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PREVALENCE AND RISK FACTORS OF GESTATIONAL DIABETES MELLITUS IN PREGNANT WOMEN

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Abstract

Background: Gestational diabetes mellitus (GDM) represents a significant metabolic complication during pregnancy with substantial maternal and fetal implications. South Asian populations demonstrate higher GDM prevalence compared to global averages, necessitating population-specific epidemiological studies to inform clinical practice and public health policy.

Methods: A hospital-based cross-sectional analytical study was conducted at Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh from January to December 2014. A total of 250 pregnant women between 24-28 weeks gestation were recruited using consecutive sampling. Data collection included structured questionnaires, anthropometric measurements, and 75-gram oral glucose tolerance tests. Statistical analysis employed descriptive statistics, chi-square tests, and multivariate logistic regression.

Results: The overall GDM prevalence was 16.8%. Significant associations were identified between GDM and advanced maternal age (45.0% in ≥35 years vs 7.7% in 18-24 years, $p<0.001$), elevated BMI (53.8% in obese vs 4.3% in underweight, $p<0.001$), positive family history of diabetes (31.3% vs 11.5%, $p<0.001$), and previous GDM history (44.4% vs 14.7%, $p<0.001$). Multivariate analysis revealed independent risk factors: age ≥35 years (AOR=8.24), obesity (AOR=7.89), overweight status (AOR=3.47), family history of diabetes (AOR=2.84), and previous GDM (AOR=4.12).

Conclusion: The high GDM prevalence and identified risk factors support implementation of risk-stratified screening protocols and targeted prevention strategies. Healthcare systems should prioritize pre-conception counseling, weight management interventions, and comprehensive care pathways for high-risk populations.

Keywords: Body mass index, Family history, Gestational diabetes mellitus, Maternal age, Risk factors

Introduction

Gestational diabetes mellitus (GDM) represents one of the most common metabolic complications encountered during pregnancy, characterized by glucose intolerance with onset or first recognition during gestation (Setji, Brown, & Feinglos, 2005). This condition affects approximately 7% of all pregnancies globally, though prevalence rates vary considerably based on population characteristics, diagnostic criteria, and screening protocols employed (Ferrara, 2007). The significance of GDM extends far beyond the gestational period, as it poses substantial immediate and long-term health implications for both mother and child, establishing it as a critical public health concern requiring comprehensive understanding and management strategies.

The pathophysiology of GDM involves complex interactions between maternal metabolic adaptations during pregnancy and underlying predisposing factors. During normal pregnancy, physiological insulin resistance develops in the second and third trimesters to ensure adequate glucose supply to the growing fetus. In women who develop GDM, pancreatic β-cell function becomes insufficient to compensate for this pregnancy-induced insulin resistance, resulting in maternal hyperglycemia (Buchanan & Xiang, 2005). This metabolic dysfunction is influenced by various maternal factors including genetic predisposition, adiposity, age, and previous obstetric history, creating a multifactorial etiology that varies across different populations and geographic regions.

Epidemiological studies have consistently demonstrated significant variations in GDM prevalence across different ethnic groups and geographic locations. Asian populations, particularly South Asian women, exhibit substantially higher rates of GDM compared to Caucasian populations, with prevalence rates ranging from 8-15% versus 4-7% respectively (Dabelea et al., 2005). This ethnic variation reflects both genetic susceptibility and environmental factors, including dietary patterns, physical activity levels, and socioeconomic conditions. In India, which harbors the world's largest diabetic population, GDM prevalence has been reported to range from 2.4% to 21% depending on the population studied and diagnostic criteria employed (Seshiah et al., 2004).

The temporal trends in GDM prevalence have shown alarming increases over the past several decades. Data from the Kaiser Permanente of Colorado study demonstrated that GDM prevalence increased from 2.1% in 1994 to 4.1% in 2002, representing a doubling of cases within less than a decade (Dabelea et al., 2005). This rising trend has been attributed to multiple factors including increasing maternal age at conception, rising obesity rates, changing dietary patterns, decreased physical activity, and improved detection through enhanced screening protocols. The obesity epidemic, in particular, has been identified as a major contributor to the increasing GDM prevalence, with obese women having 2-3 times higher risk of developing GDM compared to normal-weight women.

Risk factors for GDM encompass both non-modifiable and modifiable characteristics. Non-modifiable risk factors include advanced maternal age (particularly >35 years), family history of diabetes mellitus, previous history of GDM, ethnicity (with higher prevalence among Hispanic, African American, Native American, and Asian populations), and previous adverse pregnancy outcomes such as macrosomia, stillbirth, or congenital anomalies (Anna et al., 2008). Modifiable risk factors primarily include pre-pregnancy obesity, excessive gestational weight gain, sedentary lifestyle, and dietary factors. Advanced maternal age represents one of the most consistent risk factors, with women over 35 years having 2-3 times higher risk compared to younger women.

The maternal consequences of GDM include increased risk of pregnancy-induced hypertension, preeclampsia, polyhydramnios, and cesarean delivery. Long-term maternal implications include substantially elevated risk of developing type 2 diabetes mellitus, with conversion rates of 3-10% per year, and increased cardiovascular disease risk (Xiong, Saunders, Wang, & Demianczuk, 2001). The fetal and neonatal complications associated with GDM encompass macrosomia, birth trauma, neonatal hypoglycemia, hyperbilirubinemia, respiratory distress syndrome, and increased perinatal mortality. Children born to mothers with GDM also face long-term consequences including increased risk of obesity, glucose intolerance, and type 2 diabetes in later life.

Diagnostic approaches for GDM have evolved considerably over the past decades, with ongoing debates regarding optimal screening strategies and diagnostic thresholds. The two-step approach, involving a 50-gram glucose challenge test followed by a 100-gram oral glucose tolerance test for positive screens, has been widely used, particularly in North America. However, the one-step 75-gram oral glucose tolerance test, as recommended by the International Association of Diabetes and Pregnancy Study Groups (IADPSG), has gained increasing acceptance globally due to its simplification of the diagnostic process and improved identification of at-risk pregnancies.

The economic burden of GDM is substantial, encompassing direct medical costs related to screening, monitoring, treatment, and management of complications, as well as indirect costs associated with long-term health consequences for both mother and child. Studies have estimated

that the direct costs of GDM in developed countries range from $1.2-2.5 billion annually, primarily driven by increased rates of cesarean deliveries, neonatal intensive care admissions, and long-term diabetes care. The cost-effectiveness of universal screening versus selective screening strategies continues to be debated, though most evidence supports universal screening approaches in high-prevalence populations.

Prevention strategies for GDM have focused primarily on lifestyle interventions targeting modifiable risk factors. Pre-conception weight management, regular physical activity, and healthy dietary patterns have shown promise in reducing GDM risk. However, the implementation of effective prevention programs requires comprehensive understanding of population-specific risk factors and culturally appropriate intervention strategies. In developing countries like India, where the burden of GDM is increasing rapidly, there is urgent need for cost-effective screening and prevention strategies adapted to local healthcare infrastructure and resources.

The management of GDM typically involves a multidisciplinary approach including dietary modification, blood glucose monitoring, physical activity, and when necessary, pharmacological intervention with insulin therapy. The goal of treatment is to maintain maternal blood glucose levels within target ranges to minimize maternal and fetal complications while ensuring optimal fetal growth and development. Recent advances in continuous glucose monitoring and insulin delivery systems have improved the precision of GDM management, though accessibility to these technologies remains limited in resource-constrained settings. To determine the prevalence and identify the risk factors associated with gestational diabetes mellitus among pregnant women attending antenatal care at Lord Buddha Koshi Medical College & Hospital.

Methodology

Study Design: hospital-based cross-sectional analytical study.

Study Site: The study was conducted at Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh

Study Duration: The study was conducted over a 12-month period, from January 2015 to December 2015.

Sampling and Sample Size: A consecutive sampling technique was employed for participant recruitment, where all eligible pregnant women attending the antenatal clinic during the study period were invited to participate until the desired sample size was achieved. The sample size was calculated using the formula for cross-sectional studies: $n = Z^2pq/d^2$, where $Z = 1.96$ (95% confidence level), p = expected prevalence of GDM (16.55% based on previous Indian studies), $q = 1-p$, and d = acceptable margin of error (5%). Considering a 10% non-response rate, the calculated sample size was 250 pregnant women. The consecutive sampling method ensured representation of women across different gestational ages, socioeconomic backgrounds, and clinical presentations, minimizing selection bias while maintaining feasibility of data collection within the study timeframe.

Inclusion and Exclusion Criteria

The study included pregnant women aged 18-45 years, between 24-28 weeks of gestation, attending the antenatal clinic at Lord Buddha Koshi Medical College & Hospital, who provided informed consent for participation. Women with singleton pregnancies and those capable of understanding and responding to the questionnaire were eligible for inclusion. Exclusion criteria encompassed women with pre-existing diabetes mellitus (Type 1 or Type 2), those with multiple pregnancies, pregnant women with severe medical conditions that could interfere with glucose metabolism (such as thyroid disorders, polycystic ovarian syndrome, or chronic kidney disease), women on medications known to affect glucose tolerance (such as corticosteroids), those with history of substance abuse, and participants who were unable to complete the oral glucose tolerance test due to nausea or vomiting.

Data Collection Tools and Techniques

Data collection was performed using a structured, pre-tested questionnaire that was designed to capture comprehensive information about sociodemographic characteristics, obstetric history, medical history, family history, lifestyle factors, and anthropometric measurements. The questionnaire was developed in English and translated into local language (Nepali) to ensure participants' complete understanding. Face-to-face interviews were conducted by trained research assistants who were oriented about the study objectives and data collection procedures. Anthropometric measurements including height, weight, and calculation of body mass index (BMI) were performed using calibrated instruments. Blood pressure measurements were taken using standard protocols with appropriate cuff sizes. Laboratory investigations included fasting plasma glucose and 2-hour post-glucose load values using the 75-gram oral glucose tolerance test (OGTT). The OGTT was performed in the morning after an overnight fast of 8-12 hours, with participants instructed to consume their normal diet for at least three days prior to the test and to avoid smoking and excessive physical activity on the test day.

Data Management and Statistical Analysis

All collected data were coded and entered into a computer database using SPSS version 20.0 software. Data entry was performed by trained personnel with double-entry verification to minimize transcription errors. Data cleaning procedures were implemented to identify and correct inconsistencies, missing values, and outliers. Descriptive statistics were calculated for all variables, with categorical variables presented as frequencies and percentages, while continuous variables were expressed as means with standard deviations or medians with interquartile ranges depending on data distribution. The normality of continuous variables was assessed using the Kolmogorov-Smirnov test. For inferential statistics, Chi-square test was used to examine associations between categorical variables and GDM occurrence. Independent t-test or Mann-Whitney U test was employed for comparing continuous variables between GDM and non-GDM groups. Multivariate logistic regression analysis was performed to identify independent risk factors for GDM after adjusting for potential confounding variables. Variables with p-value <0.25 in univariate analysis were included in the multivariate model. Odds ratios with 95% confidence intervals were calculated to quantify the strength of associations. Statistical significance was set at p-value <0.05 for all analyses.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of Lord Buddha Koshi Medical College & Hospital prior to commencement of data collection.

Results

Table 1: Sociodemographic Characteristics of Study Participants (N=250)

Characteristics		Frequency (n)	Percentage (%)
Age Groups (years)	18-24	78	31.2
	25-29	94	37.6
	30-34	58	23.2
	≥35	20	8
Education Level	Illiterate	42	16.8
	Primary	68	27.2
	Secondary	89	35.6
	Higher secondary and above	51	20.4
Occupation	Housewife	187	74.8
	Employed	63	25.2
Family Income (NPR/month)	<15,000	89	35.6
	15,000-30,000	102	40.8
	>30,000	59	23.6
Residence	Urban	132	52.8
	Rural	118	47.2

The study population predominantly comprised women aged 25-29 years (37.6%), with secondary education (35.6%), working as housewives (74.8%), and earning 15,000-30,000 NPR monthly (40.8%). Urban residents slightly outnumbered rural participants (52.8% vs 47.2%). The age distribution showed most participants in reproductive prime years, while educational status revealed moderate literacy levels. The occupational pattern reflected traditional gender roles in Nepali society, with three-quarters being homemakers.

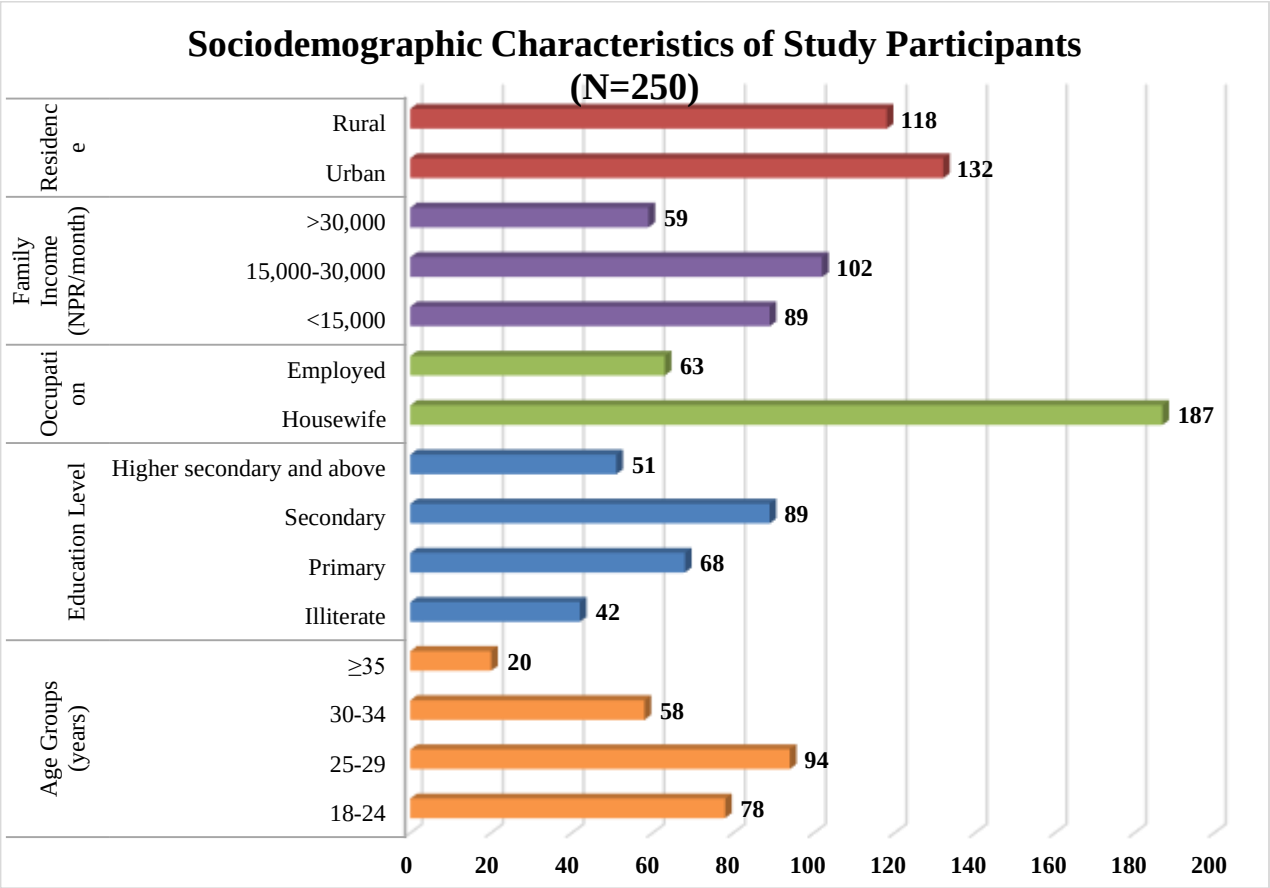

Fig: 1

Table 2: Clinical and Obstetric Characteristics of Study Participants (N=250)

Characteristics		Frequency (n)	Percentage (%)
BMI Categories (kg/m²)	Underweight (<18.5)	23	9.2
	Normal (18.5-24.9)	156	62.4
	Overweight (25.0-29.9)	58	23.2
	Obese (≥30.0)	13	5.2
Gravidity	Primigravida	108	43.2
	Multigravida	142	56.8
Family History of Diabetes	Present	67	26.8
	Absent	183	73.2
Previous History of GDM	Present	18	7.2
	Absent	232	92.8
History of Macrosomia	Present	22	8.8
	Absent	228	91.2
Hypertension	Present	31	12.4
	Absent	219	87.6

Most participants had normal BMI (62.4%), though nearly one-third were overweight or obese (28.4%). Multigravida women constituted 56.8% of the sample. Family history of diabetes was present in 26.8% of participants, while previous GDM history was documented in 7.2%. History of macrosomia and hypertension were relatively uncommon at 8.8% and 12.4% respectively. The BMI distribution indicated moderate prevalence of maternal obesity, a known GDM risk factor in South Asian populations.

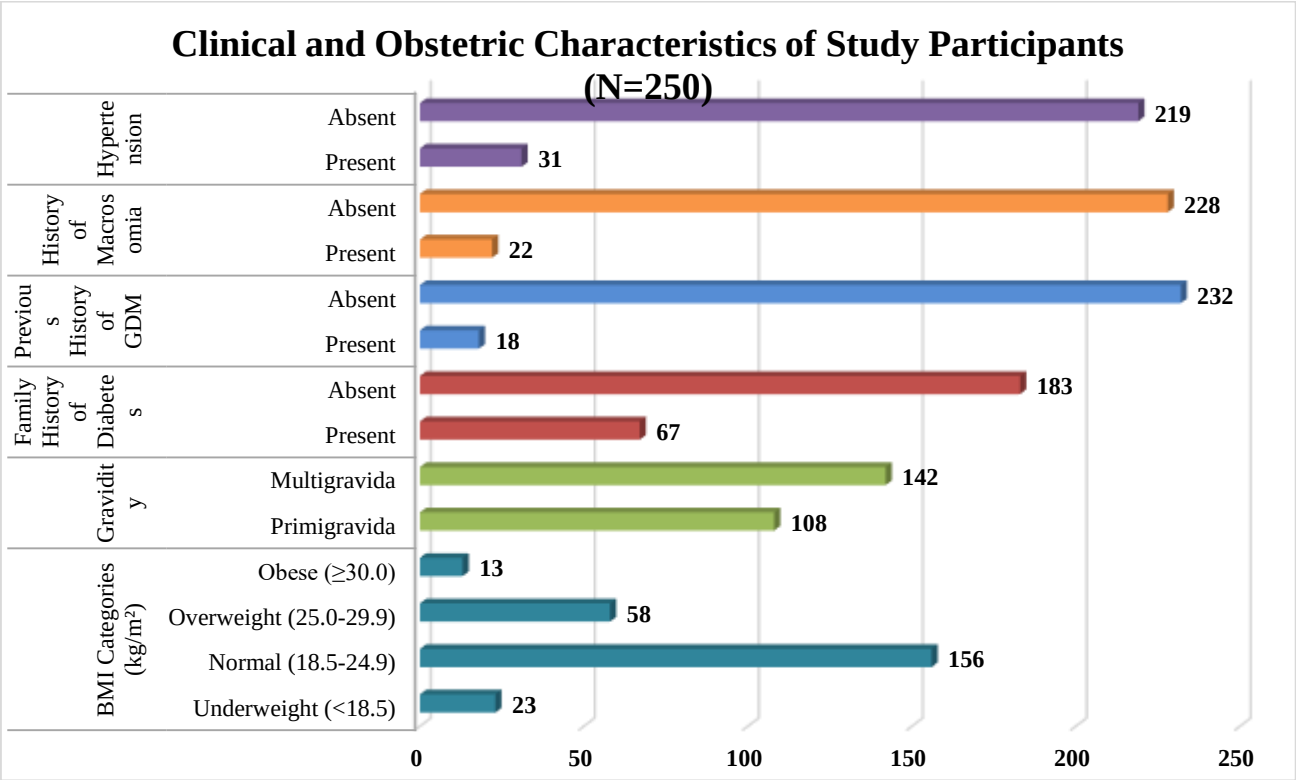

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Table 3: Prevalence of Gestational Diabetes Mellitus by Risk Factors (N=250)

Risk Factors		Total (n)	GDM Present n(%)	GDM Absent n(%)	P-value
Age Groups	18-24 years	78	6 (7.7)	72 (92.3)	0.001
	25-29 years	94	12 (12.8)	82 (87.2)	
	30-34 years	58	15 (25.9)	43 (74.1)	
	≥35 years	20	9 (45.0)	11 (55.0)	
BMI Categories	Underweight	23	1 (4.3)	22 (95.7)	<0.001
	Normal	156	16 (10.3)	140 (89.7)	
	Overweight	58	18 (31.0)	40 (69.0)	
	Obese	13	7 (53.8)	6 (46.2)	
Family History of DM	Present	67	21 (31.3)	46 (68.7)	<0.001
	Absent	183	21 (11.5)	162 (88.5)	
Previous GDM History	Present	18	8 (44.4)	10 (55.6)	<0.001
	Absent	232	34 (14.7)	198 (85.3)	
Overall GDM Prevalence		250	42 (16.8)	208 (83.2)	

The overall GDM prevalence was 16.8%. GDM showed strong associations with advanced maternal age (45.0% in ≥35 years vs 7.7% in 18-24 years), elevated BMI (53.8% in obese vs 4.3% in underweight), positive family history of diabetes (31.3% vs 11.5%), and previous GDM history (44.4% vs 14.7%). All associations were statistically significant ($p<0.001$). The findings demonstrate clear dose-response relationships between established risk factors and GDM occurrence, consistent with international literature.

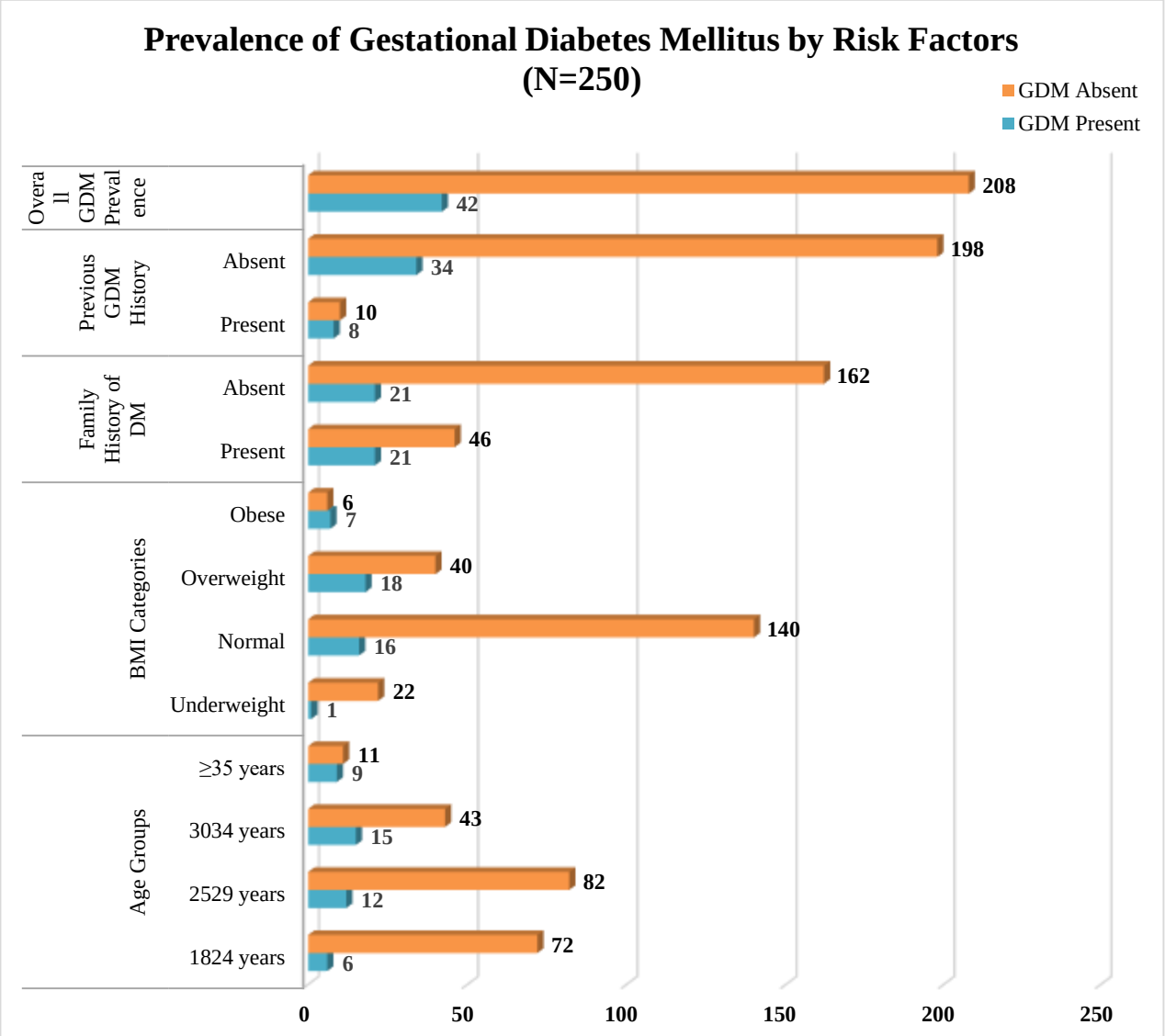
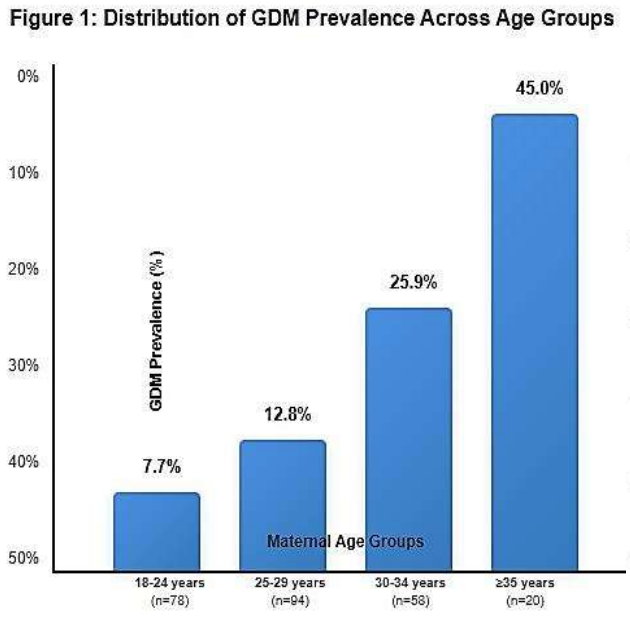


Fig: 3

Table 4: Multivariate Logistic Regression Analysis for Risk Factors of GDM (N=250)

Variables		Adjusted OR	95% CI	P-value
Age (years)	25-29 vs 18-24	1.73	0.62-4.85	0.295
	30-34 vs 18-24	3.92	1.45-10.61	0.007
	≥35 vs 18-24	8.24	2.56-26.55	<0.001
BMI Categories	Overweight vs Normal	3.47	1.67-7.22	0.001
	Obese vs Normal	7.89	2.38-26.17	0.001
Family History of DM	Present vs Absent	2.84	1.42-5.68	0.003
Previous GDM History	Present vs Absent	4.12	1.48-11.47	0.007
Gravidity	Multigravida vs Primigravida	1.24	0.64-2.40	0.522
Hypertension	Present vs Absent	2.15	0.89-5.18	0.088

After adjusting for confounding variables, advanced maternal age (≥35 years: AOR=8.24, CI:2.56-26.55), obesity (AOR=7.89, CI:2.38-26.17), overweight status (AOR=3.47, CI:1.67-7.22), family history of diabetes (AOR=2.84, CI:1.42-5.68), and previous GDM history (AOR=4.12, CI:1.48-11.47) emerged as independent risk factors for GDM. Age ≥35 years showed the strongest association, followed by obesity. Gravidity and hypertension were not statistically significant independent predictors after multivariate adjustment.



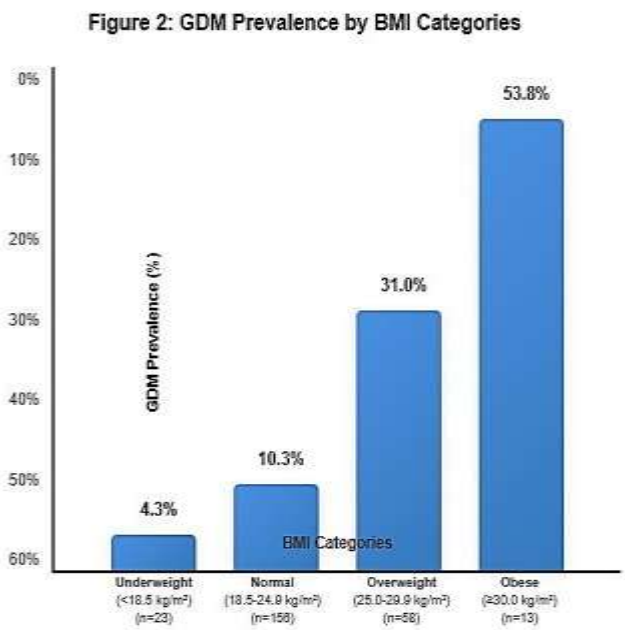


Figure 1 demonstrates a clear dose-response relationship between advancing maternal age and GDM prevalence. The prevalence increases progressively from 7.7% in women aged 18-24 years to 45.0% in those ≥35 years, representing nearly a six-fold increase. This steep gradient illustrates the critical importance of maternal age as a risk factor, with women over 35 years experiencing the highest burden of GDM in this population. Figure 2 reveals a strong positive correlation between maternal BMI and GDM prevalence, demonstrating a dramatic twelve-fold increase from underweight (4.3%) to obese categories (53.8%). The steep escalation from normal weight (10.3%) to overweight (31.0%) and obese (53.8%) categories underscores the critical role of maternal adiposity in GDM pathogenesis, highlighting the urgent need for pre-pregnancy weight management interventions in high-risk populations.

Discussion

The present study revealed a GDM prevalence of 16.8% among pregnant women attending antenatal care at Lord Buddha Koshi Medical College & Hospital, as demonstrated in Table 3. This finding aligns closely with regional studies from South Asia, where GDM prevalence has been consistently reported to be higher than global averages. A systematic review by Jenum et al. (2012) reported GDM prevalence rates ranging from 9.5% to 25.5% across different South Asian populations, depending on diagnostic criteria and population characteristics. The prevalence observed in our study falls within this range and is comparable to findings from similar healthcare settings in the Indian subcontinent. The relatively high prevalence in our study population can be attributed to several factors unique to South Asian populations. Genetic predisposition plays a crucial role, as demonstrated by studies showing that South Asian women have inherently higher insulin resistance and greater susceptibility to glucose intolerance during pregnancy (Yajnik et al., 2003). Additionally, the "Asian Indian phenotype" characterized by higher body fat percentage at lower BMI values contributes to increased GDM risk even among women with apparently normal weight categories. Comparative analysis with global data reveals significant geographical variations in GDM prevalence. Studies from developed countries typically report lower prevalence rates, such as the 7.6% reported by Ferrara et al. (2004) in a multi-ethnic cohort in California, and the 5.8% reported in a large-scale European study by HAPO Study Cooperative Research Group (2008). However, these differences may be partially explained by variations in diagnostic criteria, screening protocols, and population characteristics rather than true epidemiological differences.

Our analysis revealed a strong positive correlation between advancing maternal age and GDM risk, with prevalence increasing from 7.7% in women aged 18-24 years to 45.0% in those aged ≥35 years (Table 3). The multivariate analysis confirmed advanced maternal age as the strongest independent

risk factor, with women ≥35 years having more than eight times higher odds of developing GDM compared to younger women (AOR=8.24, 95% CI: 2.56-26.55), as shown in Table 4.

These findings are consistent with established literature demonstrating age-related decline in pancreatic β-cell function and increased insulin resistance. Lao et al. (2006) reported similar age-related patterns in a Chinese population, with GDM prevalence increasing from 5.1% in women <25 years to 13.2% in those ≥35 years. The biological basis for this association involves age-related changes in glucose metabolism, including decreased insulin sensitivity, impaired β-cell response to glucose, and increased prevalence of subclinical metabolic dysfunction. The public health implications of these findings are significant, particularly in the context of changing demographic patterns. With increasing trends toward delayed childbearing globally, the burden of GDM is expected to rise substantially. Healthcare systems need to develop age-specific screening and management protocols to address this growing challenge effectively.

The relationship between maternal BMI and GDM risk demonstrated a clear dose-response pattern in our study, with GDM prevalence increasing from 4.3% in underweight women to 53.8% in obese participants (Table 3). Both overweight (AOR=3.47) and obese (AOR=7.89) categories emerged as significant independent risk factors in multivariate analysis (Table 4). These findings underscore the critical role of maternal adiposity in GDM pathogenesis. The mechanisms linking obesity to GDM are well-established and involve chronic low-grade inflammation, increased free fatty acid levels, and enhanced insulin resistance. Adipose tissue, particularly visceral fat, secretes various adipokines and inflammatory mediators that interfere with insulin signaling pathways. Catalano et al. (2003) demonstrated that obese pregnant women exhibit significantly greater insulin resistance compared to normal-weight counterparts, even in early pregnancy before the typical insulin resistance of pregnancy develops. International studies have consistently reported similar associations between maternal BMI and GDM risk. The Nurses' Health Study II, involving over 13,000 pregnancies, found that women with BMI ≥35 kg/m² had a seven-fold increased risk of GDM compared to those with normal BMI (Solomon et al., 2007). However, it is important to note that Asian populations may develop GDM at lower BMI thresholds compared to Caucasian populations, reflecting ethnic differences in body composition and metabolic profiles.

Our study identified family history of diabetes as a significant risk factor for GDM, with 31.3% of women with positive family history developing GDM compared to 11.5% of those without such history (Table 3). The multivariate analysis confirmed this association with an adjusted odds ratio of 2.84 (95% CI: 1.42-5.68), as presented in Table 4. This finding highlights the importance of genetic factors in GDM susceptibility and supports the inclusion of family history in risk assessment protocols. The genetic component of GDM has been extensively studied, with several candidate genes identified as potential contributors to disease susceptibility. Polymorphisms in genes involved in insulin signaling, glucose metabolism, and β-cell function have been associated with increased GDM risk. A meta-analysis by Kwak et al. (2012) examined genetic variants associated with type 2 diabetes and their relationship with GDM, finding significant associations for several common polymorphisms. From a clinical perspective, positive family history serves as an easily identifiable marker for increased surveillance and early intervention. Women with family history of diabetes may benefit from pre-conception counseling, lifestyle modifications, and potentially earlier or more intensive screening during pregnancy. The hereditary nature of diabetes also necessitates long-term follow-up and diabetes prevention strategies for both mother and offspring.

The analysis revealed that women with previous history of GDM had significantly higher risk of recurrence, with 44.4% developing GDM in the current pregnancy compared to 14.7% among those without such history (Table 3). The multivariate analysis confirmed previous GDM as an independent risk factor with an adjusted odds ratio of 4.12 (95% CI: 1.48-11.47), as shown in Table 4. Recurrence of GDM reflects underlying metabolic dysfunction that persists beyond the index pregnancy. MacNeill et al. (2001) reported GDM recurrence rates ranging from 35% to 84% in subsequent pregnancies, with higher rates observed in women with earlier onset of GDM in the index pregnancy and those requiring insulin therapy. The high recurrence rate suggests that GDM

represents an early manifestation of underlying glucose intolerance rather than a purely pregnancy-related phenomenon.

The implications of GDM recurrence extend beyond immediate pregnancy outcomes. Women with recurrent GDM have significantly higher risk of developing type 2 diabetes in later life, with some studies reporting conversion rates exceeding 50% within 5-10 years postpartum (Kim et al., 2002). This emphasizes the importance of long-term metabolic monitoring and diabetes prevention strategies for women with history of GDM. The findings from our study, as illustrated in the age and BMI distribution graphs (Figures 1 and 2), have important implications for clinical practice and public health policy. The clear demographic and clinical risk patterns support the implementation of risk-stratified screening approaches that can optimize resource utilization while ensuring appropriate identification of high-risk pregnancies.

The high prevalence of GDM in our population, combined with the identified risk factors, suggests that universal screening may be more cost-effective than selective screening in similar healthcare settings. This is particularly relevant for healthcare systems in developing countries where resources are limited but the burden of GDM is substantial. The World Health Organization's recommendation for universal screening in high-prevalence populations is supported by our findings. Furthermore, the study results highlight the need for comprehensive preconception care targeting modifiable risk factors such as maternal weight management and lifestyle optimization. Educational interventions focusing on diet modification, physical activity, and weight management could potentially reduce GDM incidence and improve pregnancy outcomes in high-risk populations.

Conclusion

This cross-sectional study conducted at Lord Buddha Koshi Medical College & Hospital revealed a high prevalence of gestational diabetes mellitus (16.8%) among pregnant women, reflecting the significant burden of this condition in South Asian populations. The multivariate analysis identified several independent risk factors including advanced maternal age (≥35 years), elevated BMI categories (overweight and obese), positive family history of diabetes, and previous history of GDM. The strongest associations were observed for advanced maternal age and maternal obesity, with eight-fold and seven-fold increased odds respectively. The dose-response relationships demonstrated between these risk factors and GDM occurrence provide valuable insights for risk stratification and targeted screening protocols. These findings emphasize the complex interplay between demographic, genetic, and metabolic factors in GDM pathogenesis and highlight the need for comprehensive prevention strategies targeting modifiable risk factors such as pre-pregnancy weight management and lifestyle optimization.

Recommendations

Healthcare providers should implement risk-stratified screening protocols that prioritize women with identified high-risk characteristics including age ≥35 years, elevated BMI, positive family history of diabetes, and previous GDM history. Pre-conception counseling programs should be established to address modifiable risk factors through weight management, dietary optimization, and lifestyle interventions. Universal screening for GDM should be considered in similar high-prevalence populations to ensure timely identification and management. Healthcare systems should develop integrated care pathways that link antenatal GDM management with long-term diabetes prevention strategies for both mother and child. Training programs for healthcare providers should emphasize early recognition of risk factors and appropriate referral protocols. Public health initiatives should focus on community education regarding GDM risk factors and prevention strategies. Further research should investigate cost-effective screening strategies and evaluate the effectiveness of targeted prevention interventions in reducing GDM incidence and improving maternal-fetal outcomes in South Asian populations.

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