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A Clinical Study Analyze Serum Uric Acid as Risk Factor for Gestational Diabetes Mellitus

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Abstract
Introduction: *To analyze the relationship between risk of development of gestational diabetes mellitus (GDM) and first trimester uric acid levels.*
Method: *After obtaining their demographic data and clinical assessment blood sample for serum uric acid was taken. Women were subsequently followed till term. A total of 300 pregnant women up to 14 weeks of pregnancy were enrolled in this study. All women were subjected to blood sugar screening one hour after 50 gm glucose and glucose tolerance test if screening was < 200mg/dl. GDM was diagnosed by 3 hours glucose tolerance test using Carpenter and Coustan criteria or by one hour screening value > 200 mg /dl.*
Results: *GDM complicated 2.66% (8/300) of the pregnancies. All the women with serum uric acid > 5 mg/dl (n=6) had deranged blood sugar screening and out of this 5 developed GDM.*
Conclusion: *First trimester uric acid level may be used as predictor for development of GDM. The study demonstrates a striking association between first trimester uric acid and risk of developing GDM.*
Keywords: *Uric Acid, Gestational Diabetes Mellitus, Insulin Resistance, Glucose Tolerance Test.*

Introduction

It is well recognized that GDM and also milder degree of carbohydrate intolerance are associated with increased perinatal complications and adverse pregnancy outcomes[2]. Several studies have now shown that, compared to their peers, women who go on to develop GDM later in pregnancy have biochemical abnormalities that can be detected in the first trimester including increased levels of uric acid [3,4]. Uric acid, the final oxidation product of purine metabolism, is associated with insulin resistance [5-7].

Approximately 7% of all pregnancies are complicated by gestational diabetes mellitus (GDM), resulting in more than 2, 00,000 cases annually. The prevalence may range from 1-14% of all pregnancies depending on the population studied and the diagnostic test employed[1]. Accumulating evidence from different studies suggests that uric acid could also play a role in glucose homeostasis by increasing insulin resistance, by inhibiting insulin mediated endothelial nitric oxide release and by directly acting on adipocyte[8-12]. 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[13-15]. Hyperuric-aemia is also associated with markers of metabolic

syndrome[16-20]. Interesting relationships have been observed between serum uric acid, serum glucose and diabetes, but the studies have not been consistent [21,22]. Studies have shown that normally in pregnancy, serum uric acid level falls in early and middle pregnancy and rises to preconception values in late pregnancy. Compared with pre pregnancy values, uric acid concentration decreased significantly by 8 weeks gestation and this reduced level was maintained until about 24 weeks. Thereafter the concentrations increased such that by term they were greater than the prepregnancy values in the majority of patients and remained elevated until at least 12 weeks after after delivery[23]. Thus elevated serum uric acid in early pregnancy.

Material and Methods

All participants were given adequate information and consent was obtained from each participant. Pregnant women upto 14 weeks of gestation were enrolled in this prospective cohort study. Women who were known cases of diabetes mellitus, chronic hypertension, gout, renal disease, connective tissue disorder or had history of thromboembolism were excluded from the study. 310 eligible women were enrolled, out of which 10 were lost to follow up and hence a cohort of 300 women remained for analysis. All enrolled women were subjected to detailed history and clinical examination. All routine antenatal investigations along with serum uric acid concentration were carried out. 2 ml of blood sample was drawn from the antecubital vein following 12 hours fasting from all women upto 14 weeks of gestation. The blood sample was centrifuged to separate the serum and was stored at -70° C until analysis. Uric acid was measured by using a colorimetric assay kit U 7581-120; Pointe scientific Inc., Canton, MI with a detection limit of 10 mg/dl. All the subjects were followed up till term. GDM was diagnosed by two step approach as per the departmental protocol. Blood sugar screening 1 hour after 50 gm oral glucose irrespective of meal was measured in all registered women between 24-26 weeks of gestational age. Women with blood sugar screening > 140 mg/dl were labeled as having deranged blood sugar screening. Women with blood sugar screening ≥ 200mg/dl were directly labeled as having GDM and all the others (with normal and deranged blood sugar screening) further underwent oral glucose tolerance test with 100 gm glucose. GDM was diagnosed if 2 or more plasma glucose levels meet or exceed the thresholds given by Carpenter and Constant criteria [24]. Using structured questionaires, information was collected on other covariates like maternal sociodemographic, behavioral and medical characteristic. Covariate information included maternal age, prepregnancy weight, height, reproductive and personal and family medical history. Prepregnancy body mass index (BMI) used as an index of maternal adiposity was calculated as weight (kg) divided by height (m) squared. The statistical analysis was done using Stata, version 11.2 statistical analysis software.

Results

A total of 300 women were analyzed with mean age 24.85±3.39 years and the mean BMI 22.79±2.50 (Table 1). GDM complicated 8 (2.66%) of the pregnancies. None of the women having GDM were found to be obese (BMI ≥ 30kg/m2) in our study. Out of this 5 women (5/8, 62.5%) had early pregnancy mean uric acid concentration of 5.60±0.5 mg/dl and 3 women (3/8, 37.5%) had mean uric acid concentration of 4.33±0.2 mg/dl.

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

Variables	Mean ±SD
Age (Years)	24.85± 3.39
Weight (kg.)	51.31±6.24
Height (cm.)	152.35±2.11
BMI (kg/m2)	22.79±2.50

On correlating the early pregnancy serum uric acid concentration with blood sugar screening, it was found that blood sugar screening was normal (5 mg/dl (mean= 5.60±0.6 mg/dl), all 6 had

deranged blood sugar screening (≥140 mg/dl) and out of this, 5 had abnormal glucose tolerance test (Table 2).

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

Groups	Uric acid level (mg/dl)		Blood Sugar Screening (mg/dl)		OGTT	
	Range	Mean±SD	< 140	≥140	Positive (GDM)	Negative (Non GDM)
I(n=155)	2.0-3.0	2.61 ± 0.3	155	0	0	155
II(n=114)	3.1-4.0	3.43 ± 0.3	114	0	0	114
III(n=25)	4.1-4.9	4.33 ± 0.2	11	14	3 (12%)	22
IV(n=6)	≥5	5.60 ± 0.6	0	6	5 (83.3%)	1

Discussion

Our findings are consistent with a relatively large body of literature documenting a direct relationship between serum uric acid levels and hyperglycemia, insulin resistance and Type 2 Diabetes. For instance, Laughon et al. [25] reported that women having mean serum uric acid level of 4.2mg/dl in early pregnancy (mean gestational age =8.9 ± 2.5 wks) had a threefold increased risk of developing GDM, as compared to those with mean serum uric acid level of 2.1 mg/dl. Gharib et al in their study on 250 first trimester pregnant females susceptible to diabetes mellius found serum uric acid > 4 mg/dl, in early pregnancy is associated with increased risk of developing GDM. These results are in accordance with multiple animal and human based studies that demonstrate direct relationship between increased serum uric acid level and insulin resistance [7, 12,13,28]. In this prospective cohort study, we observed a direct relationship between serum uric acid concentration and incidence of GDM. Women with serum uric acid level ≥ 5 mg/dl in early pregnancy (upto 14 wks gestation), had 83.33% more chance of development of GDM. Statistical analysis indicates a fair diagnostic efficacy of serum uric acid level as a marker for GDM at a cut off value of 5mg/dl. This association was independent of established sociodemographic risk factors of GDM such as maternal age, prepregnancy BMI and family history of Type 2 diabetes.

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References

1. Gollenberg AL, Pekow P, Bertone-Johnson ER, Freedom PS, Markenson G et al. Sedentary behaviors and abnormal glucose tolerance among pregnant Latina women. Med Sci Sports Exerc. 2010 Jun; 42(6):1079-85. doi: 10.1249/MSS.0b013e3181c6dec8.
2. Kang DH, Park SK, Lee IK, Johnson RJ. Uric acid induced C-reactive protein expression: implication on cell proliferation and nitric oxide production of human vascular cells. J Am Soc Nephrol. 2005 Dec;16(12):3553-62. Epub 2005 Oct 26.
3. Butler R, Morris AD, Belch JJ, Hill A, Struthers AD. Allopurinol normalizes endothelial dysfunction in type 2 diabetics with mild hypertension. Hypertension. 2000 Mar;35(3):746-51
4. Carstensen M, Herder C, Kivimaki M,Jokela M,Roden M, Shipley MJ,et al. Accelerated increase in serum interleukin-1 receptor antagonist starts 6 years before diagnosis of type 2 diabetes: Whitehall II prospective cohort study. Diabetes. 2010 May;59(5):1222-7. doi: 10.2337/db09-1199. Epub 2010 Feb 25

5. Sautin YY, Nakagawa T, Zharikov S, Johnson RJ.Adverse effects of the classic antioxidant uric acid in adipocytes: NAD-PH oxidase-mediated oxidative/nitrosative stress. Am J Physiol Cell Physiol. 2007 Aug;293(2):C584-96. Epub 2007 Apr 11.
6. American Diabetes Association. Gestational diabetes mellitus. Diabetes care. 2003 Jan: 26 Suppl1: S103-5.
7. Yoo TW, Sung KC,Shin HS, Kim BJ, Kim BS,Kang JH,et al. Relationship between serum uric acid concentration and insulin resistance and metabolic syndrome. Circ J. 2005 Aug; 69(8):928-33.
8. Khosla UM. Hyperuricaemia induces endothelial dysfunction. Kidney Int. 2005 May;67(5):1739-42.
9. Katherine Laughon, Janet Catov, Traci Provins, James M Roberts, Robin E.Gandley: Elevated first trimester uric acid concentrations are associated with development of gestational diabetes. Am J Obstet Gynecol. 2009 Oct;201(4):402.e1-5. doi: 10.1016/j.ajog.2009.06.065.
10. Facchini F, Chen YD, Hollenbeck CB, Reaven GM. Relationship between resistance to insulin mediated glucose uptake, urinary uric acid clearance and plasma uric acid concentration. JAMA. 1991 Dec 4;266(21):3008-11.