DOI: https://doi.org/10.53350/pjmhs2115102753

ORIGINAL ARTICLE

Frequency of Vitamin B12 Deficiency in Pregnant Women with Gestational Diabetes Mellitus

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ABSTRACT

Objective: To determine the prevalence of vitamin B-12 deficiency in pregnant women with gestational diabetes mellitus.

Study Design: Retrospective study

Place and Duration of Study: Department of Medicine, OMC Hospital, Jail Road Lahore from January, 2020 to December, 2020.

Methods: Two hundred and thirty pregnant females were enrolled age between 18-45 years. Detailed demographics of enrolled cases age, gestational age, gravidity and body mass index were recorded after taking informed written consent. Among 230 cases, 100 women were non GDM (group I) and 130 had gestational diabetes mellitus (group II). Blood samples were taken from all the patients for measuring vitamin B12 status. Vitamin B12 was defined as <300 pg/ml.

Results: Mean age of the patients in group I was 31.64±7.45 years with mean BMI 25.88±8.65 kg/m^2 while mean age among GDM group was 34.55±5.71 years with mean BMI 27.36±9.44 kg/m^2. Mean gestational age in group I was 33.72±4.21 weeks and in group II 35.08±9.27 weeks. In group I 20 (20%) had vitamin B12 deficiency and in group II rate ofvitamin B12 deficiency was high among 90 (69.2%) cases. We found a significantly relation between vitamin B12 and GDM with p value <0.0007.

Conclusion: The prevalence of vitamin B-12 deficiency among pregnant women of gestational diabetes mellitus was significantly high as compared to normal pregnant women.

Keywords: Pregnant Women, Gestational Diabetes Mellitus, Vitamin B12 deficiency

INTRODUCTION

Body mass index (BMI) more than 30 kg/m2 is on the rise among pregnant women in the United Kingdom [1]. Poor pregnancy outcomes, such as miscarriages and maternal fatalities [2], are connected with high BMI. It has also become more common for women to be diagnosed with gestational diabetes mellitus (GDM), which affects around 5% to 18% of all pregnancies, depending on the diagnostic criteria used.[3,4]

As critical micronutrients for DNA, protein, and lipid synthesis in a series of cell reactions known as one-carbon metabolism [5,6], vitamin B12 and folate are required. Homocysteine (Hcy) is converted to a methyl donor, methionine, which requires cofactors B12 and folate. A coenzyme, B12, is required for the mitochondrial conversion of methylmalonyl-CoA to succinyl-CoA; if B12 is absent, buildup of the former molecule limits fatty acid oxidation and promotes lipogenesis [7,8]. Because of this it may be hypothesized that low B12 levels, at the level of individual cells, may be linked to obesity-related issues through altering lipid metabolism [9] as well as cellular inflammation[10]. According to a recent systematic analysis, B12 deficiency is frequent in all trimesters among pregnant women around the world (between 20 and 30 percent) [11].

In India, protein-calorie malnutrition is still a major issue. A growing body of evidence also points to the role of maternal micronutrients for fetal growth [12]. As methyl donors in one-carbon metabolism, vitamin B12 and folate influence cell development and differentiation through altering DNA syntheses and epigenetic regulation. Consequently, they play a crucial role in fetal growth [13, 14]. If you are deficient in folate or vitamin B12, you will have elevated homocysteine levels. When it comes to vitamin B12 insufficiency, Methyl Malonic Acid (MMA) is regarded to be an accurate indicator.

B12 deficiency affects maternal and fetal health indicators such as body mass index (BMI) of the pregnant woman, insulin resistance and lipid profile [6–10]. It is unclear whether a vitamin B12 deficit increases the risk of gestational diabetes mellitus [15], despite research from the UK and India showing a higher frequency of GDM in women with vitamin B12 insufficiency [16, 17].

The aim of this study is to determine the prevalence of vitamin B-12 deficiency in pregnant women with gestational diabetes mellitus.

MATERIAL AND METHODS

This retrospective study was conducted at Department of Medicine, OMC Hospital, Jail Road, Lahore from January, 2020 to December, 2020 and comprised of 230 pregnant women. Detailed demographics of enrolled cases age, gestational age, gravidity and body mass index were recorded after taking informed written consent. Pregnant women with ages <18 years, patients with renal failure,

anemic women and those did not provide written consent were excluded from this study.

Patients were aged between 18-45 years. Among 230 cases, 100 women were non GDM (group I) and 130 had gestational diabetes mellitus (group II).5 ml blood was taken from peripheral vein; 3 ml was taken in EDTA tube and 2 ml in plain tubes. By centrifuging a blood sample, we were able to obtain Sera (x3000 rpm, 15 min.). Pathologist's analyzed the hemoglobin, Hct, RBC counts, and platelet counts. HbA1c (Colorimetric technique), blood glucose (hexokinase) and vitamin B12 (ELISA test) were determined by using sera. Under300 pg/ml of vitamin B12 was considered deficient. B12 levels were classified as normal if they were ≥300 pg/mL, marginally deficient when they were 200- 299 pg/mL, and deficient when they were 200 pg/mL.

The data was entered and analyzed through SPSS-23. Chi-square test was used to determine the relation between vitamin B12 and gestational diabetes mellitus. P-value <0.05 was taken as statistical significant.

RESULTS

Mean age of the patients in group I was 31.64±7.45 years with mean BMI 25.88±8.65 kg/m^2 while mean age among GDM group was 34.55±5.71 years with mean BMI 27.36±9.44 kg/m^2. Mean gestational age in group I was 33.72±4.21 weeks and in group II 35.08±9.27 weeks. 52 (52%) patients in group I was multigravida and 48 (48%) patients were primigravida while in group II multigravida were 75 (57.7%) and 55 (42.3%) were primigravida (Table 1)

Table 1: Baseline demographically details of enrolled cases

Characteristics	Non-GDM (group I)	GDM (group II)
Mean age (years)	31.64±7.45	34.55±5.71
Mean BMI (kg/m^2)	25.88±8.65	35.08±9.27
Mean gestational age (weeks)	33.72±4.21	35.08±9.27
Gravidity		
Primigravida	48 (48%)	55 (42.3%)
Multigravida	52 (52%)	75 (57.7%)

In group I 20 (20%) had vitamin B12 deficiency and in group II rate of vitamin B12 deficiency was high among 90 (69.2%) cases. We found a significantly relation between vitamin B12 and GDM with p value <0.0007 (Table 2).

Table 2: Prevalence of Vitamin B12 deficiency among both groups

Vitamin B12 Deficiency	Non-GDM (n=100)	GDM (n=130)	P-value
Yes	20 (20%)	90 (69.2%)	<0.0007
No	80 (80%)	40 (30.8%)	

Among 230 pregnant women, over all vitamin B-12 deficiency was found among 110 (47.8%) (Table 3)

Table 3: Rate of frequency among all enrolled cases (n=230)

Characteristics	Frequency	%age
Yes	110	47.8
No	120	52.2

DISCUSSION

In addition, women with GDM had a higher risk of prenatal morbidity and T2DM following pregnancy (McIntyre et al., 2019) [18]. GDM is more common in pregnant women who have vitamin B12 insufficiency (defined as concentrations 200 pg/mL). Obstetrical studies have connected inadequate vitamin B12 intake to metabolic problems such as insulin resistance and gestational diabetes. Folate and vitamin B12 deficiencies during pregnancy increase the risk of having a baby that is too small for the mother's gestational age.[19] Pregnant women with gestational diabetes mellitus who had vitamin B12 deficiency were studied in this study.

In this study 230 patient were presented. Patients were aged between 18-45 years. Among 230 cases, 100 women were non GDM (group I) and 130 had gestational diabetes mellitus (group II). Mean age of the patients in group I was 31.64±7.45 years with mean BMI 25.88±8.65 kg/m^2 while mean age among GDM group was 34.55±5.71 years with mean BMI 27.36±9.44 kg/m^2. These findings were comparable to the previous studies in which mean age of the patients were 25-35 years with body mass index > 25kg/m^2.[20,21] . Mean gestational age in group I was 33.72±4.21 weeks and in group II 35.08±9.27 weeks.[22] 52 (52%) patients in group I was multigravida and 48 (48%) patients were primigravida while in group II multigravida were 75 (57.7%) and 55 (42.3%) were primigravida.

In our study, 20 (20%) had vitamin B12 deficiency in group I and in group II rate of vitamin B12 deficiency was high among 90 (69.2%) cases. We found a significantly relation between vitamin B12 and GDM with p value <0.0007. Over all vitamin B-12 deficiency was found among 110 (47.8%).(vitamin B12 level <300 pg/mL). Published in 2016 was a connection between maternal vitamin B12 levels and the incidence of gestational diabetes mellitus. Retrospective data from the UK population showed not only a link between poor vitamin B12 status during pregnancy and increased risk for GDM, but also an independent prognostic function for B12 deficiency of a high BMI during the first semester. No cause or direction of association between these factors was established by this investigation.[23] In another previous research same results were presented that vitamin B12 deficiency is highly associated with GDM pregnant women.[24]Vitamin B12 deficiency in combination with high folate concentrations in the bloodstream increased the risk of GDM in comparison to normal vitamin B12 status and high folate concentrations.[25]

Researchers found that B12 deficiency interfered with the mitochondrial respiration process in Boachie et al.[26] GDM-related mitochondrial impairment has also been documented. Vitamin B12 deficiency during pregnancy has been linked to increased metabolic risk for both the mother and the child due to a changed lipid profile in the mother's blood. In cultured human adipocytes, genome-wide and targeted DNA methylation analysis has shown that vitamin B12 deficiency increases the expression of genes related to cholesterol biosynthesis, low density lipoprotein receptor (LDLR) and sterol regulatory element binding protein 1 (SREBF1) by hypomethylating their promoter regions [27]. Human preadipocyte cell lines exposed to low levels of vitamin B12 promote altered expression of 12 miRNAs related with adipocyte function and differentiation, according to Adaikalakoteswari et al., 2017. Vitamin B12

insufficiency was associated with insulin resistance and obesity in pregnant women [28].

High rates of maternal and neonatal problems are linked to gestational diabetes mellitus in pregnant women. B12 has a crucial role in the health of both mothers and newborns. To summarize, we found that 69.2 percent of women with gestational diabetes had Vitamin B12 insufficiency.

CONCLUSION

The prevalence of vitamin B-12 deficiency among pregnant women of gestational diabetes mellitus was significantly high as compared to normal pregnant women.

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