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Prevalence and Risk Factors of Gestational Diabetes Mellitus Among Pregnant Women

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Abstract

Background: Pregnant women worldwide are impacted by gestational diabetes mellitus, a serious public health issue. macrosomia, pre-eclampsia, and a higher chance of type 2 diabetes.One of the detrimental effects it is associated with in both mothers and fetuses is diabetes. Understanding the prevalence and related risk factors is crucial for early diagnosis and treatment.

Objective: The primary objective of this study is to evaluate the prevalence of GDM among pregnant women and identify key risk factors contributing to its development.

Methodology: Over the course of four months, this cross-sectional study was conducted at Ghurki Hospital in Lahore. A glucose challenge test (GCT) was used to screen 100 pregnant women in total, and those with abnormal results were then screened using an OGTT. SPSS software was used to gather and analyze data on lifestyle, clinical, and demographic factors.

Results: Of the study participants, 56% had GDM. Obesity (BMI > 30 kg/m2), hypertension, a history of prior GDM, and advanced maternal age (>35 years) were identified as key risk factors. Women with GDM were more likely to experience maternal complications like preeclampsia (20%) and hypertension (21%). GDM was also substantially linked to fetal complications, such as preterm birth (22%), and macrosomia (29%).

Conclusion: In conclusion, the high incidence of GDM emphasizes the necessity of lifestyle changes, early screening, and focused interventions to reduce related risks. To lower the prevalence of GDM and enhance pregnancy outcomes, public health programs emphasizing nutritional counseling and maternal education are advised.

Keywords: Gestational Diabetes Mellitus, Prevalence, Risk Factors, Pregnancy, Maternal Health, Fetal Outcomes.

Introduction

High blood sugar levels during pregnancy in a woman without diabetes is known as gestational diabetes. On-Hispanic Caucasian women exhibited a higher propensity for Gestational Diabetes Mellitus (GDM) in the year 2006. Furthermore, compared to women in other BMI ranges, who were more physically active, and who made more money, women who were overweight (25≤ BMI ≤30 kg/m2), physically inactive, and had family incomes below the poverty line tended to have higher rates of gestational diabetes mellitus (GDM) increase between 2006 and 2016.(1)

Carbohydrate intolerance that manifests during pregnancy is referred to as gestational diabetes mellitus (GDM).[2] This diagnosis does not apply to pregnant women who had a diabetes diagnosis before becoming pregnant. Type 2 diabetes and gestational diabetes share a similar pathophysiology. As pregnancy progresses, tissue resistance to insulin increases, requiring the use of more insulin.[3] Because the vast majority of pregnancies have easily met demand, the balance between insulin resistance and supply is maintained. On the other hand, women suffer from hyperglycemia if resistance takes over. Insulin resistance usually develops in the second trimester of pregnancy, gradually increasing before delivery and usually disappearing soon after.[4] The International Diabetes Federation (IDF) reports that in 2017, GDM was found in one birth out of every seven.[5]

It is well known that both the mother and the fetus can suffer major short- and long-term consequences from gestational diabetes. In the short term, GDM may result in pregnancy complications like high blood pressure, babies with high birth weights, and obstructed labor.[6] GDM is frequently a significant risk factor for women's cardiovascular disease and type 2 diabetes (T2D).[7-9] Children born to mothers who experienced gestational diabetes are at an elevated risk of developing obesity and type 2 diabetes later in life.[10] Numerous risk factors have been linked to the onset of gestational diabetes. These risk factors can be examined under the headings of clinical, sociodemographic, obstetric, and lifestyle risk factors. Parity, stillbirth, and prior abortion are among the obstetric risk factors linked to GDM[11].Age, ethnicity, and a family history of diabetes are other sociodemographic risk factors that have been researched thus far. Obesity and hypertension are evaluated as clinical risk factors. Gestational Diabetes Mellitus (GDM) is also recognized to be correlated with lifestyle risk factors, such as physical inactivity, dietary habits, tobacco use, and alcohol consumption.[12]

There are notable regional and ethnic disparities in the prevalence pattern of Gestational Diabetes Mellitus (GDM). Asian residents are thought to be more vulnerable than white people.[13]A few primary risk factors for the development of Gestational Diabetes Mellitus (GDM) encompass advanced maternal age and obesity, early pregnancy GDM, and a family history of DM.[14, 15]It is imperative to grasp these risk factors in order to develop targeted prevention strategies and interventions that can reduce the incidence of gestational diabetes mellitus in populations that are already at risk. By identifying these risk factors, medical professionals can improve maternal and fetal health outcomes by implementing early screening and individualized care plans.[16]

Acknowledging the value of education and awareness in controlling these risk factors can enable pregnant women to make well-informed decisions regarding their health, helping to improve outcomes for both mothers and their unborn children. Incorporating community-based initiatives that emphasize physical activity, nutrition, and frequent monitoring can greatly increase awareness and support for women who are at risk and promote a healthier environment for expectant mothers. These programs can also make it easier to access resources like exercise regimens and nutritional counseling, which are essential for encouraging healthy lifestyle choices that lower the risk of gestational diabetes.[17]

A supportive network that not only tends to the immediate needs of expectant mothers but also lays the groundwork for long-term health advantages for families and communities at large can be established by prioritizing these community initiatives. These all-encompassing strategies not only provide women with information and tools, but they also promote family participation, guaranteeing that long-term, healthy habits are formed and maintained.[18]

Normal Blood Sugar Levels Chart for Pregnancy				
Pregnant women	**Fasting**	**1 hour after a meal**	**2 hours after a meal**	**A1C**
Non-diabetes	< 100 mg/dl	< 140 mg/dl	< 140 mg/dl	< 5.7%
Pre-existing diabetes	< 95 mg/dl	< 140 mg/dL	< 140 mg/dL	< 6 - 7% depending on hypoglycemia risk
Gestational diabetes	< 95 mg/dl	< 120 mg/dl	< 120 mg/dl	< 6 - 7% depending on hypoglycemia risk

Table No. 1: Normal Blood Sugar level Chart for Pregnancy

Although it is commonly known that gestational diabetes mellitus (GDM) or pregestational diabetes can occur in pregnant women with diabetes, it is important to challenge the dominant narrative that depicts GDM only as a condition that needs to be treated. Concerns regarding the medicalization of pregnancy are raised by the historical background of GDM as a temporary condition, which implies that not all cases of carbohydrate resistance call for medical intervention or attention. The idea that GDM is intrinsically harmful is called into question by the fact that many pregnant women may experience transient insulin resistance without suffering negative consequences to their health or the health of their unborn child.[19]

Furthermore, it's critical to understand that gestational diabetes has long-term effects that go beyond the immediate results of pregnancy. According to research, women with GDM have a markedly increased risk of type 2 diabetes in the future, frequently within five to ten years after giving birth.[20]Since GDM during pregnancy is temporary, many women may unintentionally ignore their increased risk, which is why this connection emphasizes the significance of continued monitoring and lifestyle changes even after giving birth. Furthermore, offspring born to mothers afflicted with gestational diabetes are predisposed to developing obesity and metabolic disorders, underscoring the profound impact of maternal health on the well-being of subsequent generations.[16]

Examining how healthcare systems can assist women by providing education and access to preventive care is crucial in light of these factors. Regular gestational diabetes screening as part of comprehensive prenatal care can be crucial; research indicates that early detection enables prompt interventions that reduce the risks of GDM and its long-term effects.[20]Additionally, a more comprehensive framework for managing gestational diabetes and other pregnancy-related complications like obesity and hypertension can be created by combining multidisciplinary approaches involving nutritionists, endocrinologists, and maternal-fetal medicine specialists.[16]

Causes of Gestational Diabetes

Insulin resistance, which occurs when the body's cells exhibit reduced responsiveness to insulin, is the primary etiology of gestational diabetes mellitus (GDM). Hormonal changes that increase insulin resistance during pregnancy make this condition worse by ensuring that the growing fetus has access to enough glucose. Blood sugar levels rise and GDM results if the pancreas is unable to produce enough insulin to meet these demands. The risk of gestational diabetes is influenced by a number of factors:

1. Obesity: Being overweight increases insulin resistance, which makes it a significant risk factor.[21]

2. Age: GDM is more likely to strike women over 25.[21]

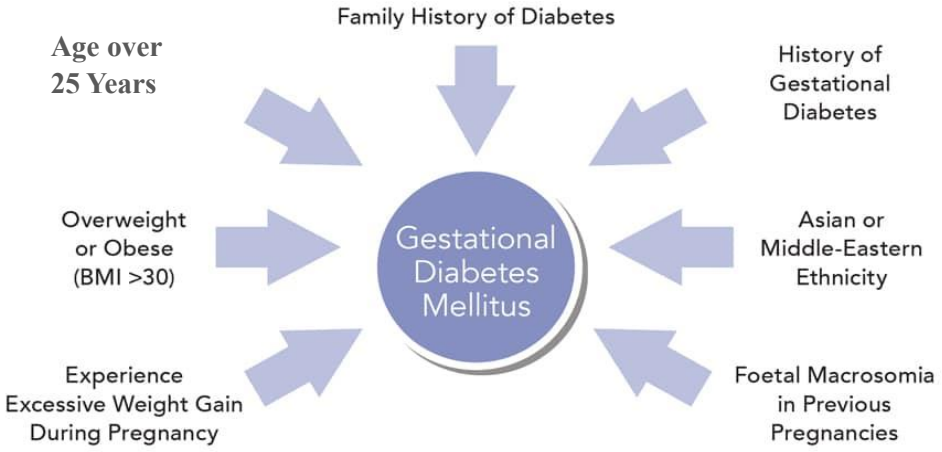


Fig 1: Causes of Gestational Diabetes

3. Family History: The risk of developing GDM can be considerably raised by a family history of diabetes.[22]
4. Ethnicity: Gestational diabetes is more common in some ethnic groups, such as Asian, Native American, African American, and Hispanic populations [23]
5. Previous GDM:Women who have previously experienced gestational diabetes are more vulnerable..[23]
6. Lifestyle Factors: Poor dietary habits, sedentary lifestyle, smoking, and alcohol consumption can also elevate the risk of GDM [24]

Symptoms of Gestational Diabetes
Gestational diabetes often presents with few noticeable symptoms, making routine screening essential. However, some women may experience:
1. Increased Thirst: Excessive thirst may result from high blood sugar levels.[25]
2. Frequent Urination: Excess glucose is filtered by the kidneys, which causes frequent urination. [26]
3. Fatigue: Although pregnancy itself may be to blame, many women report feeling more exhausted than normal.[27]

Fig 2: Symptoms of Gestational Diabetes

4. Blurred Vision: High blood sugar levels may temporarily affect vision [18]
5. Nausea: Some women may experience nausea or vomiting [27]

Many women report feeling more tired than usual, though this could be due to pregnancy itself.

Effects of Gestational Diabetes

Gestational diabetes may result in a range of immediate and enduring consequences for both the mother and the fetus:

1. Short-term Effects on the Mother:

- A higher chance of pre-eclampsia and hypertension.[28]
- Increased probability of complications necessitating a cesarean section[29]
- The possibility of macrosomia, or babies with high birth weights, which can make delivery more difficult [30]

2. Short-term Effects on the Fetus:

- A higher chance of an early birth as a result of high blood sugar-related complications.[30]
- An increased risk of hypoglycemia, or low blood sugar, soon after birth.[30]
- Newborns are more susceptible to respiratory distress syndrome.[31]

3. Long-term Effects:

- Type 2 diabetes is significantly more inclined to affect women who have previously experienced gestational diabetes, often manifesting within five to ten years following childbirth.[32]
- As they grow up, children of mothers with GDM may be more susceptible to obesity and metabolic diseases. [26]

Recognizing and managing gestational diabetes is crucial for minimizing health risks and ensuring healthier outcomes for both mother and child.Regular monitoring, lifestyle adjustments, and appropriate medical interventions can effectively aid in the management of blood sugar levels during pregnancy.

Material & Methods

At Ghurki Hospital in Lahore, a comparative cross-sectional study was carried out. 100 participants that are pregnant women were included in the study. Data was collected from Gynecology OPD, Ward and Antenatal care visits after consent of participant. All participants were under gone for Glucose Challenge Test (GCT) prior to Oral Glucose Tolerance Test for the screening of Gestation Diabetes Mellitus (GDM). Gestation Diabetes Mellitus (GDM) was finally diagnosed by HbA1c testing. Results data was analyzed using SPSS software. Depending on Standard Deviation (SD), Mean, Median Mode, Descriptive Statistics and Frequency were performed. All data was presented in the form of tables, bar graphs and histograms

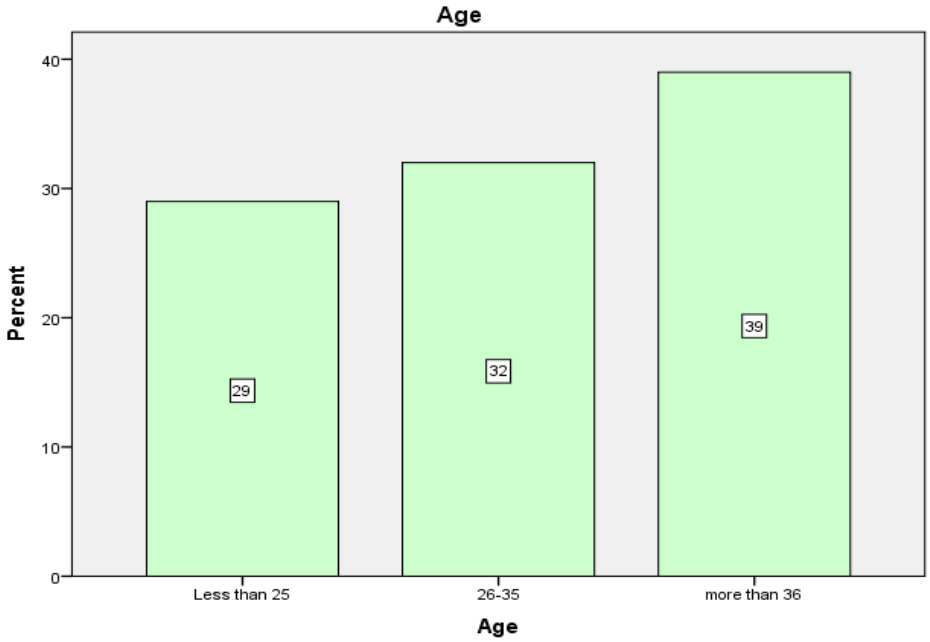
Results

Frequency of Age Distribution:

The Graph shows the distribution of age groups among pregnant women. Most participants were aged **36 years or older (39%)**, followed by **26-35 years (32%)** and **<25 years (29%)**.

Table No. 2: Frequency of Age distribution

Categories	Frequency	Percent	Cumulative Percent
Less than 25	29	29%	29%
26-35	32	32%	61%
More than 36	39	39%	100%
Total	**100**	**100%**	

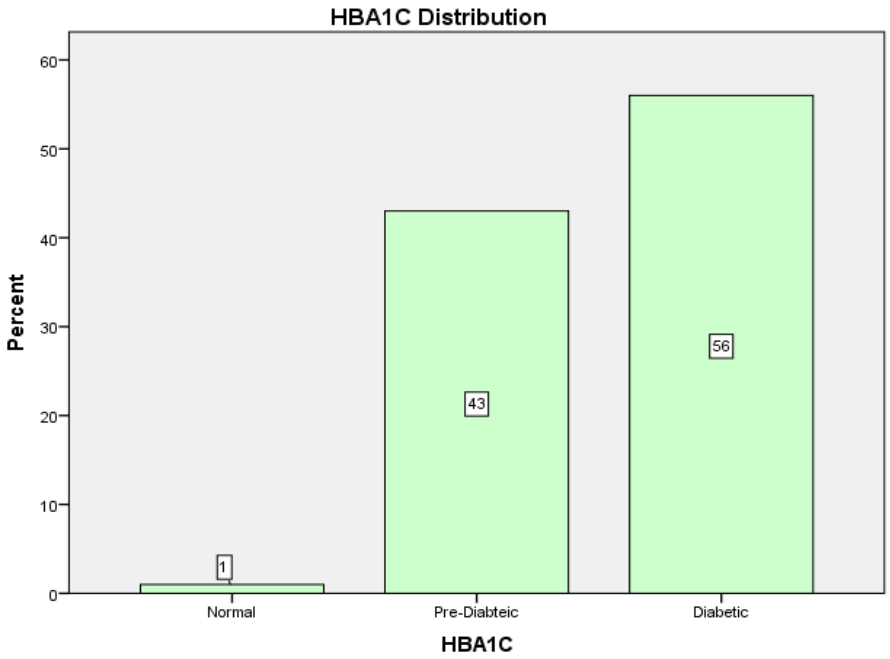


Graph No. 1: Distribution of Age among Gestational Diabetes Mellitus

Frequency of Diabetes Mellitus:
The Graph illustrate the frequency of Gestational Diabetes Mellitus in women. It shows that there is **Normal (1%), Pre-diabetic (43%), and Diabetic (56%)**.

Table No. 3: Frequency of Diabetes Mellitus

Diabetes Mellitus	Frequency	Percent	Cumulative Percent
Normal	1	1 %	1%
Pre-Diabteic	43	43 %	44 %
Diabetic	56	56 %	100 %
Total	**100**	**100 %**	

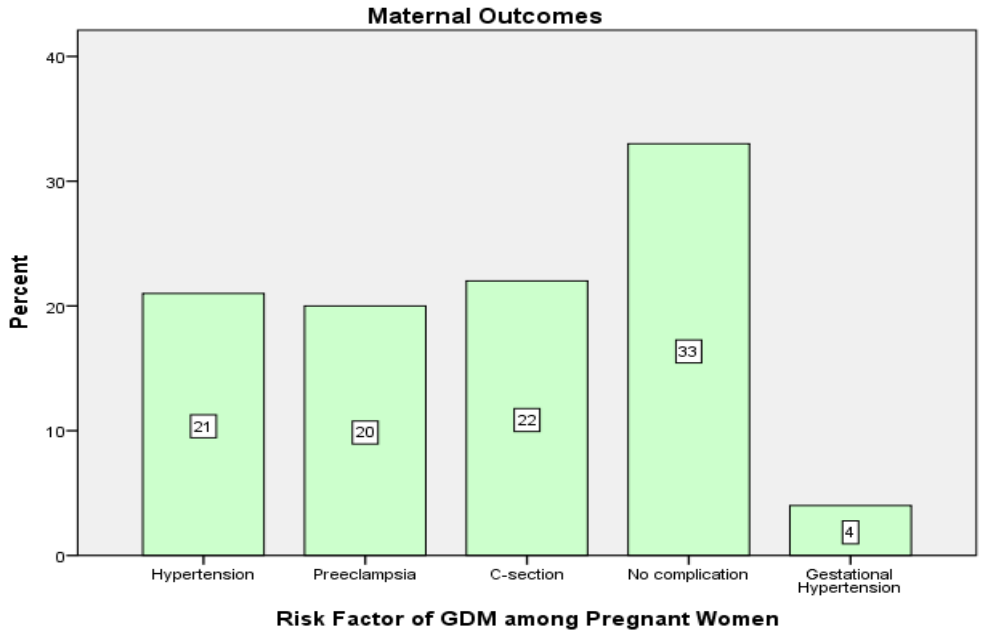


Graph No.2: Frequency of HBA1C Distribution

Risk Factors of GDM in Pregnant Women:
The Graph and Table given below Reports the risk factors of GDM in pregnant women. It shows that **Hypertension (21%)**, **Preeclampsia (20%)**, **C-section deliveries (22%)**, and **Gestational Hypertension (4%)**.

Table No. 4: Frequency of Risk factor of GDM in Pregnant Women

Risk Factors	Frequency	Percent	Cumulative Percent
Hypertension	21	21 %	21 %
Preeclampsia	20	20 %	41 %
C-section	22	22 %	63 %
No complication	33	33 %	96%
Gestational Hypertension	4	4 %	100 %
Total	**100**	**100 %**	

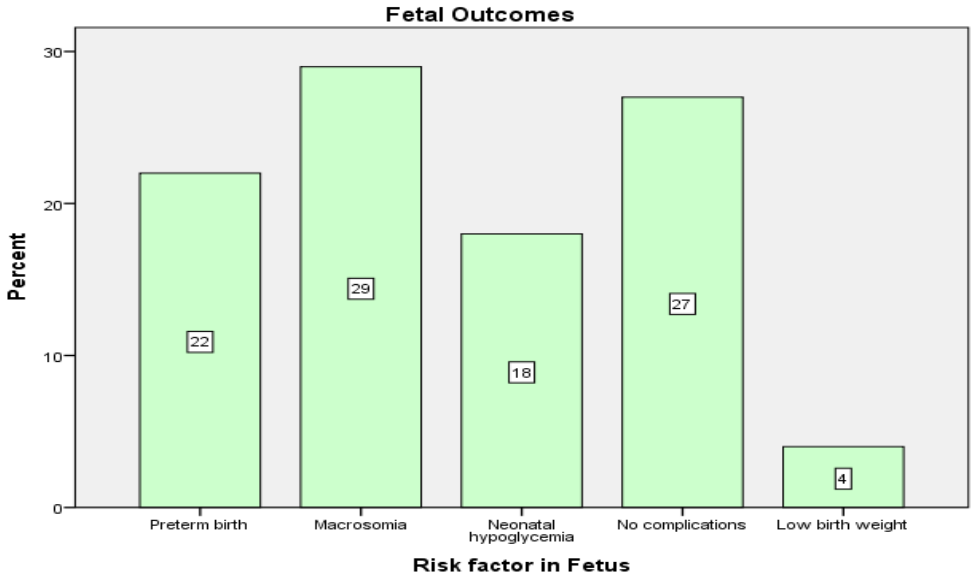


Graph No. 3: Frequency of Risk Factors of GDM in Pregnant Women

Risk Factors in Fetus:
The graph displays prevalence of **Preterm Birth (22%)**, **Macrosomia (29%)**, **Neonatal Hypoglycemia (18%)**, and **Low Birth Weight (4%)**.

Table No. 5: Frequency of Risk factors in Fetus

Risk Factors	Frequency	Percent	Cumulative Percent
Preterm birth	22	22 %	22 %
Macrosomia	29	29 %	51 %
Neonatal hypoglycemia	18	18 %	69 %
No complications	27	27 %	96 %
Low birth weight	4	4 %	100 %
Total	**100**	**100 %**	

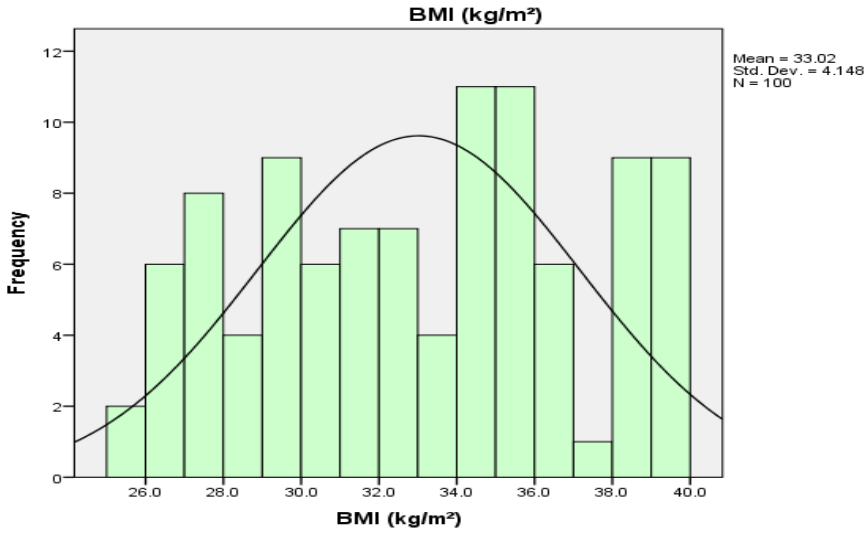


Graph No. 4: Frequency of Risk Factors in fetus

Frequency of BMI:
The graph (Histogram) indicates the frequency of Body Mass Index. It shows that **29% of participants had normal BMI, while 71% were overweight or obese**.

Table No. 6: Frequency of BMI

	Frequency	**Percent**	**Cumulative Percent**
Normal	29	29 %	29 %
Overweight	71	71 %	100 %
Total	**100**	**100 %**	

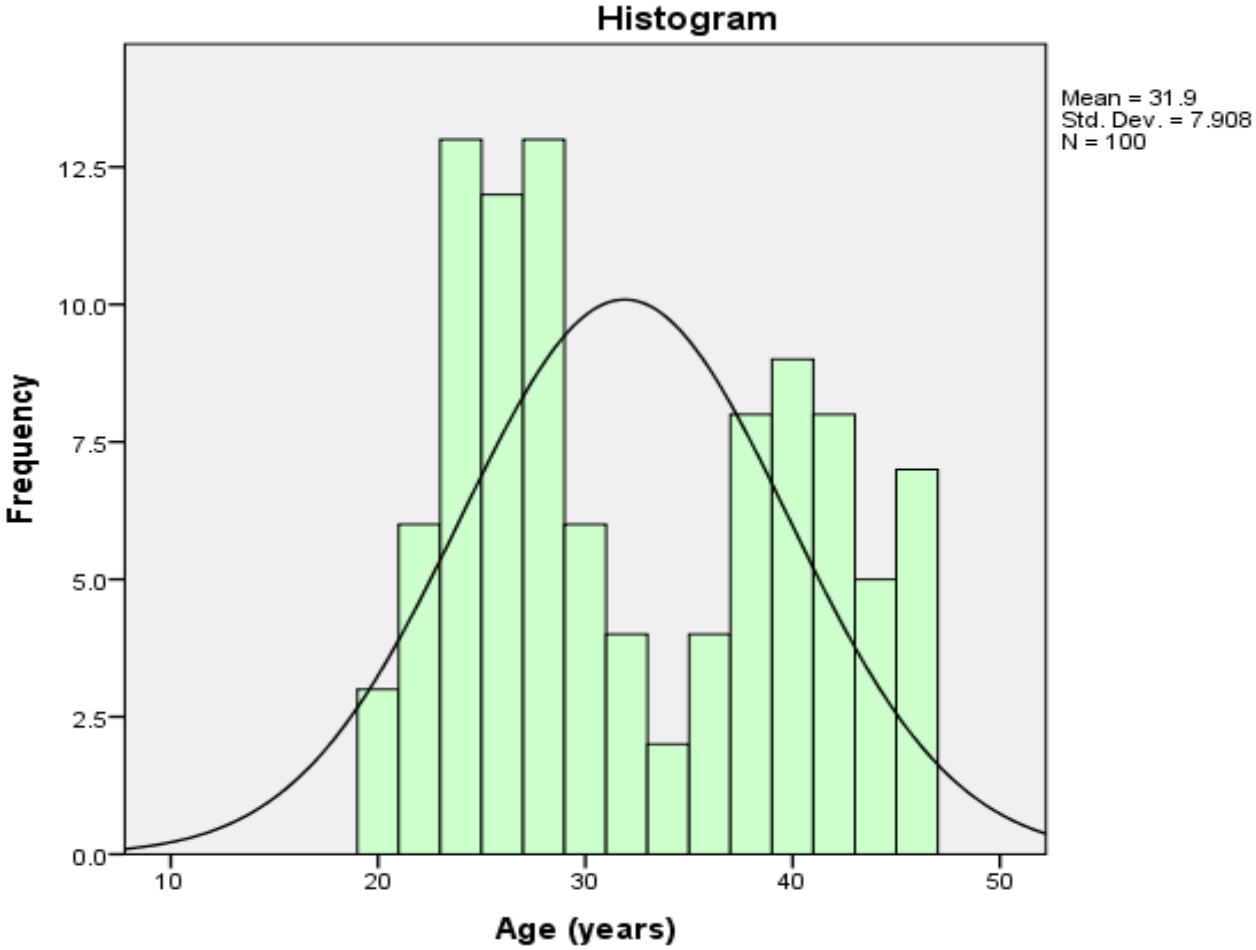


Graph no 5: Frequency of BMI

Age of Patients:
Descriptive data of age of study subject showed that minimum age found was 20 years and maximum was 45 years with mean of 31.90 ± 7.908 years.

Table No. 7: Descriptive of age of patients

Age of patients	N	Minimum	Maximum	Mean	Std. deviation
	100	20	45	31.90	7.908



Graph No. 6: Descriptive of age of Patients

Discussion
Our study highlights **fetal complications such as macrosomia and preterm birth**, which are well-documented in existing literature. According to **Mazumdar et al. (2020)**, **macrosomia was a leading outcome in GDM pregnancies**, emphasizing the importance of early screening and glycemic control. The **higher prevalence of C-sections among GDM-positive women** further supports the need for tailored obstetric care. Moreover, our study found a notable prevalence of **hypertension (21%)** and **preeclampsia (20%)**, both of which are strongly linked to the strong link between maternal obesity and GDM in our study highlights the necessity of **targeted interventions focusing on lifestyle modifications**. Furthermore, our findings underscore the need for improved **postpartum care and follow-up** for women diagnosed with GDM. Research suggests that **women with GDM have a significantly higher risk of developing type 2 diabetes later in life**. Therefore, **postpartum glucose monitoring**

and long-term lifestyle interventions should be integrated into healthcare policies to minimize this risk.

Conclusion

This study confirms a **high prevalence of GDM (56%)** among pregnant women in Lahore, with obesity, hypertension, and advanced maternal age as primary risk factors. The significant association between GDM and maternal complications such as **hypertension and preeclampsia**, as well as fetal outcomes like **macrosomia and preterm birth**, highlights the urgency for improved screening and intervention programs. To address these risks, healthcare providers should prioritize **regular glucose monitoring, blood pressure control, and personalized nutritional counseling** for high-risk women. Implementing **public health initiatives that promote maternal education and lifestyle modifications** can significantly reduce the burden of GDM. Additionally, further research is needed to explore **genetic and environmental factors** contributing to GDM. Developing **targeted prevention strategies**, including community-based programs for weight management and gestational diabetes awareness, can enhance maternal and fetal health outcomes. By integrating **early screening, proactive management, and interdisciplinary healthcare approaches**, we can reduce the incidence of GDM and its long-term health consequences for both mothers and children.

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