PREDICTORS OF GESTATIONAL DIABETES MELLITUS: STUDY CONDUCTED IN PUBLIC AND PRIVATE HEALTH CARE CENTRES OF PESHAWAR

by Ayesha Zakir

PREDICTORS OF GESTATIONAL DIABETES MELLITUS (GDM) AND THEIR INTERRELATIONSHIP IN THE DEVELOPMENT OF GDM: STUDY CONDUCTED IN PUBLIC AND PRIVATE HEALTH CARE CENTRES OF PESHAWAR

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ABSTRACT

Objective: The objective of the study was to determine the prevailing causes of gestational diabetes mellitus (GDM) and to analyze the relationship and strength of association among the risk factors in the development of GDM.

Method: This study was conducted in the Khyber teaching hospital, Health care center, and Kalsoom maternity home Peshawar. The targeted population was the registered cases of pregnant women with Gestational Diabetes Mellitus (GDM). Data was collected through questionnaire and antenatal cards of the gestational diabetic patients.

Results: 64 observed patients were ≥ 30 years of age, 64 patients had BMI greater than 25, and 71 patients showed a strong family history of diabetes mellitus. 73 patients were found multiparous and grand multiparous whereas 66 patients reported that they were suffered from GDM in their previous pregnancies.

Conclusion: According to the results, advanced maternal age i.e. above 30 years of age, multiparity, and family history of diabetes mellitus were found to be the strong predictors of GDM followed by BMI greater than 25 kg/m^2 and history of GDM in the previous pregnancies.

Key words: GDM, Maternal age ≥ 30years, Multiparity, BMI > 25, Strong family history of Diabetes mellitus, and past GDM history.

INTRODUCTION

The state of high blood glucose level during the second or third trimester of pregnancy due to inability of the pancreas to produce sufficient insulin or inability of the body's cells to properly utilize the insulin is termed as Gestational Diabetes Mellitus **1**.

GDM prevails in almost every country around the world. According to survey conducted in 173 countries found that the incidence of GDM ranged from 1% - 28%. **9**

Numerous risk factors for development of GDM have been reported. Advancing maternal age i-e. > 25 years of age has been described among women developing GDM. **2, 16** BMI of the woman has also been described as a risk factor of developing GDM. Overweight and obesity are strong predictors for development of GDM. The risk of development of GDM is doubled for overweight mothers at body mass index (BMI) 25.0-29.9 kg/m2 and at least 6-fold for obese

mothers at BMI ≥ 30 kg/m2 compared to women with normal BMI 3. Family history of DM is described as a strong risk factor for development of GDM. **2 and 4** Especially, family history of maternal DM2 is significantly more common among women with GDM than a paternal family history of DM2. **8** Higher parity has also been revealed as maternal risk factors for GDM. Grand multiparas (i.e. women with ≥ 5 deliveries) had more often an insulin dependent GDM than multiparas with 2-4 deliveries **17** and the risk of developing GDM was 2-fold compared to women with 2-3 deliveries. **12** Previous specific obstetric outcomes such as giving birth to a macrosomic child and previous GDM are considered as risk factors for GDM in the consecutive pregnancies. **2**

Generally, GDM is associated with obstetric and neonatal complications, morbidity and mortality. The most common fetal complications are fetal and neonatal (0-28 days after birth) loss, macrosomia (which can cause hypertrophic miocardiopathy, stillbirth, neonatal hypoglycemia, elevated levels of calcium and bilirubin in the blood, polycythemia), birth injury due to shoulder dystocia, respiratory distress syndrome, hyperglycemia is more common and premature delivery is more prevalent in cases of GDM. **14** and **20**

Maternal complications are pregnancy induced hypertension, pre eclampsia, c-section deliveries, macrosomia, antepartum hemorrhage, premature rupture of membrane, preterm labor, assisting deliveries. **11** Other complications are hypoglycemia, miscarriages, diabetic ketoacidosis, deterioration of diabetic retinopathy, deterioration of diabetic nephropathy, polyhydraminos. **5** Early diagnosis of GDM is very essential to prevent maternal, fetal and neonatal morbidity and mortality. GDM may complicate during the pregnancy, intrapartum or postpartum.

METHODOLOGY

This study was carried out in the Gynae Departments of Khyber teaching hospital, Health care centre, and Kalsoom maternity home of Peshawar, Pakistan. Data was collected from hundred pregnant patients suffering from GDM. Non-GDM pregnant mothers were excluded from our study. Properly designed questionnaires were used to collect data from the registered gestational diabetic mothers. Questionnaires include demographic data, diabetes history, anthropometrics, pregnancy history, maternal complications, type of therapy, pregnancy outcome, and newborn status.

Information about age, family history of diabetes, previous history of gestational diabetes and parity of the pregnant women were obtained during the face to face interview in the local language. A weight, height, fasting blood glucose and random blood glucose values were taken from the antenatal cards of gestational diabetic patients. Informed consent was obtained from each patient and a questionnaire was administered by researcher herself.

SPSS version 17.0 was applied to statistically analyze the collected data. Descriptive analysis, Pearson's Chi square correlation and Phi and Cramer's V tests were used to statistically analyze the data.

RESULTS

Table 1: Descriptive analysis of Maternal Age and Body Mass Index

Variables	No. of patients	Mean	Std. deviation	Mode	Maximum range	Minimum range
Age in years <20 20-29 30-39 >40	3 33 61 3	31.25	5.254	25.98	42	18
BMI in kg/m^2 Normal (18.0 – 24.9 kg/m^2) Overweight (25.0 – 29.9 kg/m^2) Obese ($\geq$ 30 kg/m^2)	36 56 8	25.98	2.674	26.3	31.7	18.7

Descriptive analysis of maternal age and body mass index is displayed in table 1.The observed mean age and middle age was 31.25 + 5.254 and 25.98, respectively which clearly demonstrate that GDM risk increases with advancing maternal age. The maximum and minimum age observed in the studied population was 42 and 18 years, respectively. More than half of the observed GDM patients were fall between 30 – 39 years of age.

According to the BMI values of GDM patients described in table 1 signifies that BMI greater than 25 is an alarming sign for developing GDM. The average BMI of the observed GDM patient was above 24.9 kg/m^2. Fifty six patients were overweight with BMI values fall between 25.0-29.9 kg/m^2 and eight patients were obese having BMI higher than 30 kg/m^2.31.7 kg/m^2 was the observed maximum BMI value in our studied population whereas observed minimum BMI values was 18.7 kg/m^2.

Table 2: Frequency of Parity

Variable		Frequency
Parity	Nullipara	27

	Primipara	7
	Multipara	58
	Grand multipara	8
Total		100

Table 2 shows the frequency of parity in the observed GDM patients. According to the results, the rate of multiparity was high in observed patients. Only twenty seven patients were found nulliparous. Seven patients were primiparous as they gave birth to one child. Fifty eight were found multiparous gave birth to more than two children and eight patients were grand multiparous as they gave birth to more than five children.

Table 3: Frequency of Diabetes History of GDM patients

Respondents	Family History of Diabetes Mellitus	Previous GDM History
Yes	71	66
No	29	34
Total	100	100

Diabetes history of GDM patients is displayed in table 3 which clearly shows that risk of GDM increases with the strong family history of diabetes mellitus. According to the present research, seventy one patients reported the occurrence of diabetes mellitus in their first degree relatives. Likewise, women who have GDM in the previous pregnancies are prone to develop diabetes in future pregnancies as demonstrated by the frequency of past GDM history in table 3. Sixty six patients had GDM in their previous pregnancies.

Table 4: Analysis of correlation and strength of association between the Predictors of 100 GDM patients

VARIABLES	Pearson chi square			Phi and Cramer's V	
	Value	df	p value	Value	p value
Age / Family History of DM	6.866[a]	3	0.076	0.262	0.076
Age / GDM History	8.150[a]	3	0.043*	0.285	0.043*
Age / Parity	39.140[a]	9	0.000*	0.626	0.000*
Age / BMI	7.002[a]	6	0.321	0.265	0.321
BMI / Family History of DM	1.381[a]	2.	0.501	0.118	0.501

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BMI / GDM History	4.392 [a]	2	0.111	0.210	0.111
BMI / Parity	14.090 [a]	6	0.029*	0.375	0.029*
Family History of DM / GDM History	0.289 [a]	1	0.596	0.053	0.596
Family History of DM / Parity	0.365 [a]	3	0.947	0.060	0.947
Parity / GDM History	38.30 [a]	3	0.000*	0.619	0.000*

P= <.05*

Table 4 shows the correlation and strength of association between the predictors of GDM in the studied population. Pearson chi square correlation values show the relationship and Phi and Cramer's V values shows the strength of association between the predictors. According to the present research, advanced maternal age, increasing parity and past GDM history showed a strong relationship in developing GDM. Likewise, increasing parity, higher BMI and previous GDM history also indicate strong connection with each other in the development of GDM.

According to the results, advancing maternal age and past history of GDM is associated with each other χ^2=8.150, df=3 and p=<.05. Phi and Cramer's V value shows medium strength of association between advanced maternal age and previous GDM history in the causation of GDM. Advanced maternal age and parity confides significant association with values χ^2=39.140, df=9 and p=<.0001. Similarly, value of Phi and Cramer's V test shows strong relationship between advanced maternal age and parity.

Positive correlation is also found between BMI and parity values of the observed in the development of GDM χ^2=14.090, df=6 and p=<.05. The result of Phi and Cramer's V test signifies medium strength of association between BMI and parity.

Highly significant association was found between parity and past GDM χ^2=38.302, df=3 and p=<.0001 in the development of GDM. Similarly, Phi and Cramer's V test shows strong strength of association as indicated by result displayed in table 4.

The results of correlation and strength of association between the risk factors of GDM indicated that increasing parity with advanced maternal age, higher BMI and GDM history in the previous pregnancies is strongly associated with the development of GDM.

DISCUSSION

This study was accomplished in order to observe the strong risk factors associated with GDM. According to analysis, advance maternal age, higher BMI, strong family history of diabetes, previous history of gestational diabetes mellitus and higher parity are the strong risk factors.

In this study, we observed that advancing maternal age was significant as 64 gestational diabetic patients were above 30 years of age. This shows that carbohydrate intolerance increases with age especially in females. This finding of carbohydrate intolerance with advancing age in females coincides with the results of Khan A Jaffarey and Randhawa MS et al **10** and **16**.

In this observation, 56 patients were found overweight and 8 were obese which shows that higher BMI during pregnancy can be an alarming sign of GDM. Overweight and obesity are well-known risk factors for development of GDM. Our result correlates well with the observation of Seshiah, et al, 2008 **18** and Toloroni, et al, 2009 **19** that BMI greater than 25.0 kg/m2 is positively associated with the development of GDM.

Multiparity and grand multiparity was found in 58 and 8 patients, respectively who correlate well with the observation of Randhawa MS et al, Roman H et al, and Nassar AH et al **12**, **16** and **17**, respectively that increasing parity is strongly associated with GDM. Grand multiparas (i.e. women with ≥ 5 deliveries) had more often an insulin dependent GDM than multiparas with 2-4 deliveries and the risk of developing GDM was 2-fold compared to women with 2-3 deliveries Whereas 7 patients were primiparous who gave birth to one child and they were suffered from GDM in their previous pregnancies.

GDM has revealed to follow a strong heritability. Majority of gestational diabetic women showed a positive history of diabetes mellitus in their families. This result is in accordance with the findings of Galtier **7** that GDM is strongly correlated with the positive family history of diabetes mellitus.

Furthermore, more than half of the patients had gestational diabetes history in their past pregnancies which correlates well with the findings of **6 and 13** that women with a previous history of gestational diabetes mellitus are at higher risk of developing GDM in their subsequent pregnancies.

The findings of the present research were in accordance with the results of research done by Radhia khan, khurshid Ali and Zakkia khan on "Socio-demographic Risk Factors of Gestational Diabetes Mellitus" **15** but they made comparison between healthy pregnant women and gestational diabetic patients whereas we observed the most prevailing risk factors for GDM. So

according to current research, advancing maternal age, multiparity, family history of diabetes mellitus, BMI > 25 and previous GDM history were found to be the strong predictors of GDM.

CONCLUSION

In conclusion, the results of this study revealed that the strong predictors for the development of Gestational Diabetes Mellitus include; maternal age ≥ 30 years, higher parity, and family history of diabetes mellitus especially among parents. BMI > 25 kg/m^2 and past history of GDM along with the strong predictors of GDM can worsen the situation. Based on this research, we concluded that with advanced maternal age, strong family history of diabetes and multiparity, only BMI is the factor that can be controlled by appropriate diet, physical activity and weight management prior to pregnancy in order to minimize the chances of developing diabetes mellitus in pregnancy.

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