NEED OF IRON SUPPLEMENTATION IN GESTATIONAL DIABETES MELLITUS

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Abstract

Objective. Gestational diabetes mellitus (GDM) increases the foetal morbidity and mortality and there is also risk of development of type II diabetes for the mother. In pregnancy iron supplementations are given to all the females in India. Data are not available on the relationship between serum ferritin and GDM in Indian populations.

Material & Methods. Case control study was done on 90 women (30 GDM patients approx 28 weeks of gestation and 60 control subjects without GDM) referred to the tertiary care hospital at New Delhi. Ferritin was analysed by ELISA kit. They were analyzed for the correlation of ferritin with blood glucose in GDM patients.

Results. On comparison with blood glucose the levels of ferritin were statistically significantly high in GDM cases as compared to controls (p value 0.008). There was a negative correlation of ferritin with blood glucose level (r value -0.039, p value 0.794).

Discussion. Pregnancy is an equivalent of an inflammatory state and the high levels of ferritin can help in determining the need of iron supplementation given in pregnant females. Women who had high serum ferritin had the greatest risk of GDM.

Conclusion. This study suggests a possible link between elevated serum ferritin and low-grade inflammation. Further studies in larger populations are required to establish this study.

Key words: gestational diabetes mellitus, ferritin.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy (1). The prevalence of gestational diabetes mellitus is increasing globally. In India, there is an exceptionally high estimated prevalence of GDM (27.5%)(2).

The presence of fasting hyperglycemia may be associated with an increase in the risk of fetal death during the last 4–8 weeks of gestation. GDM of any

severity increases the risk of fetal macrosomia (3, 4). GDM is associated with an increased frequency of maternal hypertensive disorders and the need for cesarean delivery. Women with GDM are at increased risk for the development of diabetes, usually type 2, after pregnancy (5). Obesity and other factors that promote insulin resistance appear to enhance the risk of type 2 diabetes after GDM, while markers of islet cell-directed autoimmunity are associated with an increase in the risk of type 1 diabetes. Offsprings of women with GDM are at increased risk of obesity, glucose intolerance, and diabetes in late adolescence and young adulthood (6).

The mechanisms involved in the development of GDM are not completely understood. It is increasingly being recognized that there is a systemic inflammation in GDM, as indicated by higher levels of serum C-reactive protein (CRP) and/or interleukin-6 (7, 8). Ferritin is also a positive acute-phase reactant and increases in the presence of various acute or chronic disease conditions (9, 10). Serum ferritin concentration provides an indirect estimate of body iron stores because it is highly correlated with bone marrow iron (11, 12). Studies also showed a significant relation between higher serum ferritin levels and insulin resistance syndrome and risk of type 2 diabetes (13). In pregnancy iron supplementations are given to all. Data are not available on the relationship between serum ferritin and GDM in Indian populations. Thus, the objective of this study was to determine whether there was a relationship between serum ferritin concentration and GDM in Indian pregnant women.

MATERIAL AND METHODS

This case control study was performed in 90 women (30 GDM patients approx 28 weeks of gestation at the time of doing oral glucose tolerance test and 60 control subjects without GDM) referred to Department

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of Biochemistry, in a tertiary care hospital, New Delhi. Informed consent was obtained from each participant after explanation of the nature and purpose of the study. It has been approved by institutional ethical committee. Gestational age was estimated from participants' last normal menstrual period which was further confirmed or modified by ultrasounds. The diagnosis of GDM was made using a two-step approach. Patients were initially screened by measuring the plasma glucose concentration 1 h after a 50-g oral glucose tolerance test (OGTT) at ~28 weeks of gestation. A diagnostic OGTT was performed on the subset of women whose plasma glucose concentrations exceeded the glucose threshold value (>140 mg/dL). The diagnostic criteria for GDM were the Carpenter/Coustan conversion as recommended by the American Diabetes Association (14). The patients with history of infection and obesity were excluded. The exclusion was done by the obstetrician so BMI was not included in the study at 28 weeks of gestation.

Sample collection and analytic procedures

Blood samples collected from study participants were refrigerated and centrifuged at 4°C. Plasma and serum samples were stored at -70°C until assayed. Blood sugar was done by fully automated autoanalyser (CX-4 analyser by Beckman Coulter USA). Ferritin was analysed by ELISA kit. Statistical analysis (SPSS version 20) was done to analyse the significance and correlation of ferritin with blood glucose in GDM patients.

RESULT

In our study the patients were initially screened by measuring the plasma glucose concentration 1 h after a 50-g OGTT at ~28 weeks of gestation. A diagnostic oral glucose tolerance test was performed on the subset of women whose plasma glucose concentrations exceeded the glucose threshold value (>140 mg/dL). The levels of serum ferritin were also high in GDM as compared to the control group and it was significant statistically.

Table 1. Levels of blood sugar & ferritin and comparison of cases and controls in gestational diabetes mellitus women

Parameters	Control $\pm$ (SEM)	Cases $\pm$ (SEM)	P value
Ferritin (pmol/L)	62.85 $\pm$ 5.12	148.47 $\pm$ 9.60	0.0001

On comparison the levels of ferritin were statistically significantly high in GDM cases (148.47

$\pm$ 9.60pmol/L) as compared to controls (62.85 $\pm$ 5.12 pmol/L) (p value 0.008). There was a negative correlation of ferritin with blood sugar level (r value -0.039, p value 0.794). Our data showed that higher serum ferritin levels are associated with increased risk of GDM. These data suggest that there may be a systemic inflammation involved in the pathophysiology of GDM, indicated by elevations of serum ferritin levels. To some extent, the inflammation is mediated by body fat mass or obesity before and during pregnancy. The inflammatory cytokines, including tumor necrosis factor- α and interleukin-1 α , have been shown to induce ferritin synthesis in the experimental models (10). Thus, serum ferritin may be an unreliable indicator of iron stores when there is infection or inflammation (15, 16). Pregnancy itself is an inflammatory state; serum CRP levels are raised as early as 4 weeks of gestation (17). Jiang *et al.* (18) found that high serum ferritin and CRP levels are independent risk factors for type 2 diabetes.

In conclusion, in our study women who had high serum ferritin had the greater risk of GDM. In pregnancy iron supplementation with the therapeutic doses of iron are given to all the females in Indian population without assessing the ferritin levels. The supplementation with iron should be given after assessing the levels of ferritin. GDM was a potent risk factor for subsequent development of DM, Further studies in larger populations are required to establish this study in Indian population.

Conflict of interest

The authors declare that they have no conflict of interest concerning this article.

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