

Levels of Serum Ferritin & BMI as A Risk Factor For Developing of Gestational Diabetes Mellitus

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ABSTRACT

Objective: To compare the ferritin levels between normal gravid women and women with diabetes mellitus (gestational) and to investigate the influence of elevated serum ferritin levels on the risk of diabetes mellitus (gestational).

Methods: This comparative cross-sectional study was carried out at Physiology Department of BMSI Jinnah Postgraduate Medical Center in cooperation with the department of Gynecology and Obstetrics of Jinnah hospital, Karachi. This study was performed on 60 gravid women of age ranging between 20-40 years and gestational age 28 weeks to 33 weeks, divided into two equal groups. Ferritin levels of subjects were measured through enzyme linked immunosorbent assay (Elisa), fasting and random blood glucose by enzymatic method & hemoglobin by Sahlis hemoglobinometer.

Results: In women with diabetes mellitus (gestational) levels of ferritin were significantly elevated as contrast to control group pregnant female. Serum ferritin was detected 70.3 ± 77 ng/ml versus 19.8 ± 0.31 ng/ml, fasting blood sugar 194.9 ± 0.81 VS 80.3 ± 0.65 and random blood sugar 279.4 ± 2.27 VS 109.7 ± 1.11 .

Conclusion: Levels of ferritin were observed significantly greater in women with gestational diabetes mellitus in contrast to control group gravid women due to inflammation but not due to iron over load & inflammation created by higher BMI before pregnancy.

Key Words: Ferritin, Blood Sugar, Pregnancy, Diabetes Mellitus, BMI.

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INTRODUCTION:

Diabetes mellitus (gestational) is defined as any grade of glucose intolerance first renowned during pregnancy. Description pertains whether insulin or only diet improvement is used

for treatment & whether or not the condition continues after pregnancy¹. Insulin is a heterodimeric protein isolated from the pancreas. Receptors of insulin from tissue composed of two subunits. Elevated levels of glucose increase the secretion of insulin from pancreas². Mechanism of insulin resistance in pregnancy remains unclear, but the possible mechanism may be considered are firm binding of insulin to plasma protein during pregnancy, decreasing the rate of insulin availability to tissue³. Insulin resistance gradually develops during the phase of pregnancy⁴. Ferritin is a highly preserved iron binding protein⁵. Pro-inflammatory cytokines TNF & Interleukin 1 α (IL-1 α) convince the H chain of ferritin signifying the way correlated to inflammation^{6,7}. Ferritin is a protein of an acute phase inflammatory process. High serum ferritin

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levels occur in iron overload or inflammation⁸. Association between diabetes & ferritin is not clear but deposition of iron in the liver may cause insulin resistance by interfering with the capability of insulin to decrease the hepatic glucose production⁹. Pregnant women with higher serum ferritin levels in early gestation $> 131\text{p mol/L}$ have two fold increase the risk of gestational diabetes mellitus¹⁰. Adipose tissue observed as dynamic tissue effective of producing elements for instance, adipokines, which participate in the pathogenesis of insulin resistance. Normal pregnancy considered as a “diabetogenic stage”¹¹.

METHODS:

This cross-sectional research was conducted in the Department of Physiology, BMSI, Jinnah Postgraduate Medical Center, Karachi, with the collaboration of Gynae/Obs: department, during the period of June 2008 to May 2009. 60 subjects were selected for the study and they were divided into two equal groups, all the women were in third trimester of pregnancy. Group A- consists of normal gravid female, and Group B- comprising of female with diabetes mellitus (gestational). Inclusion criteria were women with normal pregnancy, women with diabetes mellitus (gestational) & age 20-40 years. Exclusion criteria were ladies having age below 20 years and above 40 years, known type 1 & type 2 diabetes, malignancy disorders, acute & chronic inflammatory conditions. The research was conducted after the permission of ethical committee.

With the help of disposable syringe 5 ml of venous blood was drawn and transmitted to a gel centrifuge tube. Blood was centrifuged to take serum after clotting, Serum then removed to clean dry plastic cups and stored at -50°C . Serum was thawed and allowed to get room temperature before analyzing. All subjects' height and weight were measured in Kg and centimeters. For BMI calculations, height in centimeters was changed to meters. BMI of the subjects was measured by using formula: $\text{BMI} = \frac{\text{Body weight in Kg}}{\text{ht in meter}^2}$.

Serum ferritin was assessed by ELISA process. Serum glucose was determined by enzymatic colorimetric (GOD PAP) method, using kit, kat No. GL.1021 manufactured by Rondox UK. And Hemoglobin by Sahlis hemoglobinometer.

For Data analysis paired-t-test for co-relation SPSS version 10.0 for windows paired simple t-test was used to analyze the numeric parameters such as inflammatory markers and age. Pearson's co-relation co-efficient (r) were calculated to create the linear co-relation among ferritin, random blood sugar, fasting blood sugar, hemoglobin and BMI.

RESULTS:

The present study reveals that serum ferritin levels proportionally increased in inflammation created by higher BMI before pregnancy.

The mean values of age, body mass index and weight were statistically greatly significant ($p=0.001$) in females with GDM as contrast to normal study group. Whereas the height & gestational age mean values were non-significant (Table-I). Mean serum ferritin, fasting & random blood sugar level were greatly significant ($p=0.001$) in gravid female with GDM as contrast to normal pregnant women (Table-II). Ferritin levels displayed statically significant ($p=0.001$) positive correlation with Body Mass Index & RBS in gravid female with GDM only & highly significant correlation was also seen with serum ferritin, fasting blood sugar & Hemoglobin in group A & B (Table III).

DISCUSSION:

Diabetes mellitus (Gestational) is a collective metabolic syndrome of pregnancy; it increases maternal morbidity due to increase in pre-eclampsia & polyhydramnios. The outcomes of our research propose that in gestational diabetes mellitus patients in the last period of gestation, the values of ferritin were obtained to be higher as contrast to female with normal pregnancies. These results are matched with the research performed by Chen et al¹².

Table-I: Assessment of Biophysical Parameters between Normal Pregnant Women and Women with GDM

Parameters	Group A Normal gravid female	Group B Gravid female with gestational diabetes mellitus	P - Value
Age	23.6 0.27	33.7 0.26	0.001
Gestational age	32.2 0.18	3.2 0.21	1.000
Height (m)	1.6 0.01	1.6 0.01	0.62
Weight (kg)	58.8 0.39	85.2 3.27	0.001
BMI (kg/m)	23.2 0.12	36.3 0.22	0.001

Table-II: Assessment of Serum Ferritin, Fasting & Random Blood Sugar between Two Groups

Parameters	Group A Normal gravid female	Group B Gravid female with gestational diabetes mellitus	P - Value
Serum Ferritin	19.8 0.31	70.3 0.77	0.001
Fasting blood sugar	80.3 0.65	194.9 0.81	0.001
Random blood sugar	109.7 1.11	279.4 2.27	0.006
Hemoglobin (g/dl)	12.2 0.12	12.0 0.10	0.148

Table-III: Correlation Coefficient of Ferritin VS Hemoglobin, BMI FBS & RBS Two Groups

Parameters	Group A Normal gravid female	Group B Gravid female with gestational diabetes mellitus
Serum Ferritin Versus BMI	-0.317	
Serum ferritin Versus FBS	0.493	0.95
Serum Ferritin Versus RBS	-0.203	0.98
Serum Ferritin Versus hemoglobin	0.79	0.42

DISCUSSION:

Diabetes mellitus (Gestational) is a collective metabolic syndrome of pregnancy; it increases maternal morbidity due to increase in pre-eclampsia & polyhydramnios. The outcomes of our research propose that in gestational diabetes mellitus patients in the last period of gestation, the values of ferritin were obtained to be higher as contrast to female with normal pregnancies. These results are matched with the research performed by Chen et al¹².

Jiang et al¹³ stated that elevated body iron stores & only heme iron in diet are related

with high risk of diabetes. Fernandez et al¹⁴ found that increased body iron stores in general population associated with the occurrence of glucose intolerance, diabetes mellitus & gestational diabetes. This was also confirmed & proved in our study that shows increased iron stores in patients with gestational diabetes mellitus. Fsharifiet al¹⁵ found that higher concentration of serum ferritin were present in impaired fasting glucose subjects, the high-risk population for type 2 diabetes. In one study of inflammation performed on rat, found increased synthesis of intracellular iron storage protein

ferritin by liver preceded a reduction in serum iron level. This indicates that inflammation is responsible for the induction of ferritin synthesis. Lee et al¹⁶. Our results also justify with the results of Huges et al¹⁷ & Fords et al¹⁸ were studied that elevated serum ferritin & increased iron stores have been associated with diabetes.

BMI play as a prime risk factor for gestational diabetes mellitus. Adipokines such as, adiponectin, leptin & tumor necrotic factor released by adipose tissue cells play active role in the regulation of insulin sensitivity. Bays et al¹⁹.

Result of our research suggests that pre gravid body weight is a well-established predictor of gestational diabetes mellitus. These results are matched with the research performed by Meltzer et al²⁰ & Khine et al²¹. Furthermore, in our population we establish a significant positive correlation between ferritin, fasting & random blood glucose levels. These findings of our research are matched with the research of Saleem et al²².

CONCLUSION:

In an early gestation elevated serum ferritin levels linked with an increased risk of diabetes mellitus (gestational). Serum ferritin values were increased because of inflammation created by the higher BMI before pregnancy.

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