kg/m2). The mean average BMI was 26.8 ± 4.2 kg/m^2. Maximum number of subjects were belongs to 25.0 to 30.0 BMI range. It was observed that 108 pregnant woman had serum uric acid level < 3 mg/dl (mean average 2.59 ± 0.4 mg/dl) and all were having < 140 mg/dl blood sugar level at screening and non of them were having GDM. Subjects who were having serum uric acid level in between ≥4.1-< 4.9, 25% were diagnosed with GDM, where as subjects who were having serum uric acid level in ≥5 mg/dl, 85.7% were diagnosed with GDM.*
Conclusion: *The study results conclude a strong relationship between development of GDM and first trimester elevated uric acid concentration in pregnant women. To predict GDM and diagnosed in time authors strongly recommend routine antenatal care with predictive test such as first-trimester serum uric acid.*
Keywords:*Gestational Diabetes Mellitus, Serum uric Acid, Hyperuricaemia, Insulin Resistance.*

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I. INTRODUCTION:

The epidemic of diabetes and obesity gripping the world today has resulted in a proportionate increase in the number of cases of gestational diabetes mellitus (GDM) globally, more so in the high risk ethnic populations [1]. India is no different with about 4 million women having GDM in India alone [2]. The region wise prevalence varies from 3.8% to 21% in different parts of the country, with a higher incidence in urban populations [3,4]. GDM is associated with not only adverse pregnancy outcomes, but also predisposes both the mother and her baby to developing diabetes and metabolic disorders including obesity later in life [5]. An early diagnosis and screening strategy go a long way in detecting GDM early and providing an effective management strategy to reduce its complications [6]. Hence, GDM provides a golden window of opportunity for intervention benefiting not only the pregnant women but also her baby. There have been various different recommendations for screening and diagnosis as well as management of GDM which vary from region to region with no global single set of guideline to follow.

In non- pregnant women serum uric acid is associated with insulin resistance. In women with gestational diabetes mellitus (GDM) and gestationnel hypertension uric acid is correlated with insulin resistance. We can predict the development of diabetes, since elevated serum uric acid levels were correlated with insulin resistance. Especially in women, for development of Type 2 Diabetes uric acid could be an important risk factor as supported by large body of evidence [7-11].

The main objective of the current study was to evaluate the relationship between maternal serum uric acid levels with the development of Gestational Diabetes Mellitus in early pregnancy.

II. METHODS:

The current study was an observational prospective study conducted in accordance of both diabetic and gynaecology OPD at multidisciplinary hospital. A total of 210 antenatal women attending OPD at the first trimester were included in the study after satisfying inclusion and exclusion criteria.

In this observational study pregnant women upto 14 weeks of gestation and were willing to give consent to participate in this study were enrolled. All participants were thoroughly briefed regarding all the parameters and objective of the study before the enrolment. Any pregnant woman who had history of thromboembolism, connective tissue disorder, renal disease, chronichypertension, established cardiovascular disease, elevated thyroid level and known cases of diabetes mellitus were excluded from the study.

After enrolment of the participants demographic details were tabulated in a predesigned pro forma which include age, weight, height, BMI, both systolic and diastolic blood pressure and family history of diabetes if any. All pathological test were performed including serum acid test and OGTT at NABL accreted pathological laboratory and it was highly attempted to ensure that the all serum test were done from a single laboratory to ensure the authority as well as accuracy of the data. Any blood sugar reports which were > 140 mg/dl were considered as the concern subject were having GDM.

To analyze all data we used SPSS software version 16.0. As the means ± standard deviation continuous variables were shown.

III. RESULT:

Total no of subjects who were participated in this study was 210. Table 1 demonstrated the demographic values of the participants. 23.9 ± 4.2 were the mean average age of the participants.

Table 1: Demographic variables of women enrolled in the study (n=300)

Variables	**Measurements (Mean ±SD)**
Age (Years)	23.9 ± 4.2
Weight (kg.)	60.33 ± 7.13
Height (cm.)	172.19 ± 2.38
BMI (kg/m^2)	26.8 ± 4.2
Family history of Diabetes (N%)	19 (9%)
Systolic pressure (mmHg)	114.18 ± 11.68
Diastolic pressure (mmHg)	69.43 ± 8.56

Among 210 subjects 38 patients were obese (BMI ≥ 30kg/m2). The mean average BMI was 26.8 ± 4.2 kg/m^2. The distribution of BMI among the participants were illustrated in figure 1. Maximum number of subjects were belongs to 25.0 to 30.0 BMI range.

Figure 1:BMI (kg/m2) distribution of pregnant women studied

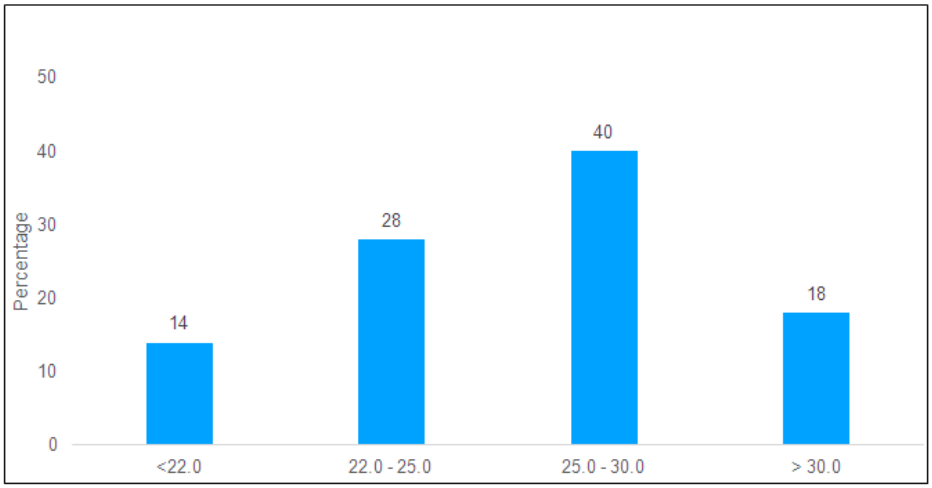

Table 2 demonstrated association of serum uric acid with blood sugar screening (1 hr after 50 gm glucose) and development of GDM. It was observed that 108 pregnant woman had serum uric acid level < 3 mg/dl (mean average 2.59 ± 0.4 mg/dl) and all were having < 140 mg/dl blood sugar level at screening and none of them were having GDM. Where 22 subjects were having serum uric acid level <4 mg/dl and precisely among them 7 subjects were having serum uric acid level <5 mg/dl. Subjects who were having serum uric acid level in between ≥4.1-< 4.9, 25% were diagnosed with GDM, where as subjects who were having serum uric acid level in ≥5 mg/dl, 85.7% were diagnosed with GDM.

Table 2: Association of serum uric acid with blood sugar screening (1 hr after 50 gm glucose) and development of GDM

SUA level in mg/dl	Number of pregnant women	Uric acid level (mg/dl)	**Blood Sugar Screening (mg/dl)**		**OGTT**	
			< 140	**≥140**	**Positive (GDM)**	**Negative (Non GDM)**
<3	108	2.59 ± 0.4	108	0	0	108
≥3.1-< 4	79	3.52 ± 0.3	79	0	0	79
≥4.1-< 4.9	16	4.42 ± 0.3	6	10	4 (25%)	12
≥5	7	5.82 ± 0.7		7	6 (85.7%)	1

Table 3 demonstrated the distribution of maternal age with elevated uric acid among the participants. It was observed subjects in an age group of 21–25 years were the highest (43%) followed by the age group of 26–30 years (35%).

Table 3: Distribution of maternal age with elevated uric acid

Age	Number (elevated uric acid) (%) (≥4.1 mg/dl)
Upto 20	2 (9%)
21–25	10 (43%)
26–30	8 (35%)
>30	3 (13%)
Total	23

IV. DISCUSSION:

In pregnant women we found that high serum uric acid concentrations showed a correlation with higher glycemic levels. Association between elevated serum uric acid with hypertension, cardiovascular disease, diabetes mellitus and metabolic syndrome [12-16]. Pregnancy-related diseases, such as gestational diabetes mellitus, eclampsia and gestationnel hypertension have been observed elevated serum UA concentrations by several other previous studies conducted across the globe [17-19].

Our study has documented a strong relation of GDM with elevated serum uric acid level. In line with our study few previous study was also reported that pregnant woman who were developed GDM were also having serum uric acid > 4 mg/dl and the risk of developing GDM among these patients were 3 fold higher as compared to those with mean serum uric acid level of 2.1 mg/dl [20-22]. Even the result that we had observed in accordance to various previously conducted studies which like ours also established a strong relationships between insulin resistance and elevated serum acid levels [23-26].

Cardiovascular disease, arterial hypertension and acute coronary syndrome has already being related to elevated serum acid level and furthermore serum CRP concentrations were altered as compare to healthy population [27-29]. In fact in current studies pregnant women were also having higher cardiovascular risk factors as they were having higher BMI rate and higher number of subjects were having elevated BMI level. Among 210 subjects 38 patients were obese (BMI ≥ 30kg/m2). The mean average BMI was 26.8 ± 4.2 kg/m^2. Maximum number of subjects were belongs to 25.0 to 30.0 BMI range. As found in several previous study, an increased risk of GDM been consistently associated with high maternal BMIs [27,28]. In individuals at high risk, including women with a history of GDM, weight loss and increased physical activity reduce the risk of type 2 diabetes as demonstrated in several randomized trials [29-32].

The present results had some limitations. Pre-pregnancy weight is self-reported and relationships between pregnancy outcomes and serum uric acids concentration have not been investigated. Apart of that in the present population we could not measure the markers of oxidative stress. Despite the limitation our study observation is strong enough to established the correlation between elevated serum uric acid and higher incidence of GDM.

V. CONCLUSION:

The study results conclude a strong relationship between development of GDM and first trimester elevated uric acid concentration in pregnant women. This association is independent of family history of DM, BMI and maternal age though there is association of increased BMI with GDM. The use of first-trimester serum uric acid as a predictor of GDM is easy and simple to perform, non–invasive and inexpensive. Hence to predict GDM and diagnosed in time authors strongly recommend routine antenatal care with predictive test such as first-trimester serum uric acid.

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