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PREVALENCE AND RISK FACTORS FOR GESTATIONAL DIABETES AMONG CHILD BEARING AGE WOMEN - A CROSS SECTIONAL STUDY

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ABSTRACT

Objective: *To determine the frequency and risk factors of gestational diabetes mellitus (GDM) among child bearing age women.*

Materials and Methods: *A cross-sectional descriptive study was conducted at the gynecology department of HMC, Peshawar, involving 120 women using non-probability consecutive sampling method. Inclusion criteria comprised women presenting with a gestational age between 16 to 28 weeks. Exclusion criteria included preexisting diabetes, lack of prenatal care before 16 weeks, and delivery before 28 weeks. Data on risk factors such as hypertension, body mass index (BMI), place of residence, age, education, and occupation were systematically recorded. Statistical analysis was performed including descriptive statistics, chi-square test, student t-test, and logistic regression.*

Results: *GDM was present in 13 (10.83%). Women with GDM also had a significantly higher mean BMI (20.91 ± 2.20 kg/m²) (p = 0.015) and were more likely to be older than 25 years (92.31%) (p = 0.007). Univariate and multivariate analyses showed that each unit increase in BMI was associated with a 1.52-fold to 1.64-fold increase in GDM odds, and being older than 25 years was associated with a Significantly Higher Odds of GDM.*

Conclusion: *The frequency of GDM in this study is slightly higher than in previous research. Older age and higher BMI are significant risk factors for GDM.*

Keywords: *Gestational Diabetes Mellitus, Risk Factors, Body Mass Index, Age*

INTRODUCTION

Diabetes is a major public health challenge that often starts asymptomatically but leads to chronic hypoglycemia and organ damage.[1] Gestational diabetes mellitus (GDM) is characterized by dysglycaemia first detected during pregnancy, increasing risks for both mother and baby, such as gestational hypertension, preeclampsia, caesarean sections, macrosomia, congenital abnormalities, neonatal hypoglycemia, and later-life type 2 diabetes mellitus (T2DM).[2] Early detection and management are essential to reduce these risks. Global prevalence of GDM is approximately 7.0% and 16.7% in Pakistan.[3,4] In India has it ranged from 10% to 18%.[5] Factors contributing to this variation include ethnicity, diagnostic criteria, screening strategies, and population characteristics.

GDM diagnosis primarily relies on the oral glucose tolerance test (OGTT), either a 75-g two-hour test or a 100-g three-hour test. The 75-g two-hour OGTT is more practical and sensitive, requiring only one elevated glucose value for diagnosis compared to the 100-g three-hour test, which requires two abnormal values.[6]

Risk factors for GDM can be demographic, physiological, and lifestyle behaviours. Advanced maternal age increases the risk due to declining insulin sensitivity, while certain ethnic groups have a higher predisposition due to genetic and environmental factors.[7] Physiological factors include preexisting conditions such as obesity and polycystic ovary syndrome (PCOS). Obesity is linked to insulin resistance, making it harder for the body to regulate blood glucose levels.[8] PCOS often involves hormonal imbalances that can affect glucose metabolism, increasing the likelihood of developing GDM. **Lifestyle factors** such as diet, physical activity, and smoking also play a significant role. Poor dietary habits and physical inactivity contribute to weight gain and insulin resistance, while smoking can impair metabolic processes and exacerbate the risk of glucose intolerance.[9]

There is a gap in literature regarding the risk factors for gestational diabetes mellitus (GDM). Many of these risk factors are modifiable, which presents an opportunity for both clinicians and patients to actively prevent and manage GDM. Knowing these modifiable risk factors is essential for implementing effective strategies to reduce the incidence and complications associated with GDM.

The objective of this was to determine the frequency and risk factors of gestational diabetes.

Materials and Methods

The study design was a cross-sectional descriptive study conducted at the gynecology department of Hayat Abad medical complex, Peshawar. A sample size of 120 women was calculated using OpenEpi with an 8.5% prevalence from a previous study[10], aiming for 5% absolute precision and a 95% confidence level. Non-probability consecutive sampling was employed.

Inclusion criteria consisted of women presenting to the outpatient department of obstetrics and gynecology at Hayatabad Medical Complex Hospital, Peshawar, with a gestational age between 16 to 28 weeks. Exclusion criteria included women with preexisting diabetes, those who did not report for prenatal care before 16 weeks of gestation, and those who delivered before 28 weeks of gestation.

Gestational diabetes mellitus (GDM) was defined based on abnormal glucose tolerance detected during pregnancy using the 2-hour 75 g oral glucose tolerance test (OGTT), as per NICE guidelines.

Data collection involved obtaining ethical approval and informed consent from participants. Screening was initially performed at 16 weeks of gestation and repeated between 24 to 28 weeks if the initial test was normal. Participants were instructed to maintain a normal diet and physical activity before the test. After an overnight fast, a 75g glucose load (Galaxose-D in 250ml water) was administered, and blood samples were collected at 1-hour, 2-hour, and 3-hour intervals post-glucose ingestion. Blood sugar levels were measured using the glucose oxidase hexokinase method.

Risk factors for GDM were systematically recorded, including hypertension, body mass index (BMI), place of residence, age, education, and occupation. The presence or absence of hypertension was documented, and BMI was recorded as a continuous variable to assess its relationship with GDM. The trimester of pregnancy at the time of testing was noted, as it could influence GDM risk. Participants' place of residence was classified as either urban or rural. Age and educational level (e.g., primary, secondary, higher) were recorded to explore demographic associations with GDM. Employment status (employed or unemployed) was also documented to evaluate its impact on GDM risk.

Data analysis was conducted in R software 4.3.1. Mean and SD was computed for numeric data and frequencies with percentage for categorical variables. Frequency of GDM was compared among risk factors using chi-square test and student t test. Logistic regression was run to calculate odd ratios with 95% confidence interval using GDM as dependent variable and risk factors as independent variables. $p < 0.05$ was significant level.

RESULTS

Table 1 presents the descriptive statistics for risk factors of gestational diabetes among 120 participants. The mean age was 28.29 years (SD 7.45). The most common place of residence was urban (n = 76, 63.33%). Education levels varied, with the most common being illiterate (n = 42, 35.00%), followed by matric education (n = 35, 29.17%). The majority of participants were housewives (n = 101, 84.17%). The mean BMI was 19.60 kg/m² (SD 1.81). The most common age group was participants above 25 years (n = 69, 57.50%).

The gestational diabetes was present in 13(10.83%) women. **(Fig 1) Table 2** shows the distribution of risk factors among women with and without gestational diabetes mellitus (GDM). The mean age was significantly higher in women with GDM (33.15 ± 7.07 years) compared to those without GDM (27.70 ± 7.31 years) (p = 0.015). Most women with GDM resided in urban areas (84.62%), though this difference was not statistically significant (p = 0.13). Education levels were similar between the groups (p = 0.8). The majority in both groups were housewives (p > 0.9). Women with GDM had a significantly higher mean BMI (20.91 ± 2.20 kg/m²) compared to those without GDM (19.44 ± 1.70 kg/m²) (p = 0.015). Additionally, a significantly higher proportion of women with GDM were above 25 years of age (92.31%) compared to those without GDM (53.27%) (p = 0.007).

Table 3 provides the univariate and multivariate analyses for gestational diabetes mellitus (GDM) with respect to BMI and age. A positive association was observed for both BMI and age. Each unit increase in BMI is associated with a 1.52-fold increase in the odds of GDM (univariate OR: 1.52, 95% CI 1.12-2.12, p = 0.009; multivariate OR: 1.64, 95% CI 1.16-2.43, p = 0.007). Additionally, being older than 25 years is associated with significantly higher odds of GDM (univariate OR: 10.53, 95% CI 1.97-195.15, p = 0.026; multivariate OR: 13.11, 95% CI 2.29-251.49, p = 0.018).

Table 1: Descriptive statistics for risk factor of Gestational diabetes

Characteristic	**N = 120**
Age(years)	28.29 ± 7.45
Residence	
rural	44 (36.67)
urban	76 (63.33)
Education	
Higher	14 (11.67)
Illiterate	42 (35.00)
Matric	35 (29.17)
Primary	29 (24.17)
Occupation	
govt servant	19 (15.83)
house wife	101 (84.17)
BMI(Kg/M2)	19.60 ± 1.81
Age category	
Above 25 yrs	69 (57.50)
Upto 25 yrs	51 (42.50)

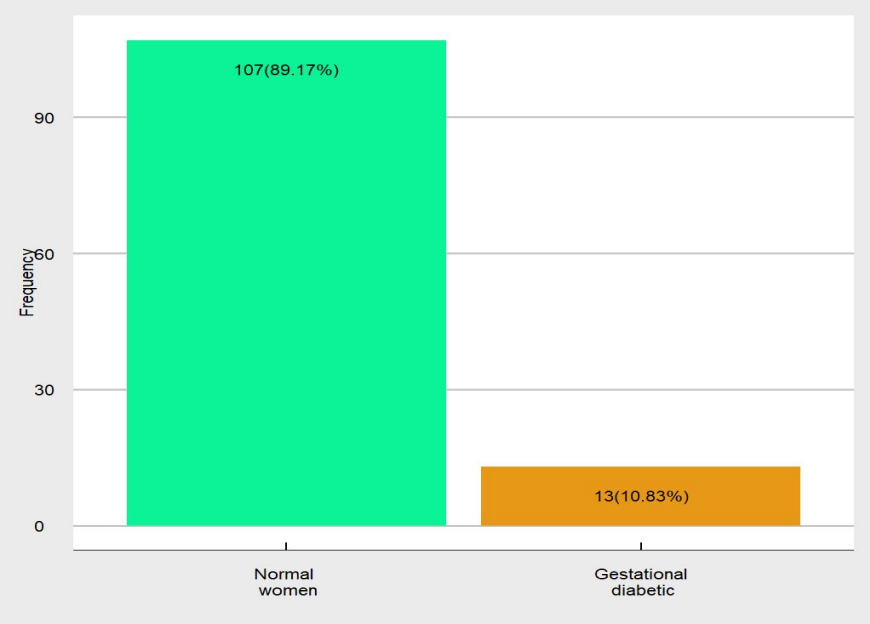

Fig 1. Frequency of gestation diabetes

Table 2: Distribution of risk factor in women with and without diabetes

Characteristic	**Without GDM**, N = 107	**with GMD**, N = 13	**p-value**
Age	27.70 ± 7.31	33.15 ± 7.07	0.015[a]
Residence			0.13[b]
Rural	42 (39.25)	2 (15.38)	
Urban	65 (60.75)	11 (84.62)	
Education			0.8 [b]
Higher	12 (11.21)	2 (15.38)	
Illiterate	37 (34.58)	5 (38.46)	
Matric	31 (28.97)	4 (30.77)	
Primary	27 (25.23)	2 (15.38)	
Occupation			>0.9 [b]
Govt servant	17 (15.89)	2 (15.38)	
House wife	90 (84.11)	11 (84.62)	
BMI	19.44 ± 1.70	20.91 ± 2.20	0.015[a]
Age group			0.007[b]
Above 25 yrs	57 (53.27)	12 (92.31)	
Upto 25 yrs	50 (46.73)	1 (7.69)	

[a]Student test; Fisher's exact test; [b]Pearson's Chi-squared test, GDM, Gestational diabetes mellitus

Table 3: Univariate and multivariate analysis for gestation diabetes with respect to BMI and age

Predictor	**characteristics**	**Without GDM**	**With GMD**	**Univariate* OR (95%CI)**	**Multivariate* OR (95%CI)**
BMI (kg/m^2)	Mean (SD)	19.4 (1.7)	20.9 (2.2)	1.52 (1.12-2.12, p=0.009)	1.64 (1.16-2.43, p=0.007)
Age	Upto 25 yrs	50 (98.0)	1 (2.0)	-	-
	above 25 yrs	57 (82.6)	12 (17.4)	10.53 (1.97-195.15, p=0.026)	13.11 (2.29-251.49, p=0.018)

*Logistic regression

DISCUSSION

Demographic factors such as age, ethnicity, and family history of diabetes are important because they influence susceptibility to GDM . A family history of diabetes signifies a genetic component that elevates risk. Our findings showed that 13(10.83%) women were affected by GDM. Women with GDM had a significantly higher mean BMI (20.9 ± 2.2) compared to those without GDM (19.4 ± 1.7). Each unit increase in BMI is associated with 1.52 odds of GDM. In the multivariate analysis, the OR was 1.64 (95% CI 1.16-2.43, p = 0.007), confirming that the association remains significant after adjusting for other factors. Women above 25 years had a significantly higher likelihood of GDM compared to those 25 years or younger. This suggests that being older than 25 years is strongly associated with higher odds of GDM, even after adjusting for other variables.

In Ghana, Boadu et al.[10] studied 200 pregnant women with an age range of 18 to 45 years. The prevalence of GDM was 8.5%. Risk factors identified included a history of oral contraceptive use (adjusted odds ratio [aOR]: 13.05, 95% CI: 1.43-119.23), previous preeclampsia (aOR: 19.30, 95% CI: 2.15-71.63), and intake of soda drinks (aOR: 10.05, 95% CI: 1.19-84.73).

In Saudi Arabia, Wahabi[11] followed 500 women who had GDM during pregnancy. The study found that 44% of these women developed impaired glucose tolerance (IGT) or diabetes one year postpartum. Risk factors for ongoing glucose intolerance included the need for insulin during pregnancy (odds ratio [OR]: 3.8) and a family history of type 2 diabetes (OR: 1.2).

In Ethiopia, Larebo et al.[12] examined 290 pregnant women with an age range of 20 to 40 years. The prevalence of GDM was 26.2%. Significant factors associated with GDM included urban residency (adjusted odds ratio [AOR]: 2.181), lower education levels (AOR: 2.286), and adequate dietary diversity (AOR: 2.740).

In India, Hussain et al.[13] included 400 pregnant women with an age range of 18 to 40 years. The prevalence of GDM was 9.89%. The study highlighted the impact of younger age, sedentary lifestyle, and higher body mass index (BMI) as risk factors for GDM. these results are similar to our findings but we did not included life style as risk factor.

In Saudi Arabia, Ghamri[14] investigated 150 women with confirmed GDM. The age range was not specified, but the study found a confirmation rate of 75.4% for GDM among those initially testing positive. High gravidity and parity were notable characteristics, suggesting that multiple pregnancies may be a risk factor for GDM in this population.

In China, Wu et al.[15] studied 350 pregnant women with an age range of 20 to 45 years. The prevalence of GDM was 8.5%. The study found that GDM prevalence was associated with age and BMI, consistent with findings from other regions.

The study has several strengths, including its use of both univariate and multivariate models, focused research questions, and stringent methodology. However, there are limitations, such as the cross-sectional design of the study, which limits the ability to establish causality, a small sample size that may affect the generalizability of the results, and the potential for unmeasured confounding factors that could influence the outcomes.

Conclusion

Within the limitations of the study, it can be concluded that the frequency of GDM is slightly higher than in previous studies, and older age and higher BMI are significant risk factors for GDM.

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