

Elevated Serum Ferritin Levels in Gestational Diabetes Mellitus (GDM) at a Tertiary Care Hospital

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ABSTRACT

Objective: To determine the frequency of elevated serum ferritin levels in gestational diabetes mellitus (GDM) at a tertiary care hospital.

Material and methods: This cross sectional study was carried out from 10th July 2017 to 10th January 2018 at "Department of Obstetrics & Gynaecology, Shaikh Zayed Hospital, Rahim Yar Khan". The sample included 114 pregnant women with gestational diabetes mellitus both primi- and multi-gravida. Patients with known diabetics and hypertensives, patients with history of heart diseases and malignancies like breast cancer and brain tumor, severely anemic ladies were excluded. Routine investigations like FBS and serum ferritin levels were done. age, FBS, serum ferritin levels, gestational age, obesity, residential status and family history of GDM was recorded.

Results: In present study, age range was 20-40 years and mean age of 30.535±4.29 years, mean gestational age 29.228±2.95 weeks, mean BMI 26.359±1.93 kg/m², mean Baseline FBS 124.780±6.14 mg/dl and mean Serum ferritin level was 18.122±4.57 ng/ml. Majority of the patients (50.9%) belongs to 31-40 years age group. 33.3% patients were of obese category. 28.9% patients have family history of GDM. Patients from rural areas were 43% and from urban areas were 57%. Elevated serum ferritin level was seen in 102 (89.5%) patients.

Conclusion: Serum ferritin level was high in GDM patients. We conclude that the elevated serum ferritin levels lead to gestational diabetes.

Keywords: GDM, serum ferritin levels, obesity

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as "any degree of glucose intolerance occurring first time during pregnancy".¹⁻⁴ With the global increase in obesity, GDM prevalence has also increased. Figures show a variable range of incidence in all pregnancies starting from 1 to 14% that are complicated by gestational diabetes mellitus.⁵ According to the latest report of the American Diabetes Association, prevalence of GDM has increased and it is considered to affect up to 15–20% of all pregnancies.⁶ GDM, being the highly frequent among medical complications of pregnancy, has association with many long and short term maternal and neonatal adverse outcomes.⁷ Firstly, the existence of GDM always related with an augmented maternal risk of preeclampsia, caesarean section, and development of type-II DM post pregnancy. Macrosomia being another major complication, which is one of risk factors leading to instrumental delivery, caesarean section and shoulder dystocia during the delivery and post birth neonatal hypoglycemia.⁸ Influence of intrauterine hyperglycemia environment further may complement the children in later on life. So, primarily, management of GDM is intended at controlling of levels of glycemia.^{9,10}

In humans, iron is stored as Ferritin and it acts as key role in the metabolism of iron. Ferritin levels gives a roundabout estimate of body iron stores because it is extremely interrelated with bone-marrow iron.

Serum ferritin is a reactant which triggers in acute-phase. It is raised in the existence of different chronic or acute diseases. In a number of chronic inflammation related diseases, altered levels of ferritin have been found. In recent studies, significant relation have been shown between insulin-resistance syndrome and increased levels of ferritin and risk of type 2 diabetes.¹¹ Serum ferritin level has been shown to be as high as 92% in gestational diabetes.¹²

With careful search, it has been found that there is no local study that has reported association of serum ferritin levels and gestational diabetes. Results of international studies cannot be generalized on our population due to different confounding variables in different populations like life style and dietary habits. Therefore we planned this study keeping these facts in mind and to generate database on local population. The findings of this study would help us to take preventive measures to improve pregnancy

outcomes and decrease disease morbidity.

MATERIAL AND METHODS

This cross sectional study was conducted during 10th July 2017 to 10th January 2018 at "Department of Obstetrics & Gynaecology, Shaikh Zayed Hospital, Rahim Yar Khan". A total of 114 women with gestational diabetes both primigravida and multigravida were included in this study. Patients with known diabetics and hypertensives, known cases with heart diseases and malignancies like breast cancer, brain tumor and severely anemic ladies were excluded. Three ml blood samples were taken and sent to the hospital laboratory for routine investigations like FBS and serum ferritin levels. The test was performed by a senior Pathologist having more than 10 years of experience. All the data such as age, FBS, serum ferritin levels, gestational age, obesity, residential status and family history of GDM was recorded.

By using SPSS version 20, mean and SD was calculated for age, baseline FBS level, Serum ferritin levels, gestational age, and BMI. Frequencies were calculated for obesity, residential status, family history of GDM and elevated serum ferritin levels. Effect modifiers like age, gestational age, family history of GDM, residential status and obesity were controlled by stratification to see the effect of these variables on outcome (elevated serum ferritin levels). Post stratification Chi square test was applied at level of significance (≤ 0.05).

RESULTS

Age range was 20-40 years, and mean age, mean gestational age, mean BMI, mean FBS and mean ferritin level was 30.535±4.29 years, 29.228±2.95 weeks, 26.359±1.93 kg/m², FBS 124.780±6.14 mg/dl and 18.122±4.57 ng/ml respectively.

Majority of the patients (50.9%) belongs to 31-40 age group, 33.3% patients were of obese category, 28.9% patients have family history of GDM, Patients from rural areas were 43% and from urban areas were 57% and elevated Serum Ferritin Levels was seen in 102 (89.5%) patients (Table 1) Stratification of Elevated Serum Ferritin Levels with respect to age, gestational age, obesity, family history of GDM and residential area are shown in Table 2.

Table-1: Distribution of patients according to age, obesity, family history, residential area and Elevated Serum Ferritin Levels

Variable	N	%
Age Distribution		
20 – 30	56	49.1%
31– 40	58	50.9%
Obesity		
Yes	38	33.3%
No	76	66.7%
Family History of GDM		
Yes	33	28.9
No	81	71.1
Residential Status		
Urban	49	43.0
Rural	65	57.0
Elevated Serum Ferritin Levels		
Yes	102	89.5
No	12	10.5
Total	114	100%

Table 2: Stratification in relation to age, gestational age, obesity, family history and residential status

Variable	Elevated Serum Ferritin Levels		P value
	Yes	N	
Age (in Years)			
20 – 30	49	7	0.4999
31 – 40	53	5	
Gestational Age			
26 – 30	70	9	0.6508
> 30	32	3	
Obese			
Yes	34	4	1.0
No	68	8	
Family History			
Yes	29	4	0.72321
No	73	8	
Residential Status			
Urban	44	5	0.922458
Rural	58	7	

DISCUSSION

In this study, association of ferritin levels with GDM found significant that was independent of BMI. Other studies have shown that elevated levels of ferritin enhance the risk of DM^{13,14} and pre-diabetes.¹⁵ However it is not clear that this association is independent of BMI or not.^{16,17} In our study, levels of elevated ferritin were seen in 102 (89.5%) patients. Our study results are comparable with local study in which serum ferritin level has been shown to be as high as 92% in gestational diabetes.¹²

Lao et al revealed that hemoglobin >13 g/dl was an independent risk for gestational diabetes in pregnant women and that women with iron deficiency anemia had a lesser risk of gestational diabetes mellitus.^{18,19}

Tae Gyu Ahn et al found that higher ferritin levels (at 28–33.9 weeks gestation) has association with risk of development of GDM as much as 3.7%.

Lubna Durrani and colleagues²¹ also indicated in a systemic review that high levels of maternal serum ferritin played an important role in the development of GDM.

Feroz Alam et al²² in an Indian case-control study divided 50 women having 24-28 weeks gestational age into 35 GDM cases and 15 normal controls. They found significantly higher values of serum ferritin (p< 0.05) in gestational diabetes mellitus cases as compared to control group.

Binit Mamkoottathil Benny et al²³ found 5 times greater odds of developing GDM in pregnant women having haemoglobin more than 12.6 g/dL (p = 0.001).

Ce Sun et al²⁴ in a meta-analysis suggested that increased ferritin levels are associated with an increased risk of GDM.

Preeyaporn Jirakittidulet al²⁵ in one retrospective cohort study revealed that the group which was supplied with early iron supplement had significantly higher prevalence of GDM as

compared to control group. (9.7% vs 5.6%).

Association of increased risk of gestational diabetes mellitus and greater ferritin levels has also been studied by Shimin and colleagues²⁶ and Sharifi F et al²⁷.

Our results were in agreement with Chen who has found that women with highest quintile of serum ferritin had twice the increased risk of gestational diabetes.¹¹

Katherine A Bowerset al²⁸ in a case control study revealed plasma concentrations of ferritin and sTfR were significantly elevated in gestational diabetes cases than in the controls in early pregnancy. A significant association in Ferritin and GDM risk was found even after adjusting major risk factors of gestational diabetes mellitus, including pre-pregnancy BMI.

In another study²⁹ authors found that women having developed diabetes during pregnancy had an elevated concentration of serum ferritin than the women without gestational diabetes (p=0.01). Author took 45ng/ml ferritin concentration as the 75th percentile in case of healthy females with pregnancy. Considering the above said level, in GDM group 32% and in normal subjects 25.2% of women shown to have high ferritin levels (p=0.01), GDM risk being 1.4fold higher than in the subjects having low concentrations.

Shristi Rawal et al³⁰ in this case-control study revealed a positive association between Ferritin levels and risk of GDM. Adjusted odd ratio (95% CI) was 2.43 for highest versus lowest quartile (1.12, 5.28) at weeks 10–14 and 3.95(1.38, 11.30) at weeks 15–26.

CONCLUSION

We conclude that the elevated serum ferritin levels lead to gestational diabetes.

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