Original Article

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Mode of Delivery in Patients with Gestational Diabetes Mellitus

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Author`s Contribution

[1,2,3]Substantial contributions to the conception or design of the work; or the acquisition, [4]Drafting the work or revising it critically for important intellectual content

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ABSTRACT

Objective: To determine the frequency of mode of delivery in patients with gestational diabetes mellitus.

Methodology: The Descriptive study was conducted from August 2024 to November 2024 the Department of Obstetrics and Gynaecology, ATH Abbottabad.

A total of 139 women with singleton pregnancies diagnosed with GDM after 36 weeks of gestation were included. The sample size was calculated using the WHO sample size calculator, considering a 95% confidence interval, a 5% margin of error, and an expected frequency of 10% for instrumental deliveries. Data collection included demographic information, pregnancy details, and delivery outcomes.

Results: The mean age of participants was 29.76 ± 4.74 years, with a mean gestational age of 38.49 ± 0.96 weeks. The average parity was 1.63 ± 1.12, and the mean BMI was 29.26 ± 3.68 kg/m². The majority of participants (60.4%) resided in rural areas. The mode of delivery distribution was as follows: 57.6% spontaneous vaginal delivery, 7.2% instrumental delivery, and 35.3% cesarean section.

Conclusion: GDM significantly impacts the mode of delivery, with age and BMI being key determinants.

Keywords: Gestational diabetes mellitus, Mode of delivery, Cesarean section, Spontaneous vaginal delivery

Introduction

Gestational Diabetes Mellitus (GDM) is a condition that is seen in a significant percentage of pregnant women and is distinguished by an increased risk for labor and delivery complications. The method of delivery in GDM patients is an urgent decision that is made on the basis of factors such as fetal growth, severity of hyperglycemia, and maternal health.[2] There is generally a preference to avoid risk to fetal macrosomia, shoulder dystocia, and complications in the mother such as preeclampsia.[3] Pregnant women with controlled GDM generally have a vaginal delivery, offered there is no other obstetric reason for a cesarean section.[4] In instances where there is uncontrolled diabetes or there is a complication with fetal growth (macrosomia), risk for shoulder dystocia, or other complications, a cesarean delivery is recommended.[5]

Management of GDM during labor also has a critical role in choosing the mode of delivery.[6] Constant management of blood sugar is key to it, with both hyper- as well as hypoglycemia having adverse effects on fetal as well as maternal outcomes.[7] In pregnant women with optimally controlled GDM, there is a low risk for spontaneous preterm labor, and a safe vaginal delivery is possible as long as fetal position is favorable and there is no sign of serious fetal distress.[8] In pregnant individuals with poorly controlled sugar, induction may need to be delayed or a cesarean section may need to be performed due to suspected fetal compromise or complications secondary to an oversized infant.[9]

For these patients with GDM for whom a planned cesarean is expected, timing is also quite crucial.[10] Planned cesarean is typically performed at 39 weeks' gestation to prevent preterm spontaneous labor in instances where fetal growth is oversized.[11] Pre- and post-operative control of the patient's blood sugar is also extremely important to prevent complications like infection or dehiscence.[12] Mode of delivery in patients with Gestational Diabetes Mellitus in general is a complicated maternal and fetal problem, with individually customized management depending on severity of control, fetal size, and progress of pregnancy.[13]

Metcalfe A and others in a study determined that of patients with gestational diabetes mellitus, 53% delivered spontaneously, 10% delivered instrumentally, and 37% delivered by cesarean section.[14]

It is imperative to research the mode of delivery in patients with Gestational Diabetes Mellitus (GDM) due to the potential complications of the condition for the baby and the mother. Fetal growth, the rate of caesarean sections, and harmful outcomes such as neonatal

hypoglycemia or birth trauma are some of the potential implications of GDM. Knowledge of the most suitable delivery techniques will optimize outcomes, reduce risks, and inform the practices of clinicians in the management of GDM complicated pregnancies. This investigation serves to shed light on the most efficient delivery techniques in enhancing maternal and neonatal outcomes.

Methodology

This descriptive study was conducted at the Department of Obstetrics and Gynaecology at ATH Abbottabad between August 2024 to November 2024. A total of 139 women participated in the study, with the sample size calculated using the WHO sample size calculator, considering a 95% confidence interval, a 5% margin of error, and an expected frequency of 10% for instrumental deliveries in patients diagnosed with gestational diabetes mellitus.[14]

Women aged 18 to 40 years, with singleton pregnancies diagnosed after 36 weeks of gestation, and diagnosed with gestational diabetes mellitus, were included. The diagnosis of gestational diabetes was confirmed if at least one abnormal plasma glucose concentration was observed in laboratory tests, including fasting plasma glucose greater than 92 mg/dl, or after a 75g oral glucose tolerance test (OGTT), with a result greater than 180 mg/dl at one hour or greater than 153 mg/dl at two hours. Exclusion criteria consisted of women with prior uterine surgeries, uncontrolled hypertension (systolic blood pressure > 140 mmHg), fetal malpresentation, a history of placenta previa, and several other conditions such as a body mass index greater than 40 kg/m², among others.

The data collection process began with obtaining informed consent from the participants, ensuring their confidentiality and that no risk was involved in the study. Demographic information such as age, BMI (calculated as weight in kilograms divided by the square of height in meters), residential status, socioeconomic status, and profession was gathered. Information on the pregnancy's gestational age (determined by the last menstrual period) and parity (number of previous pregnancies carried to at least 20 weeks of gestation) was also collected. Upon admission, the progress of labor was monitored. The onset of spontaneous labor or any induction methods used was documented. If labor did not progress, operative vaginal delivery was considered. Instrumental delivery was defined as the use of forceps or a vacuum extractor to assist in the delivery of the fetus. The indications for instrumental delivery, such as prolonged second stage of labor or fetal distress, were noted. In cases where instrumental delivery was not feasible, a cesarean section was performed, which involved the delivery of the baby through an incision in the abdomen and uterus. The reasons for choosing cesarean section were also recorded.

The route of delivery—whether spontaneous vaginal delivery, instrumental delivery, or cesarean section—was documented for all participants. The entire procedure was conducted under the supervision of a consultant gynecologist with over three years of post-fellowship experience. All data was collected by the researcher herself using a specially designed proforma.

Statistical analysis was performed using IBM SPSS version 26. Descriptive statistics were used to calculate frequencies and percentages for categorical variables, including mode of delivery and other demographic variables. Continuous variables such as age, BMI, gestational age, and parity were expressed as mean ± standard deviation. Stratification of the mode of delivery was done based on various factors, including age, BMI, and residential status. The chi-square test was applied after stratification to assess statistical significance, with a p-value of ≤ 0.05 considered significant.

Results

As shown in Table-I, the mean age of the patients was 29.76 ± 4.74 years, with a gestational age mean of 38.49 ± 0.96 weeks. The average parity was 1.63 ± 1.12, and the mean BMI was 29.26 ± 3.68 kg/m². The demographic breakdown indicated that 60.4% of patients resided in rural areas, while 39.6% lived in urban locations. Socioeconomically, 48.9% of participants were categorized as poor, 37.4% as middle class, and 13.7% as rich. In terms of occupation, 74.1% of women were housewives, and 32.4% had hypertension and obesity each.

Table-II shows the mode of delivery distribution: 57.6% of patients had a spontaneous vaginal delivery, 7.2% had an instrumental delivery, and 35.3% underwent a C-section.

In Table-III, the association of mode of delivery with demographic factors is examined. For spontaneous vaginal delivery, age played a significant role, with 76.9% of those aged ≤30 years delivering vaginally, compared to only 32.8% of those aged >30 years ($p < 0.001$). BMI was also a significant factor, with all patients with a BMI ≤25 having spontaneous vaginal deliveries ($p < 0.001$). Rural versus urban residency did

not show a significant difference in spontaneous vaginal delivery (p = 0.127).

Table I: Patient Demographics.

Demographics		Mean ± SD
Age (years)		29.755±4.74
Gestational age (weeks)		38.489±0.96
Parity		1.633±1.12
BMI (Kg/m^2)		29.264±3.68
Residential Status	Rural n (%)	84 (60.4%)
	Urban n (%)	55 (39.6%)
Socioeconomic Status	Poor n (%)	68 (48.9%)
	Middle n (%)	52 (37.4%)
	Rich n (%)	19 (13.7%)
Profession	Housewife n (%)	103 (74.1%)
	Job n (%)	36 (25.9%)
Hypertension	Yes n (%)	45 (32.4%)
	No n (%)	94 (67.6%)
Obesity	Yes n (%)	45 (32.4%)
	No n (%)	94 (67.6%)

Table- II: Mode of delivery.

Mode of delivery	Frequency	% age
Spontaneous Vaginal	80	57.6%
Instrumental	10	7.2%
C-Section	49	35.3%

For instrumental delivery, no significant differences were found in age, BMI, or residential status (p-values 1.000, 0.220, and 1.000, respectively). Lastly, C-section delivery was strongly associated with age and BMI. Among those aged >30 years, 60.7% had a C-section compared to 15.4% of those ≤30 years (p < 0.001). Additionally, 41.9% of patients with a BMI >25 had a C-section, compared to none of those with a BMI ≤25 (p < 0.001). Residential status had no significant impact on C-section rates (p = 0.111).

Table III: Association of Mode of Delivery with Demographic Factors.

Demographic Factors		Spontaneous Vaginal		p-value
		Yes n(%)	No n(%)	
Age (years)	≤30	60 (76.9%)	18 (23.1%)	<0.001
	>30	20 (32.8%)	41 (67.2%)	
BMI (Kg/m^2)	≤25	22 (100%)	0 (0%)	<0.001*
	>25	58 (49.6%)	59 (50.4%)	
Residential Status	Rural	44 (52.4%)	40 (47.6%)	0.127
	Urban	36 (65.5%)	19 (34.5%)	
Demographic Factors		Instrumental		p-value
		Yes n(%)	No n(%)	
Age (years)	≤30	6 (7.7%)	72 (92.3%)	1.000*
	>30	4 (6.6%)	57 (93.4%)	
BMI (Kg/m^2)	≤25	0 (0%)	22 (100%)	0.220*
	>25	10 (8.5%)	107 (91.5%)	
Residential Status	Rural	6 (7.1%)	78 (92.9%)	1.000*
	Urban	4 (7.3%)	51 (92.7%)	
Demographic Factors		C-Section		p-value
		Yes n(%)	No n(%)	
Age (years)	≤30	12 (15.4%)	66 (84.6%)	
	>30	37 (60.7%)	24 (39.3%)	<0.001
BMI (Kg/m^2)	≤25	0 (0%)	22 (100%)	<0.001*
	>25	49 (41.9%)	68 (58.1%)	
Residential Status	Rural	34 (40.5%)	50 (59.5%)	0.111
	Urban	15 (27.3%)	40 (72.7%)	

*Fisher Exact Test

Discussion

The close relationship between age and delivery mode, and the higher incidence of C-section among the over-30-year-olds, could be due to the higher incidence of complications at older maternal age, such as macrosomia, often necessitating surgical delivery. Similar to the relationship between the delivery mode and the BMI, the latter also points to a close relationship between delivery mode and obesity, possibly due to the higher rate of obstructed labor and fetal distress among obese patients. The lack of significant relationship between residential status and delivery mode could imply that the delivery mode is primarily determined by the clinical factors of age and BMI and not residential status.

These results reinforce the necessity of more tightly controlling high-risk GDM pregnanancies in older and obese women to better identify the need for a specific delivery and minimize potential complications in the mother and infant.

In our study, the mean age of the patients was 29.76 ± 4.74 years, which is comparable to the findings of Saima Yasmin et al. [15] where the mean age was 32.3 years, indicating that GDM tends to occur more frequently in women aged over 25 years, as both studies reported a higher prevalence of GDM in this age group. Furthermore, Shayda Miran Sabah Ibrahim et al. [16] also reported that half of the women in their study with GDM were ≥35 years old, which is consistent of the trend of GDM increasing with increasing age among other studies. And that's likely because the older you are, the more risk you have of developing insulin resistance and other metabolic changes, and higher chance of getting GDM.

Further, we found 60.4% of participants lived in rural areas, similar to Swaroop N et al. [17] who also indicate that a large number of GDM patients (59%) live in rural areas. This implies that GDM may be more prevalent in rural settings where due to lack of healthcare facilities, poor awareness of GDM, and other lifestyle factors.

On the mode of delivery, we observed that 35.3 of patients delivered via cesarean section in which the incidence of cesarean delivery increases with age, and

BMI particularly in those aged > 30 years and BMI > 25. This is consistent with the results of Swaroop N et al. [17] who observed that GDM patients had higher cesarean section rate (54.54%) compared with patients without GDM (16.74%) as a consequence of macrosomia. This is also supported by a high cesarean section rate (58%) by Saima Yasmin et al. [15] in GDM pregnancies.

By way of association, our study also found a strong association between BMI and delivery method. Spontaneous vaginal deliveries were found in all patients with a BMI≤25 years and a higher rate with C-section deliveries (41.9%) as seen in Swaroop N et al. [17,] where patients with a higher BMI had more cesarean sections.

In comparison, Shayda Miran Sabah Ibrahim et al. [16] found that women with GDM in their study had a significantly higher rate of cesarean sections (74%) compared to the control group (33%), which aligns with our study's finding of an increased risk of cesarean delivery in GDM patients. However, our study's rate of C-sections was slightly lower, likely due to differences in patient populations and management practices across the various studies.

Based on the results of our research and in comparison to the current literature, we see that Gestational Diabetes Mellitus (GDM) has a significant bearing on maternal and fetal outcomes, with age, body mass index (BMI), and glycemia control being the determining factors in mode of delivery and the rate of complications. Although strict glycemia control and personalized therapy remain paramount for the enhancement of outcomes, the differences across the studies also reflect the need for context-specific approaches to management. This gives a call to conduct more research aimed at creating more generalizable guidelines to be followed by different patient populations and different healthcare systems.

Nonetheless, there were a number of limitations of our research. To start with, it was a single-center-based research, and that might reduce the generalizability of the results to other parts of the country with varied demographic populations and healthcare practices. The relatively small number of patients might also have altered the statistical power to identify differences in some of the outcomes. Furthermore, the research was observational in nature and thus could not control all the potential confounders that could have affected the outcomes, including the differences in access to healthcare, patient compliance, and socioeconomic status. More multicenter trials with larger patient populations and long-term follow-up would be useful to confirm and generalize these results.

Conclusion

We have determined in our research that Gestational Diabetes Mellitus strongly influences mode of delivery, and age, body mass index and control of glycemia all have key roles in determining delivery mode. The implications of the research reiterate the necessity of timely identification, regular observation, and individually specific management plans to achieve the best outcomes for the mother and baby. Given the high rate of cesarean deliveries and neonatal morbidity in GDM, timely management and adequate care will be required to optimize perinatal health. Further research will have to be conducted to maximize management guidelines to obtain better outcomes in all patient populations.

References

1. Nakshine VS, Jogdand SD. A Comprehensive Review of Gestational Diabetes Mellitus: Impacts on Maternal Health, Fetal Development, Childhood Outcomes, and Long-Term Treatment Strategies. Cureus. 2023 Oct 23;15(10):e47500. doi: 10.7759/cureus.47500.
2. Sweeting A, Wong J, Murphy HR, Ross GP. A Clinical Update on Gestational Diabetes Mellitus. Endocr Rev. 2022 Sep 26;43(5):763-793. doi: 10.1210/endrev/bnac003.
3. Li X, Li TT, Tian RX, Fei JJ, Wang XX, Yu HH, Yin ZZ. Gestational diabetes mellitus: The optimal time of delivery. World J Diabetes. 2023 Mar 15;14(3):179-187. doi: 10.4239/wjd.v14.i3.179.
4. Nevander S, Carlhäll S, Källén K, Lilliecreutz C, Blomberg M. Gestational diabetes mellitus and time in active labor: A population-based cohort study. Acta Obstet Gynecol Scand. 2023 Jul;102(7):873-882. doi: 10.1111/aogs.14592.
5. Parveen N, Iqbal N, Batool A, Mahmoud T, Ali S. Macrosomia predictors and pregnancy outcomes in Gestational Diabetes patients: An observational study from Ha'il, Saudi Arabia. Pak J Med Sci. 2022 May-Jun;38(5):1126-1131. doi: 10.12669/pjms.38.5.5809.
6. Albairmani RA, Basheer BM, Macky MM, Al Syouti T, AlZubaidy H, Elfaki E, Kidwai A, Basheer YM, Ahmed F, Salaheldin M. Management of Diabetes in Pregnancy: A Review of Clinical Guidelines and Practices. Cureus. 2025 Feb 19;17(2):e79334. doi: 10.7759/cureus.79334.
7. Silva CM, Arnegard ME, Maric-Bilkan C. Dysglycemia in Pregnancy and Maternal/Fetal Outcomes. J

Womens Health (Larchmt). 2021 Feb;30(2):187-193. doi: 10.1089/jwh.2020.8853.

8. Morlando M, Savoia F, Conte A, Schiattarella A, La Verde M, Petrizzo M, Carpentieri M, Capristo C, Esposito K, Colacurci N. Maternal and Fetal Outcomes in Women with Diabetes in Pregnancy Treated before and after the Introduction of a Standardized Multidisciplinary Management Protocol. J Diabetes Res. 2021 Nov 12;2021:9959606.
9. Zhao F, Xiao B. Factors Influencing Adverse Pregnancy Outcomes in Gestational Diabetes Mellitus. Comput Intell Neurosci. 2022 Sep 1;2022:5177428. doi: 10.1155/2022/5177428.
10. Lu H, Hirst J, Yang J, Mackillop L, Clifton D. Standardising the assessment of caesarean birth using an oxford caesarean prediction score for mothers with gestational diabetes. Healthc Technol Lett. 2022 Mar 13;9(1-2):1-8. doi: 10.1049/htl2.12022.
11. Boulvain M, Thornton JG. Induction of labour at or near term for suspected fetal macrosomia. Cochrane Database Syst Rev. 2023 Mar 8;3(3):CD000938. doi: 10.1002/14651858.CD000938.pub3.
12. Sethuraman RM, Parida S, Sethuramachandran A, Selvam P. A1C as a Prognosticator of Perioperative Complications of Diabetes: A Narrative Review. Turk J Anaesthesiol Reanim. 2022 Apr;50(2):79-85. doi: 10.5152/TJAR.2021.854.
13. Thakur A, Agrawal S, Chakole S, Wandile B. A Critical Review of Diagnostic Strategies and Maternal Offspring Complications in Gestational Diabetes Mellitus. Cureus. 2023 Dec 24;15(12):e51016. doi: 10.7759/cureus.51016.
14. Metcalfe A, Hutcheon JA, Sabr Y, Lyons J, Burrows J, Donovan LE, et al. Timing of delivery in women with diabetes: a population-based study. Acta Obstet Gynecol Scand. 2020;99(3):341-9.
15. Yasmin S, Yasmin T, Fatima I. Maternal and fetal outcome in gestational diabetes. J Ayub Med Coll Abbottabad. 2012;24(3-4):17-22.
16. Ibrahim MS, Hamad D, Hussein RM, Aziz EN, Rostam S, Luqman Z, Sherzad S, Ismael Z. Mode of delivery and fetal outcome in women with diabetes mellitus. J Crit Rev. 2022;9(4):116-121.
17. Swaroop N, Rawat R, Lal P, Pal N, Kumari K, Sharma P. Gestational diabetes mellitus: study of prevalence using criteria of diabetes in pregnancy study group in India and its impact on maternal and fetal outcome in a rural tertiary institute. Int J Reprod Contracept Obstet Gynecol. 2015;4(6):1950-3. DOI: 10.18203/2320-1770.ijrcog20151292.