

Comparison of Body Mass Index and Physical Activity Patterns in Pregnant Women with and without Gestational Diabetes Mellitus

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ABSTRACT

Objective: To compare body mass index and physical activity patterns in pregnant women with and without gestational diabetes mellitus.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Gynecology and Obstetrics Department, Pak Emirates Military Hospital, Rawalpindi Pakistan, from Jun 2019 to Aug 2021.

Methodology: A total of 1500 pregnant women who came for routine antenatal checkup and underwent baseline investigations at 20th week of pregnancy were included in our study. Patients with suspicion of gestational diabetes underwent oral glucose tolerance test and diagnosis was confirmed. Body mass index and physical activity were compared in both groups along with other socio-demographic factors.

Results: Out of 1329 pregnant women studied, 998(75.1%) had no gestational mellitus at 20th week of pregnancy while 331(24.9%) had confirmed gestational diabetes on oral glucose tolerance test. Mean age of participants was 33.75±8.65 years. 909(68.3%) had normal body mass index, 220(16.5%) were overweight while 200(15.1%) women were obese. It was found that parity, high body mass index and low physical activity had statistically significant associated with presence of gestational diabetes in pregnant women included in our study (p -value<0.05).

Conclusion: Gestational diabetes mellitus was a fairly common finding in pregnant women managed in our hospital. Special attention should be paid on women who are primiparous, have high body mass index and low physical activity status at start or during the course of pregnancy.

Keywords: Body Mass Index, Gestational Diabetes Mellitus, Physical Activity.

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INTRODUCTION

Women who get pregnant face a lot of physiological changes in the body which some time prone them towards various pathological processes leading to number of illnesses.¹ Metabolic and endocrine changes at different phases of pregnancy have been well documented.² Blood sugar, fats and electrolyte abnormalities can be seen in women who are pregnant and may prove harmful for both mother and baby if left unchecked and unaddressed.³

Glycemic control in human body is of utmost importance and becomes more an area of concern if is affecting two beings as in case of pregnant women.⁴ Timely diagnosis become easy if clinicians are aware of risk factors which may predispose pregnant women towards poor glycemic control. Number of conditions

related to glucose metabolism and gestational diabetes mellitus have been reported during the pregnancy.^{5,6}

A lot of socio-demographic factors and clinical conditions have been associated with presence of gestational diabetes in women during child bearing. In 2021 Linder *et al.*,⁷ published a very important data from Germany regarding relationship of physical activity with obesity and diabetes. They concluded that advanced age and low education determined physical inactivity in data set and physical inactivity had strong association with obesity and presence of diabetes mellitus. Lust *et al.*, published similar data on pregnant women and came up with the findings that following same exercise routine as that was before pregnancy may be helpful in preventing gestational diabetes especially in those women who were high risk for having this disease during pregnancy.⁸ Xu *et al.*, went one step ahead and studied how metabolic health parameters before pregnancy can determine health parameters during pregnancy and

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related to outcome of pregnancy. It was revealed that high body mass index and other weight parameters were found statistically significantly related to presence of GDM and poor neonatal outcome.⁹

Prevention has always been the best and cost-effective strategy. Identifying the risk factors and addressing them in time may be beneficial for both fetus and mother. A local study published by Fatima *et al.*, in 2017 came up with the findings that pre-pregnancy high BMI and positive family history of GDM were risk factors for women for having GDM during pregnancy.¹⁰ We therefore planned this study with the objective to compare body mass index and physical activity patterns in pregnant women with and without gestational diabetes mellitus.

METHODOLOGY

This study was a comparative cross sectional study conducted in Gynecology and obstetrics department, Pak Emirates Military Hospital Rawalpindi from June 2019 to August 2020. WHO Sample Size Calculator was used for sample size calculation with population prevalence proportion of high BMI in patients of gestational diabetes mellitus as 13%.¹¹ Non probability consecutive sampling technique used to gather the sample for this study.

Inclusion Criteria: All the pregnant women between 18 and 45 years of age reporting for routine antenatal checkup at 20th week of pregnancy ready for blood investigations were included in the study.

Exclusion Criteria: The diagnosed cases of hypertension, type II diabetes mellitus, IHD, any metabolic or endocrine disorders or those who were morbidly obese were excluded. Patients with history of gestational diabetes in previous pregnancies were also excluded from the study. Women with past or current history of hypoglycemic drugs or any medications interfering with the glycemic control were also excluded from the study. Pregnant women who could not undergo oral glucose tolerance test were excluded as well.

Ethical approval was obtained from Internal Review Board of Pak Emirates Military Hospital (IREB Letter no: A/28). Study was explained and informed consent was taken. Pregnant women meeting the inclusion/exclusion criteria coming for routine antenatal checkup underwent blood sampling at 20th week of pregnancy. Intravenous blood samples were collected from the pregnant women with the help of 5ml syringe. Blood sugars were measured on random

and fasting sample. Patients with raised blood sugar levels underwent oral glucose tolerance test and gestational diabetes mellitus was diagnosed on the basis of OGTT.¹² Patients were categorized as normal, overweight and obese on the basis of body mass index calculated by consultant obstetrician.¹³ Physical activity was measured by international physical activity questionnaire and categorized as low, moderate or high.¹⁴

Data was entered and processed via statistical package for social sciences (SPSS-24.0). Mean and standard deviation for the age of pregnant women included in the study was calculated. Frequency and percentages for patients with gestational diabetes mellitus, classes of body mass index, parity and classes of physical activity were calculated. Chi-square was applied to look for any association between the dependent and independent variables. The *p*-values of less than or equal to 0.05 were considered as significant.

RESULTS

Target population was all pregnant women who underwent all baseline investigations including glycemic assessment at 20th week of pregnancy and agreed to follow up till the results were back but with the application of inclusion and exclusion criteria and consent of the individuals, 1329 women were finally recruited in the study which were followed up and analyzed. Out of 1329 pregnant women studied, 998(75.1%) had no gestational mellitus at 20th week of pregnancy while 331(24.9%) had confirmed gestational diabetes on oral glucose tolerance test. Table-I summarized the general characteristics of study participants. Mean age of participants was 33.75±8.65 years. 909(68.3%) had normal body mass index, 220(16.5%) were overweight while 200(15.1%) women were obese. 687(51.6%) were primi-parous while 642(48.4%) women included in our study were multiparous. On international physical activity questionnaire, 1031(77.5%) had low physical activity, 190(14.3%) had moderate while 108(8.2%) had high physical activity.

Table-II showed the results of statistical analysis. It was found that parity (*p*-value<0.001), high body mass index (*p*-value<0.001) and low physical activity (*p*-value-0.021) had statistically significant associated with presence of gestational diabetes in pregnant women included in our study while age (*p*-value-0.235) had no such relationship with presence of gestational diabetes in pregnant women in our data set.

Table-I: Characteristics of Pregnant Women Included in our Study (n=1500)

Study Parameters	n(%)
Age (years)	
Mean±SD	33.75±8.65 years
Range (min-max)	20 - 44 years
Parity	
Primiparous	687(51.6%)
Multiparous	642(48.4%)
Gestational diabetes mellitus	
No	998(75.1%)
Yes	331(24.9%)
Body mass index	
Normal	909(68.3%)
Overweight	220(16.5%)
Obese	200(15.1%)
Physical activity	
Low	1031(77.5%)
Moderate	190(14.3%)
High	108(8.2%)

Table-II: Comparison of Various Factors in Pregnant Women with and without Diabetes Mellitus (n=1500)

Factors Studied	No Gestational Diabetes Mellitus	Gestational Diabetes Mellitus	p-value
Age			
<35 years	768(76.9%)	265(80.1%)	0.235
>35 years	230(23.1%)	66(19.9%)	
Parity			
Primiparous	561(56.2%)	126(38.1%)	<0.001
Multiparous	437(43.8%)	205(61.9%)	
Body mass index			
Normal	730(73.1%)	179(54.1%)	<0.001
Overweight or Obese	238(26.9%)	152(45.9%)	
Physical activity			
Low	787(78.8%)	244(73.7%)	0.021
Moderate	127(12.7%)	63(19.1%)	
High	84(8.4%)	24(7.2%)	

DISCUSSION

Around 1/4th of our patients showed the presence of gestational diabetes in our study participants with physical inactivity and high BMI clearly associated with this condition. Gestational diabetes mellitus has not been an uncommon condition associated with pregnancy.^{3,5} A lot of pre-pregnancy factors may predispose a woman to develop this clinical condition during pregnancy. The factors which predispose individuals towards diabetes without pregnancy may be equally valid and responsible in case of pregnant women as well. We therefore conducted this study with an aim to compare body mass index and physical activity patterns in women who were pregnant and had GDM or did not have GDM.

A Brazilian study published in 2021 revealed that physical activity and weight profile had direct and indirect relationship and diet quality indices and had an impact on weight gain and poorly controlled gestational diabetes mellitus.¹⁵ Our study was slightly different in design and compared patients of gestational diabetes mellitus with pregnancies not having gestational diabetes mellitus and we found that high body mass index and low physical activity were found more in patients suffering from gestational diabetes mellitus.

Persson *et al.*, in 2015 studied this subject from another angle and followed up study participants for a long time to compare women with and without gestational diabetes mellitus during pregnancy.¹⁶ They concluded that overall women had low levels of physical activity but women with history of GDM had more chances of low physical activity even after four years of delivering their babies. We did not follow up our participants for long time but within limited time we had similar results as that of Persson *et al.*, that low physical activity had statistically significant relationship with gestational diabetes mellitus.

De Oliveira Santini *et al.*,¹⁷ in 2019 studied the impact BMI on gestational DM and physical activity during pregnancy and postpartum period. They came up with the findings that there was no significant difference in patients with and without normal BMI regarding diagnosis of GDM and it did not affect the physical activity status as well. Results generated by our study were different in this regard and we observed that women who were primiparous, had high BMI and low physical activity status at start or during the course of pregnancy were more at risk of being diagnosed with gestational diabetes mellitus.

Liang *et al.*, in 2021 studied clinical and demographic characteristics of women who suffered from gestational diabetes mellitus.¹⁸ They came up with a conclusion that pre-pregnancy BMI, family history of DM, history of polycystic ovarian disease and dyslipidemias were found more in patients with GDM as compared to those pregnant women who did not develop this condition. Our results supported the findings generated by Liang *et al.*

LIMITATION OF STUDY

Study design posed a major limitation to this study. Follow up was not done to look for the course of gestational diabetes mellitus and impact of factors studied on maternal and fetal outcome. Confounding factors which were not catered for in the study design may also hinder in

generalization of results and concluding that high BMI and low activity may be cause or risk factor for gestational diabetes mellitus.

CONCLUSION

GDM was a fairly common finding in pregnant women managed in our hospital. Special attention should be paid on women who are primiparous, have high BMI and low physical activity status at start or during the course of pregnancy.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AK & TY: Data acquisition, data analysis, critical review, approval of the final version to be published.

SSB & UH: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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