

Association of Serum Ferritin with Gestational Diabetes Mellitus

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Abstract

Original Research Article

Background: The aim of the present study was to evaluate the association of serum ferritin with GDM (n=60) and without GDM (n=60). The age and body mass index of the participants along with their gestational age, gravidity and parity were harmonized. The serum ferritin levels and blood glucose were investigated. The results revealed that pregnant women with GDM had significantly higher level of serum ferritin than their healthy counterparts. **Methods:** This cross sectional analytical study was done in Department of Obstetrics & Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), and Dhaka, Bangladesh during April 2019 to March 2020. 120 pregnant women between 18-35 years of age attending antenatal clinic in their 24-34 weeks of pregnancy were included in this study. Among them 60 diagnosed case of GDM were considered as group A and rest 60 (without GDM) were considered as group B. Serum ferritin concentration was measured in all of these patients. **Results:** The mean serum ferritin level was 121.1±17.7 ng/ml and 86.4±19.9 ng/ml in group A and group B respectively. The difference was statistically significant (p<0.05) between two groups. More than half (65.0%) patients had serum ferritin level >120 ng/ml in group A and 12(20.0%) in group B. Serum ferritin level >120 ng/ml had 3.1 (95.0% C.L. 1.6 to 7.60) times significantly (p<0.05) increase to develop gestational diabetes mellitus. **Conclusion:** The serum ferritin was markedly higher in women with GDM than without GDM. Therefore, high serum ferritin can be regarded as a significant risk factor for the development of GDM.

Keywords: Gestational diabetes mellitus, Pregnancy, Ferritin.

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INTRODUCTION

Among all obstetric complications, gestational diabetes mellitus (GDM) is a rising prevalence of a disorder characterized by variable severity of glucose intolerance with onset or first recognition in pregnancy, has been reported over the years, reaching 10-15% in the world [1]. GDM is diagnosed when FBS is 5.1-6.9 mmol/L or 2 hours plasma glucose is 8.5-11.0 mmol/L following a 75g oral glucose load [1].

The prevalence of GDM varies among different races and ethnic groups [2]. In Bangladesh, the prevalence of GDM is 9.7% [3]. Certain groups of women are at increased risk of developing GDM. The risk factors are: age >35 years, BMI >30 kg/m², prior history of GDM, previous macrosomic baby (weight >4.5 kg), prior history of unexplained still birth, family history of diabetes and PCOS [2]. Women with GDM

are unable to increase insulin production to compensate for the increased insulin resistance, resulting in β -cells deterioration and hyperglycaemia [4]. Serum ferritin concentration provides an indirect estimate of body iron stores because it is highly correlated with bone marrow iron. Ferritin is also a positive acute-phase reactant and increases in the presence of various acute or chronic disease conditions [5, 6].

Iron overload and the oxidative stress contribute to the pathogenesis and increase risk of type 2 diabetes. If iron overload, the accumulation interferes with the extraction, synthesis and secretion of insulin [7]. High level of ferritin was a risk factor for the development of gestational diabetes mellitus (GDM) in pregnant women [8].

Elevated serum ferritin concentration, which is associated with insulin resistance and diabetes in the

general population, has also been recently described in GDM. In some studies, high iron level has been shown to be a harmful factor for the body via oxidative stress and free radicals [9]. GDM is associated with an increased serum C-reactive protein level; some authors suggest that GDM might be part of an inflammatory process [6, 10]. It has been previously reported that iron overload promotes inflammatory processes by inducing free radical formation through an oxidative mechanism [11]. GDM is a common pregnancy complication and is associated with increased maternal and neonatal morbidity. Identifying and treating women with or at risk for GDM is important to improve the outcomes. The objective of this study was to compare serum ferritin between GDM and without GDM patients and to determine the association of serum ferritin with GDM.

METHODOLOGY

This cross sectional analytical study was conducted in BSMMU, during April 2019 to March 2020. A total of 120 pregnant women of which 60 with GDM were one (Group A) and rest 60 without GDM were another group (Group B) were selected by non-random purposive sampling technique. The participants with GDM were used as experimental group while the healthy pregnant women without GDM within 18 to 35 years were selected as control group. Pregnant woman with history of diabetes mellitus, severe anaemia, haemoglobinopathies, acute or chronic infection, renal diseases, liver diseases, thyroid disorder were excluded from the study. Demographical variable were age of the pregnant women, educational status, occupational status, socio-economic status, exposure variable was Serum ferritin and outcome variable was GDM.

Venous blood (5ml) was taken from the ante cubital vein. Serum ferritin concentration was measured by Chemiluminescence Microparticles Immunoassay method (CMIA) in Abbott Architect system (ci4100). When there was delay the samples was stored 2-8° Celsius for 7 days and if more delay, the samples was stored at -20° Celsius till further analysis. Normal level of serum ferritin in female: 22-120 ng/mL.

Statistical analyses of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-22). Comparison of means made by using Student t-test and categorical data was analyze by Chi-square Test, Odds Ratio (OR) with 95% confidence interval and p value < 0.05 was considered significant.

RESULTS

The mean age was 29.5±4 years in Group A and 28.1±4.4 years in Group B. The difference was statistically not significant (p>0.05) between two groups. According to parity, it was observed that almost two third (70.0%) patients were multipara in Group A and 39(65.0%) in GroupB. The difference was statistically not significant (p>0.05) between two groups. The mean duration of gestation was 29.3±3.6 weeks in Group A and 27.6±3.5 weeks in Group B. The difference was statistically not significant (p>0.05) between two groups. The mean serum ferritin level was 121.1±17.7 ng/ml in Group A and 86.4±19.9 ng/ml in Group B. The difference was statistically significant (p<0.05) between two groups. Regarding association between elevated serum ferritin and GDM, it was observed that more than half (65.0%) patients had serum ferritin level >120 ng/ml in Group A and 12(20.0%) in Group B. Serum ferritin was significantly (p<0.05) increased (3.1 times) to developed GDM.

Table-I: Distribution of the study patients by age (n=120)

Age group (years)	Group A		Group B		P-Value
	n=60	%	n=60	%	
<20	0	0.0	3	5.0	0.09 ^{ns}
20-30	42	70.0	48	80.0	
>30	18	30.0	9	15.0	
Mean±SD	29.5±4.0		28.1±4.4		

Ns=not significant, p value reached from Unpaired t-test

Table-II: Serum ferritin concentration in study patients (n=120)

Duration of gestation (week)	Group A (n=60)	Group B (n=60)	P-Value
	Mean±SD	Mean±SD	
Serum Ferritin levels (ng/ml)	121.1±17.7	86.4±19.9	0.001 ^s

s= significant, p value reached from Unpaired t-test

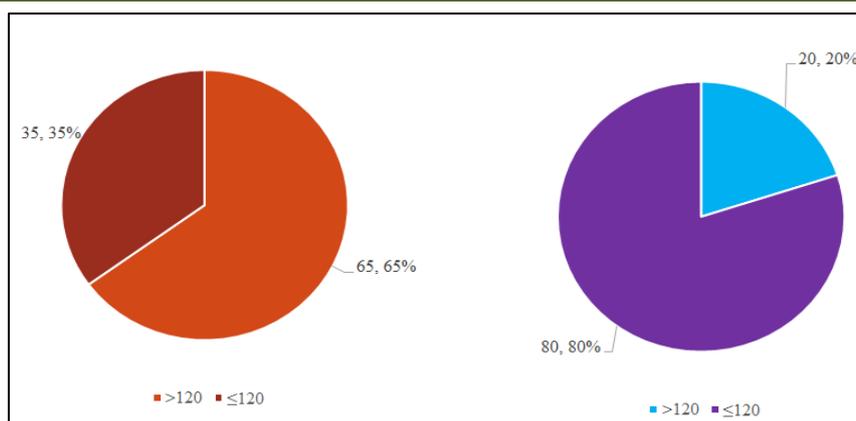


Fig-I: Association between elevated serum ferritin and GDM (n=120)

Serum Ferritin levels (ng/ml) of Group A (n=60)	Serum Ferritin levels (ng/ml) of Group B (n=60)
OR(95% CI)= 3.1(1.6-7.60), p value=0.001 ^s (P value performed by Chi-square test, s =significant)	

DISCUSSION

The aim of present study was to; compare serum ferritin level between two groups and to evaluate any association between serum ferritin level and GDM. In this present study, it was observed that 70.0% patients belonged to age 20-30 years in Group A and 80.0% in Group B. The mean age was 29.5±4 years in Group A and 28.1±4.4 years in Group B. The difference was statistically not significant ($p>0.05$). In this current study 70.0% patients had multipara in Group A and 39(65.0%) in Group B. And the mean duration of gestation was 29.3±3.6 weeks in Group A and 27.6±3.5 weeks in Group B, which were almost similar between two groups. A significant correlation between higher serum ferritin levels and insulin resistance syndrome has been showed [11-13]. Some studies revealed a significant association between higher serum ferritin and risk of type 2 diabetes [14].

Present study also confirmed that the mean serum ferritin levels were 121.1±17.7 ng/ml in Group A and 86.4±19.9 ng/ml in Group B, which is significantly ($p<0.05$) elevated in Group A. In one study showed that in pregnant women with gestational diabetes, the serum ferritin level was found to be higher (41±35 in GDM and 35.5±30.7 in non GDM) in comparison with healthy pregnant women and the difference was statistically significant ($p<0.05$) [9]. The risk of type 2 diabetes is increased when the level of ferritin is elevated [15]. Serum ferritin levels were significantly elevated in GDM with compared to non GDM group also observed by many investigators [14, 16, 17].

The result found in the present study, that 65.0% patients had serum ferritin level >120 ng/ml in Group A and 20.0% in Group B. Serum ferritin level >120 ng/ml had 3.1 (95.0% C.I. 1.6 to 7.60) times significantly ($p<0.05$) increase to developed gestational diabetes mellitus with compared to healthy pregnant women. In a study showed that the risk of having GDM with these high level of ferritin to be 1.4-fold higher

than that in subjects with lower ferritin concentrations having OR 1.4 with 95% CI= 1-1.87 ($p<0.05$) [9]. The investigators also reported that after adjusted for age Odds Ratio was 1.38 (95% CI=1.02-1.86) ($p<0.05$). That high ferritin levels increased the risk of gestational diabetes to 2.4-fold with 95% CI= 0.83-6.9 ($p<0.05$) [18]. The risk of having GDM to be more than two fold higher than the risk for those with lower concentrations of ferritin were also observed [19]. The above findings are closely resembled with the present study.

Serum ferritin is significantly higher in GDM when compare with non GDM women. Thus high serum ferritin may be considered as a risk factor for the development of GDM.

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