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ORIGINAL ARTICLE

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Ascorbic acid and uric acid levels in gestational diabetes mellitus

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OBJECTIVE(S) : To assess ascorbic acid and uric acid levels in GDM.

METHOD(S) : Plasma vitamin C and serum uric acid levels were analysed in 25 patients of GDM and 25 normotensive pregnant women who served as controls.

RESULTS: Significantly low vitamin C levels were observed in GDM as compared to those in controls ($P<0.05$). Significantly high serum uric acid levels were observed in GDM as compared to those in controls ($P<0.05$).Vitamin C and uric acid levels showed a significant negative correlation ($r = 0.25, P<0.05$).

CONCLUSION(S) : These findings indicate decreased detoxification or free radical scavenging capacity in GDM and compensatory elevation of uric acid confers protection in pregnancies complicated by diabetes.

Key words: gestational diabetes mellitus, oxidative stress, ascorbic acid levels, uric acid levels

Introduction

Fetuses born to mothers with gestational diabetes mellitus (GDM) are at increased risk of developing respiratory distress, macrosomia, anomalies and platelet hyperaggregability [1]. Low insulin sensitivity has been suggested to be the cause of oxidative stress in diabetes which eventually leads to free radical generation [2].

The present study was planned to evaluate vitamin C and uric acid levels in GDM.

Methods

The study was carried out on 50 primigravidas of 18-36 years age at 32-39 weeks gestation attending our antenatal clinic. They included a study group of 25 pregnant women diagnosed as having GDM by oral glucose tolerance test with 100g of glucose [3] and a control group of 25 women having healthy normotensive pregnancy. None of them had a family history of diabetes mellitus, hypertension, and obesity, and none were taking any vitamin supplements or drugs. Study samples were drawn after overnight fasting and vitamin C was estimated spectrophotometrically [4]. Serum uric acid was estimated colorimetrically [5].

The data so obtained were analyzed using student's t-test. Regression analysis was also carried out.

Results

The mean fasting, 1 hour, 2 hours and 3 hours blood glucose levels in GDM are given in Table 1. The plasma level of vitamin C was significantly decreased in the study group as compared to that in the control group ($P<0.05$). Serum uric acid level was significantly increased in the study group as compared to that in the control group ($P<0.05$), (Table 2).

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Table 1: Blood glucose levels in GDM (mean ± SD, mg%).

	Fasting	1 hour	2 hour	3 hour
Control group	72.8±11.17	108.0±25.4	110±24.0	80.92±15.15
Study group	76.68±14.18	119.48±28.0	110.8±28.7	89.24±26.49

Table 2: Vitamin C and uric acid levels (mean ± SD, mg%).

	Control group	Study group
Vitamin C	1.077±0.392[a]	0.801±0.118[a]
Uric acid	3.73±0.14[b]	5.23±0.33[b]

[a] and [b] - P < 0.5

Decrease in vitamin C levels and rise in uric acid levels showed a significant negative correlation (r= 0.25, P<0.05) in GDM.

Discussion

Most important physiological antioxidants are vitamin C and uric acid, while bilirubin and thiol-containing molecules make a comparatively small contribution. Vitamin C can reduce superoxide, hydroxyl, peroxynitrite radical and other reactive oxidants, and may serve a protective physiological role by preventing lipid peroxidation. Several reports implicate role of lipid peroxidation in GDM. Substantial evidence from animal models suggests that oxidative stress in diabetic pregnancy might contribute to the risk of fetal abnormality and this can be prevented by antioxidants[1,3].

The present study, shows significantly low (P<0.05) vitamin C level in GDM as compared to that in controls (Table 2). Little information is available with regard to the antioxidant defenses and GDM. In diabetics, hypertensives and tobacco users circulating vitamin C levels are lower, which is attributed to impairment of nitricoxide (NO) mediated endothelial function[6]. Shortterm administration of vitamin C in these groups leads to restoration of normal vascular function, offering further evidence that endothelial dysfunction may be a consequence of oxidative stress. Uric acid possesses antioxidant properties and contributes about 60% of free radical scavenging activity in human serum[7]. In the present study, significantly elevated levels of serum uric acid are observed in GDM as compared to those in controls (P<0.05). The uric acid elevation may be a protective response, capable of opposing harmful effects of free radical activity and oxidative stress. Elevated serum uric acid is a consistent feature of insulin resistance syndromes[7], though no reports are available regarding uric acid level in GDM. Insulin has physiological action on renal tubules, causing reduced sodium and uric acid clearance [6]. Despite blunting of the action of insulin on glucose metabolism, sensitivity to the renal effects persists[6]. Because plasma insulin concentration is characteristically elevated in insulin resistance syndromes, hyperuricemia may arise as a consequence of enhanced renal insulin activity.

In addition, an elevated serum uric acid concentration may reflect impaired endothelial integrity, in which endothelium dependent vascular relaxation produced by NO is reduced. In diabetic subjects, NO is removed through the scavenging action of oxygen free radicals[7]. Thus, elevated serum uric acid possibly confers protection against persistent exposure to potentially damaging vascular oxidants. The clinical manifestations of GDM have been attributed to fetal hyperglycemia, hyperlipidemia, hyperinsulinemia and reduced placental blood flow resulting in chronic fetal hypoxia. High blood glucose levels induce oxidative stress and decrease antioxidant defences, thus leading to increased free radical formation. The resulting free radicals may damage not only the organ in which they are formed, but if released into circulation, also the remote organs. Fetus is a potential source of substrate for xanthine dehydrogenase / oxidase. Hypoxanthine on crossing the placenta provides substrate for maternal xanthine dehydrogenase / oxidase, which would amplify reactive oxygen species generation at distant sites.

In all of the above scenarios the results would be similar viz., the promotion of oxidative stress, consumption of antioxidant vitamin C and compensatory elevation of uric acid to confer protection against raised free radical activity.

Conclusion

In GDM serum ascorbic acid levels are significantly lowered and uric acid levels significantly elevated. Both are important physiological antioxidants.

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