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Research Article

Demographical Variation of Gestational Diabetes Mellitus at a Tertiary Care Center

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ABSTRACT

Background: Gestational Diabetes Mellitus (GDM) poses significant health challenge globally, impacting maternal and fetal well-being during pregnancy.

Objectives: The objective of this study was to determine demographical variations of gestational diabetes mellitus observed at a tertiary care center.

Methodology: This cross sectional research using non-probability convenient sampling was carried out at Department of Gynecology and Obstetrics of Memon Medical Institute Hospital for six months. After ethical approval, pregnant females visiting GYOB out-patient department of MMI and diagnosed with GDM between 20-45 years and during 16 to 36 weeks of gestation were included. Pregnant females with any known chronic illness and refusal for participation were excluded. Sample size was calculated using open epi online software. For data analysis, SPSS version 23.0 was used. Demographical variations were observed by applying chi-square test keeping p-value of <0.05 as statistically significant.

Results: Majority of participants were 31-35 years old and between 23-37.5 kg/m^2. GDM was reported higher in third trimester (77) as compared to first and second (52 and 56,). GDM was higher in educated and upper socio-economic class females. Family history of GDM was strongly observed along with hypertension and <24 months interval between pregnancies. A significant difference was observed between GDM in different trimesters (p-0.04), smoking status (p-0.04), socio-economic status (p<0.01), education (p<0.01, hypertension (p-0.03) and time interval between pregnancies (p-0.04).

Conclusion: Demographic factors such as age, BMI, family history of GDM, parity, gravity, and time interval between pregnancies played significant roles in the occurrence of GDM in this study.

Keywords: Gestational Diabetes Mellitus, Pregnancy, Demographics

INTRODUCTION

Gestational Diabetes Mellitus (GDM) poses a significant health challenge globally, impacting maternal and fetal well-being during pregnancy[1]. The prevalence of GDM varies across different populations, with demographic factors playing a pivotal role in its manifestation[2]. Understanding the demographical variation of GDM is crucial for tailoring effective preventive strategies and optimizing antenatal care.

GDM is a type of diabetes that develops during pregnancy, typically around the 24th to 28th week of gestation, and may pose risks to both mother and baby if not managed effectively[3]. The etiology of GDM is complex and multifactorial, involving a combination of genetic, environmental, and lifestyle factors[4]. Over the past decade, numerous studies have investigated the prevalence and risk factors associated with GDM, emphasizing the need for targeted

interventions based on demographic characteristics[5].

The demographic landscape of GDM is inherently diverse, influenced by factors such as maternal age, ethnicity, socio-economic status, and geographical location. Research has shown that certain populations may be at a higher risk of developing GDM, thereby warranting a more nuanced understanding of these demographical variations[6]. Moreover, the healthcare infrastructure and resources available at tertiary care centers can significantly impact the detection, management, and outcomes of GDM cases[7].

As the prevalence of GDM continues to rise globally, it becomes imperative to delve into the demographical nuances within specific healthcare settings[8]. This study focuses on a tertiary care center, where a comprehensive understanding of demographical variations can inform targeted interventions and contribute to the development of personalized antenatal care plans.

One crucial demographical factor influencing GDM prevalence is maternal age[9]. Advanced maternal age has been identified as a risk factor for GDM, with studies indicating an increased likelihood of GDM occurrence in older pregnant females[10]. Investigating the age-specific patterns of GDM within the tertiary care center setting will shed light on the unique challenges faced by different age groups[11].

Ethnicity plays a pivotal role in GDM prevalence, with variations observed across different racial and ethnic groups. Studies have reported higher rates of GDM in certain ethnic populations, emphasizing the need for targeted screening and interventions[12].

Socio-economic factors have been identified as contributors to GDM risk, with disparities in prevalence observed among different socio-economic strata[13]. Understanding the socio-economic dimensions of GDM within the tertiary care center's patient population is crucial for developing equitable healthcare strategies[14].

The objective of this study was to determine the demographical variations of gestational diabetes mellitus observed at a tertiary care center.

METHODOLOGY

This cross sectional observational research using non-probability convenient sampling was carried out at the Department of Gynecology and Obstetrics of Memon Medical Institute Hospital for a period of six months. After obtaining ethical approval from the Ethical Review Committee of MMI, pregnant females visiting the GYOB out-patient department of MMI and diagnosed with GDM between 20-45 years of age and Attending antenatal clinic during 16 to 36 weeks of gestation were included in the study. Pregnant females with any known chronic illness which may be source of bias in the study and refusal for participation were excluded from the study. Sample size was calculated using open epi online software. Keeping the prevalence of GDM in Pakistan at 14 %, population size at 1000000 and confidence level at 95 %, the sample size came out to be 185[15].

Informed consent was obtained from each participant before inclusion in the study. Data was collected from pregnant females attending the antenatal clinic of the Department of Gynecology and Obstetrics. Confidentiality of data will be maintained throughout the study. After obtaining all demographical data from the participants, oral glucose tolerance test was be performed according to the American Diabetes Association guidelines. OGTT was considered normal with baseline fasting glucose < 95mg/dl, after 1 hour < 180mg/dl, after 2 hour <155mg/dl, and < 140mg/dl after 3 hours. Patients having difference in any two values were identified positive for GDM.

Data Analysis Procedures

For data analysis, SPSS version 23.0 was used. Data was categorical classified and represented as frequency and percentages. Demographical variations were observed by applying chi-square test keeping p-value of <0.05 as statistically significant.

RESULTS

From the total of 185 participants included in the study, 32 (17 %) participants were between 20-25 years, 29 (16 %) between 26-30 years, 52 (28 %) between 31-35 year, 37 (20 %) between 36-40 years and 35 (19 %) between 41-45 years [Figure 1]. 46 (25 %) participants had a BMI of <18.5 kg/m^2, while 29 (16 %) between 18.5-23 kg/m^2 , 65 (35 %) were between 23-27.5

kg/m^2 and 45 (24 %) were >27.5 kg/m^2 [Figure 2]. 53 (29 %) of participants had parity of 1 while 57 (31 %) had >2. <2 gravity was observed in 96 (52 %) of participants while >2 in 89 (48 %). Gestational Diabetes Mellitus (GDM) was reported in first trimester in 52 (28 %) participants, while in 56 (30 %) during second trimester and in 77 (42 %) during third trimester. 70 (38 %) participants reported to be currently smoking. 98 (53%) belonged to upper socio-economic class, 50 (27 %) middle and 37 (20 %) belonged to lower socio-economic class. 33 (18 %) of participants were uneducated, 28 (15 %) had completed matriculation, 29 (16 %) intermediate, 53 (29 %) Bachelors and 42 (23 %) Masters or above. 103 (56 %) of participants reported a positive family history of GDM. 61 (33 %) reported to be hypertensive along with GDM. The time interval between pregnancies <24 months was reported in 107 (58 %) of participants while >24 months in 78 (42 %) of participants [Table 1].

A significant difference was observed between GDM in different trimesters (p-0.04), smoking status (p-0.04), socio-economic status (p<0.01), education (p<0.01, hypertension (p-0.03) and time interval between pregnancies (p-0.04) [Table 2].

Risk Factors		**Frequency**	**%**
Age (years)	20-25	32	17
	26-30	29	16
	31-35	52	28
	36-40	37	20
	41-45	35	19
BMI (kg/m^2)	<18.5	46	25
	18.5-23	29	16
	23-27.5	65	35
	>27.5	45	24
Parity	0	75	41
	1	53	29
	>2	57	31
Gravity	<2	96	52
	>2	89	48
Trimester	First	52	28
	Second	56	30
	Third	77	42
Smoking Status	Yes	70	38
	No	115	62
Socio-Economic Class	Upper	98	53
	Middle	50	27
	Lower	37	20
Education	None	33	18
	Matric	28	15
	Intermediate	29	16
	Bachelor	53	29
	>Masters	42	23
Family History of GDM	Yes	103	56
	No	82	44
Hypertension	Yes	61	33
	No	124	67
Time Interval Between Pregnancies	<24 Months	107	58
	>24 Months	78	42

Table 1: Demographical distribution of study participants (n=185)

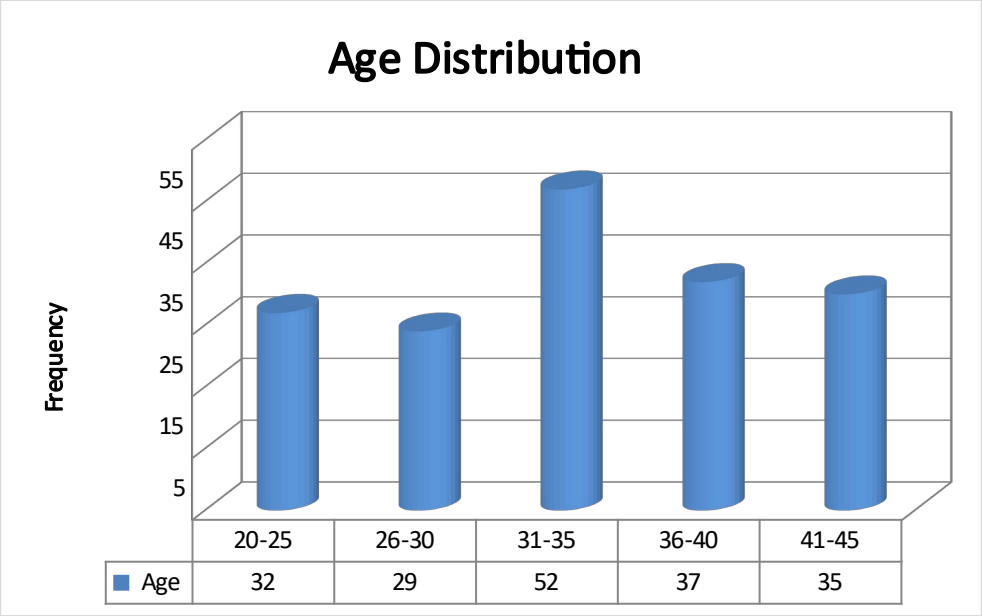


Figure 1: Graphical representation of age distribution of participants (n=185)

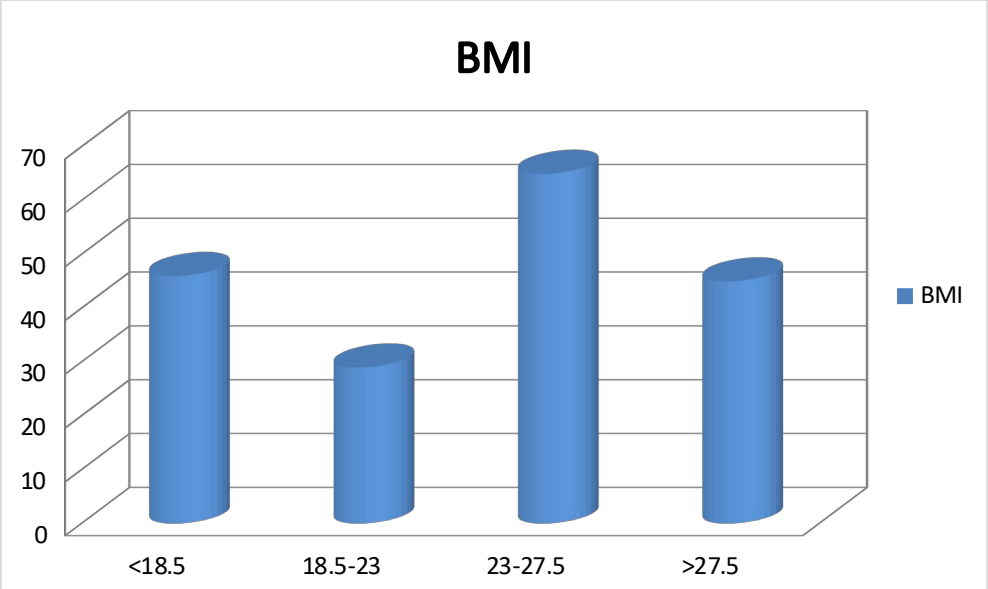


Figure 2: Graphical representation of BMI (kg/m2) distribution of participants (n=185)

Risk Factors		Frequency	p-value
Age (years)	20-25	32	0.76
	26-30	29	
	31-35	52	
	36-40	37	
	41-45	35	
BMI (kg/m^2)	<18.5	46	0.07
	18.5-23	29	
	23-27.5	65	
	>27.5	45	
Parity	0	75	0.44
	1	53	
	>2	57	
Gravity	<2	96	0.89
	>2	89	
Trimester	First	52	0.04
	Second	56	
	Third	77	
Smoking Status	Yes	70	0.04
	No	115	
Socio-Economic Status	Upper	98	<0.01
	Middle	50	
	Lower	37	
Education	None	33	<0.01
	Matric	28	
	Intermediate	29	
	Bachelor	53	
	>Masters	42	
Family History of GDM	Yes	103	0.05
	No	82	
Hypertension	Yes	61	0.03
	No	124	
Time Interval Between Pregnancies	<24 Months	107	0.04
	>24 Months	78	

Table 2: Cross tabulation of various demographical parameters (n=185)

DISCUSSION

From the results observed in this study, majority of participants were between 31-35 years of age with mostly being in between 23-37.5 kg/m^2 BMI. GDM was reported in higher number of females in third trimester (77) as compared to first and second (52 and 56, respectively). GDM was higher educated females and in upper socio-economic classes. Family history of GDM was also strongly observed in GDM along with hypertension and a <24 months interval between pregnancies.

Gestational Diabetes Mellitus (GDM) is a complex condition influenced by various demographic factors that can significantly impact its prevalence and management. Understanding these demographical variations is crucial for healthcare providers to implement targeted interventions and preventive strategies[15].

Advanced maternal age is a well-established risk factor for GDM which was also observed in our study as well. Older aged pregnant female, typically around 35 and above years old, are more likely to develop GDM due to age-related changes in insulin sensitivity and pancreatic function[16]. As females age, their bodies may become less efficient at processing glucose, leading to impaired glucose tolerance during pregnancy. Additionally, older females are more likely to have preexisting metabolic conditions such as obesity and insulin resistance, further increasing their risk of GDM[17].

Similar to the findings in this research, obesity was regarded as one of the strongest risk factors for GDM. Females who are overweight or obese before pregnancy are at a higher risk of

developing GDM compared to females with a healthy weight[18]. Excess adipose tissue, especially visceral fat, contributes to insulin resistance and dysregulation of glucose metabolism. The rising prevalence of obesity globally has contributed to the increasing rates of GDM in many populations. Efforts to address obesity through lifestyle modifications and weight management interventions may help reduce the incidence of GDM among high-risk individuals[19].

In accordance with study, a family history of diabetes, particularly a history of GDM in a woman's immediate family, increases the likelihood of developing GDM[20]. Genetic factors play a significant role in GDM susceptibility, and females with a familial predisposition may have a higher risk of developing the condition. Healthcare providers should inquire about family history during prenatal assessments to identify females who may benefit from closer monitoring and early intervention to prevent or manage GDM[21].

Smoking during pregnancy has been associated with an increased risk of GDM. Tobacco smoke contains numerous harmful chemicals that can impair glucose metabolism and insulin sensitivity. Smoking also contributes to oxidative stress and inflammation, which further exacerbate metabolic dysfunction. Pregnant females who smoke should be encouraged to quit smoking to reduce their risk of GDM and other pregnancy complications[22]. However in our study, only 70 participants with GDM were found to be currently smoking out of 185.

The time interval between pregnancies, also known as inter-pregnancy interval (IPI), may influence the risk of GDM[23]. Shorter IPIs, particularly intervals less than 24 months, have been associated with an increased risk of GDM, similar to our study[24]. Short IPIs may not allow sufficient time for maternal metabolic recovery between pregnancies, leading to persistent insulin resistance and glucose intolerance. Additionally, closely spaced pregnancies may exacerbate nutritional deficiencies and increase maternal stress, further contributing to GDM risk[25].

In conclusion, demographic factors such as age, BMI, family history of GDM, parity, gravity, and time interval between pregnancies play significant roles in the occurrence of GDM. Healthcare providers should consider these factors when assessing GDM risk and implementing preventive measures and interventions during prenatal care. By addressing modifiable risk factors and providing targeted support to high-risk individuals, healthcare providers can help reduce the burden of GDM and improve maternal and fetal outcomes.

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REFERENCES

1. McIntyre HD, Catalano P, Zhang C, Desoye G, Mathiesen ER, Damm P. Gestational diabetes mellitus. Nature reviews Disease primers. 2019 Jul 11;5(1):47.
2. Gyasi-Antwi P, Walker L, Moody C, Okyere S, Salt K, Anang L, et al. Global prevalence of gestational diabetes mellitus: a systematic review and meta-analysis. New American Journal of Medicine. 2020 Jul 1;1(3):1-0.
3. Sweeting A, Wong J, Murphy HR, Ross GP. A clinical update on gestational diabetes mellitus. Endocrine reviews. 2022 Oct 1;43(5):763-93.
4. Modzelewski R, Stefanowicz-Rutkowska MM, Matuszewski W, Bandurska-Stankiewicz EM. Gestational diabetes mellitus—recent literature review. Journal of Clinical Medicine. 2022 Sep 28;11(19):5736.
5. Simmons D, Immanuel J, Hague WM, Teede H, Nolan CJ, Peek MJ, et al. Treatment of gestational diabetes mellitus diagnosed early in pregnancy. New England Journal of Medicine. 2023 Jun 8;388(23):2132-44.
6. Stewart ZA. Gestational diabetes. Obstetrics, Gynaecology & Reproductive Medicine. 2020 Mar 1;30(3):79-83.
7. Muche AA, Olayemi OO, Gete YK. Prevalence of gestational diabetes mellitus and associated factors among women attending antenatal care at Gondar town public health facilities, Northwest Ethiopia. BMC pregnancy and childbirth. 2019 Dec;19:1-3.
8. Khan R, Ali K, Khan Z. Socio-demographic risk factors of gestational diabetes mellitus. Pakistan journal of medical sciences. 2013 May;29(3):843.

9. Li Y, Ren X, He L, Li J, Zhang S, Chen W. Maternal age and the risk of gestational diabetes mellitus: a systematic review and meta-analysis of over 120 million participants. Diabetes research and clinical practice. 2020 Apr 1;162:108044.
10. Kuo CH, Chen SC, Fang CT, Nien FJ, Wu ET, Lin SY, et al. Screening gestational diabetes mellitus: The role of maternal age. PloS one. 2017 Mar 15;12(3):e0173049.
11. Han Y, Tong M, Jin L, Yu J, Meng W, Ren A, Jin L. Maternal age at pregnancy and risk for gestational diabetes mellitus among Chinese women with singleton pregnancies. International Journal of Diabetes in Developing Countries. 2021 Jan;41:114-20.
12. Yuen L, Wong VW, Simmons D. Ethnic disparities in gestational diabetes. Current diabetes reports. 2018 Sep;18:1-2.
13. Liu J, Liu E, Leng J, Pan L, Zhang C, Li W, et al. Indicators of socio-economic status and risk of gestational diabetes mellitus in pregnant women in urban Tianjin, China. Diabetes Research and Clinical Practice. 2018 Oct 1;144:192-9.
14. Roustaei Z, Anttonen S, Räisänen S, Gissler M, Heinonen S. Socioeconomic status, maternal risk factors, and gestational diabetes mellitus across reproductive years: a Finnish register-based study. BMJ Open Diabetes Research and Care. 2023 Aug 1;11(4):e003278.
15. Riaz M, Nawaz A, Masood SN, Fawwad A, Basit A, Shera AS. Frequency of gestational diabetes mellitus using DIPSI criteria, a study from Pakistan. Clinical Epidemiology and Global Health. 2019 Jun 1;7(2):218-21.
16. Wang X, Zhang X, Zhou M, Juan J, Wang X. Association of gestational diabetes mellitus with adverse pregnancy outcomes and its interaction with maternal age in Chinese urban women. Journal of Diabetes Research. 2021 May 18;2021:1-8.
17. Marozio L, Picardo E, Filippini C, Mainolfi E, Berchialla P, Cavallo F, et al. Maternal age over 40 years and pregnancy outcome: a hospital-based survey. The Journal of Maternal-Fetal & Neonatal Medicine. 2019 May 19;32(10):1602-8.
18. Zehravi M, Maqbool M, Ara I. Correlation between obesity, gestational diabetes mellitus, and pregnancy outcomes: an overview. International Journal of Adolescent Medicine and Health. 2021 Dec 7;33(6):339-45.
19. Alwash SM, McIntyre HD, Mamun A. The association of general obesity, central obesity and visceral body fat with the risk of gestational diabetes mellitus: Evidence from a systematic review and meta-analysis. Obesity Research & Clinical Practice. 2021 Sep 1;15(5):425-30.
20. Zhang Y, Xiao CM, Zhang Y, Chen Q, Zhang XQ, Li XF, Shao RY, Gao YM. Factors associated with gestational diabetes mellitus: a meta-analysis. Journal of diabetes research. 2021 May 10;2021:1-8.
21. Popova PV, Klyushina AA, Vasilyeva LB, Tkachuk AS, Vasukova EA, Anopova AD, et al. Association of common genetic risk variants with gestational diabetes mellitus and their role in GDM prediction. Frontiers in endocrinology. 2021 Apr 19;12:628582.
22. Wang JW, Cao SS, Hu RY, Wang M. Association between cigarette smoking during pregnancy and gestational diabetes mellitus: a meta-analysis. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 Mar 3;33(5):758-67.
23. Chou JS, Packer CH, Mittleman MA, Valent AM. Association of interpregnancy interval and gestational diabetes mellitus. The Journal of Maternal-Fetal & Neonatal Medicine. 2022 Dec 30;35(26):10545-50.
24. Wang Y, Zeng C, Chen Y, Yang L, Tian D, Liu X, et al. Short interpregnancy interval can lead to adverse pregnancy outcomes: A meta-analysis. Frontiers in Medicine. 2022 Nov 30;9:922053.
25. Gebremedhin AT, Regan AK, Ball S, Betrán AP, Foo D, Gissler M, et al. Effect of interpregnancy interval on gestational diabetes: a retrospective matched cohort study. Annals of epidemiology. 2019 Nov 1;39:33-8.