

Original Article

Gestational Age at Delivery and Fetomaternal Outcome of Patients with Hyperglycemia in Pregnancy

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Abstract:

Background: Hyperglycemia in pregnancy (HIP) is associated with increased risk of adverse fetomaternal outcomes, which may vary according to the timing of delivery. Evidence regarding the association between gestational age at delivery and fetomaternal complications is limited in Bangladesh.

Objective: This study aimed to evaluate the association between gestational age at delivery and fetomaternal outcomes among women with HIP.

Methods: A hospital-based cross-sectional study was conducted from July 2019 to June 2020 in the Department of Obstetrics and Gynecology, BIRDEM, Dhaka, Bangladesh. A total of 207 women aged ≥ 18 years with HIP admitted for delivery were purposively selected. Women with multiple pregnancies, active per vaginal bleeding, or severe comorbidities were excluded. Data were collected using a pretested semi-structured questionnaire through face-to-face interviews and review of hospital records during the 3rd–7th day of the puerperium.

Results: The majority of mothers were aged 26–35 years (69.1%), and most deliveries occurred in the early-term period (61.4%). Caesarean delivery was predominant (96.6%). Pregnancy-induced hypertension (22.7%) and polyhydramnios (15.9%) were the most common maternal complications. Among neonates, 22.2% had low birth weight, 12.6% had APGAR scores < 7 , 14.5% developed jaundice, 9.7% had respiratory distress syndrome, and 26.1% required NICU admission. Maternal age, PIH, oligohydramnios, and genitourinary tract infections were significantly associated with preterm delivery ($p < 0.05$). Fetal outcomes such as low birth weight, depressed APGAR score, neonatal jaundice, respiratory distress syndrome, and NICU admission were significantly higher in preterm and early-term deliveries compared to full-term ($p < 0.05$).

Conclusion: Gestational age at delivery in women with HIP is strongly associated with both maternal and neonatal complications. Preterm and early-term deliveries were related to higher risks of adverse outcomes, emphasizing the importance of optimal glycemic control and careful monitoring to improve fetomaternal outcomes in hyperglycemic pregnancies.

Key words: Hyperglycemia in pregnancy, gestational age, maternal complications, fetal outcomes, Bangladesh.

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Introduction:

Hyperglycemia in pregnancy (HIP), which includes gestational diabetes mellitus (GDM) and pre-existing diabetes, is a common metabolic disorder that poses significant risks to both the mother and the fetus.^{1,2}

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The prevalence of HIP has been increasing worldwide due to rising rates of obesity, sedentary lifestyles, and advanced maternal age, making it a major public health concern.^{3,4} Women with HIP are at higher risk of

complications such as pregnancy-induced hypertension, polyhydramnios, prelabor rupture of membranes, and increased cesarean delivery rates.⁵⁻⁸

Fetuses of mothers with HIP are also at risk of adverse outcomes, including macrosomia, low birth weight, neonatal hypoglycemia, respiratory distress syndrome, jaundice, and higher rates of neonatal intensive care unit (NICU) admission.⁹⁻¹¹ These complications are often influenced by the timing of delivery, with preterm and early-term births associated with greater neonatal morbidity and mortality.^{2,12} Optimal timing of delivery is therefore crucial to minimize risks for both mother and child.^{8,9}

Despite the known risks, there is scanty research in Bangladesh on the association between gestational age at delivery and fetomaternal outcomes among women with HIP. Most studies focus on the prevalence and management of diabetes in pregnancy, while the impact of delivery timing on maternal and neonatal complications remains underexplored.^{1,3-5} Understanding these associations is essential for developing evidence-based guidelines to improve perinatal outcomes in this high-risk population.

This study aims to evaluate the association between gestational age at delivery and fetomaternal outcomes in women with HIP admitted for delivery in a tertiary care hospital in Dhaka, Bangladesh. The findings are expected to inform clinical decision-making regarding optimal delivery timing and strategies to reduce adverse outcomes for both mothers and neonates.

Methodology

Study design and settings

This was a hospital-based analytical cross-sectional study was carried out to determine the association between of gestational age at delivery and fetomaternal outcome in patient with HIP in the Department of Obstetrics and Gynaecology of Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka 1000, Bangladesh.

Sample selection criteria

The study comprised purposively selected 207 women aged ≥ 18 years, diagnosed as

hyperglycemia in their pregnancy, and admitted in inpatient department of BIRDEM General Hospital for delivery prior to interview. Patients had a history of HIP with active per vaginal bleeding and multiple pregnancies, and HIP with severe comorbidity (cardiac failure, hepatic failure, and renal failure) were excluded from the study.

Data collection procedures

The study was conducted from July 2019 to June 2020 using a pretested semi-structured questionnaire to collect data through face-to-face interviews and review of hospital records during the 3rd to 7th day of the puerperium. Each participant had a separate data collection sheet to record maternal age, gestational age at delivery, mode of delivery, maternal complications, and fetal outcomes. Gestational age at delivery was treated as the independent variable, while maternal outcomes such as pregnancy-induced hypertension, prelabor rupture of membranes, polyhydramnios, genitourinary tract infections, and mode of delivery and fetal outcomes including birth weight, APGAR score, hypoglycemia, jaundice, respiratory distress syndrome, and NICU admission were considered dependent variables.

Data analysis

Data were entered, cleaned, and analyzed using the Statistical Package for Social Sciences (SPSS), version 25 (IBM Corp., New York, USA). Descriptive statistics were expressed as frequency and percentage for categorical variables; as mean and standard deviation (SD) for continuous variables. The Chi-square test was used to assess associations between categorical variables. Differences in mean age among preterm, early-term, and full-term deliveries were analyzed using the One-way ANOVA test. The strength of associations was estimated by calculating odds ratios (ORs) with 95% confidence intervals (CIs). A p-value < 0.05 at a 95% confidence level was considered statistically significant.

Ethical approval

Participation was voluntary, and participants were informed that they have the right to withdraw at any point without any negative consequences. The participants' confidentiality was maintained throughout the study. Ethical approval was obtained from the

'Institutional Review Board' of Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka 1000, Bangladesh. (Reference: BIRDEM/IRB/2021/257)

Result

Table 1 shows the majority of mothers were aged between 26 and 35 years (69.1%), only a small proportion of mothers were ≥ 36 years (11.1%) or ≤ 25 years (19.8%). Regarding gestational age at delivery, most women delivered in the early term period (37 to 38 weeks, 61.4%), while preterm and full-term deliveries were less frequent (both 19.3%).

Figure 1 portrays among women with hyperglycemia in pregnancy, pregnancy-induced hypertension (PIH) was the most common maternal complication, occurring in 22.7% of cases. Polyhydramnios was observed in 15.9%, followed by Oligohydramnios in 6.3%. Premature rupture of membranes (PROM) and genitourinary tract infections were less frequent, affecting 5.3% and 5.8% of women, respectively.

Figure 2 shows among the studied women with hyperglycemia in pregnancy, the overwhelming majority (96.6%) delivered by caesarean section, while only a small proportion (3.4%) had a vaginal delivery.

Table 2 shows the majority (75.8%) had normal birth weight, while 22.2% were low birth weight and 1.9% was macrosomic. Depressed APGAR scores (<7) at 5 minutes were observed in 12.6% of neonates, and 4.8% experienced hypoglycemia shortly after birth. Neonatal jaundice occurred in 14.5%, and respiratory distress syndrome was seen in 9.7% of cases. Over one-fourth of the newborns (26.1%) required NICU admission.

Table 3 demonstrates that maternal age was positively associated with preterm delivery. Women ≥ 36 years had the highest proportion of preterm deliveries (39.1%), and the mean maternal age was significantly higher in preterm deliveries (31.5 ± 5.8 years) compared to early-term (30.3 ± 4.6) and full-term deliveries (28.8 ± 4.2) ($p = 0.039$). PIH was significantly associated with gestational age at delivery. Among women with PIH, 36.2% delivered preterm compared to 14.4% of

women without PIH ($p = 0.002$). Oligohydramnios also showed a significant association, with 46.2% of affected women delivering preterm versus 17.5% without the condition ($p = 0.025$). Similarly, genitourinary tract infections were strongly associated with preterm delivery; 66.7% of women with infections delivered preterm compared to 16.4% without infections ($p = 0.001$). Other complications, including PROM, polyhydramnios, and mode of delivery, did not show statistically significant associations with gestational age at delivery ($p > 0.05$).

Table 4 demonstrates that significant association between gestational age at delivery and several adverse fetal outcomes in pregnancies complicated by hyperglycemia. Birth weight was strongly associated with gestational age. Low birth weight (<2.5 kg) was most common in preterm deliveries (45.7%), compared to early-term (34.8%) and full-term (19.6%) deliveries ($p = 0.001$). Normal birth weight (2.5-4.0 kg) was predominant in early-term deliveries (68.8%). Macrosomia (>4.0 kg) was rare and mostly seen in full-term neonates. APGAR scores <7 were significantly more frequent in preterm (50%) and early-term (46.2%) deliveries than in full-term neonates (3.8%) ($p = 0.001$), indicating higher immediate postnatal risk in earlier deliveries. Neonatal jaundice occurred more commonly in preterm (36.6%) and early-term (56.7%) infants compared to full-term (6.7%) ($p = 0.014$). RDS was significantly higher among preterm neonates (65%) than early-term (30%) or full-term (5%) ($p = 0.001$). NICU admission was required more frequently for preterm (42.6%) and early-term (40.7%) neonates compared to full-term (16.7%) ($p = 0.001$). Hypoglycemia after birth did not show a statistically significant association with gestational age ($p = 0.269$).

Table 1: Patient's profiles (n=207)

Attributes		Frequency (n)	Percent (%)
Age groups of the mothers (in years)	≤ 25	41	19.8
	26-30	71	34.3
	31-35	72	34.8
	≥ 36	23	11.1
Gestational age (in weeks)	Pre term ($33^{+0} - 36^{+6}$)	40	19.3
	Early term ($37^{+0} - 38^{+6}$)	127	61.4
	Full term ($39^{+0} - 40^{+6}$)	40	19.3

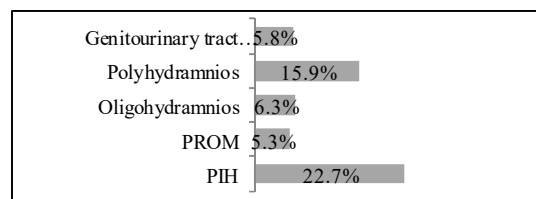


Figure 1: Maternal complications of the participants (n=207)

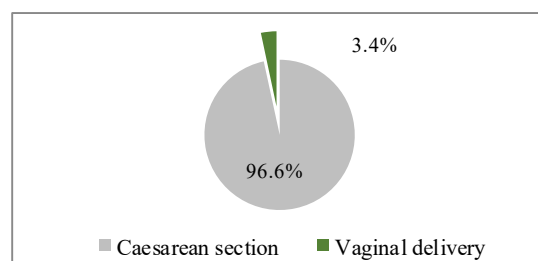


Figure 2: Mode of delivery (n=207)

Table 2: Fetal outcomes (n=207)

Attributes		Frequency (n)	Percent (%)
Birth weight (in kg)	<2.5	46	22.2
	2.5-4.0	157	75.8
	>4.0	4	1.9
APGAR score depressed (<7)	Yes	26	12.6
	No	181	87.4
Hypoglycemia after birth	Yes	10	4.8
	No	197	95.2
Neonatal Jaundice	Yes	30	14.5
	No	177	85.5
RDS	Yes	20	9.7
	No	187	90.3
NICU admission	Yes	54	26.1
	No	153	73.9

Table 3: Association of maternal complications with their gestational age at delivery (n=207)

Variables	Gestational age at delivery				Test of significance	p-value
	Pre term	Early term	Full term	Total		
Age groups (in years)						
≤25	7(17.1)	26(63.4)	8(19.5)	41(100)	$\chi^2=11.9$	0.063
26-30	10(14.1)	41(57.7)	20(28.2)	71(100)		
31-35	14(19.4)	48(66.7)	10(13.9)	72(100)		
≥36	9(39.1)	12(52.2)	2(8.7)	23(100)		
Mean±SD	31.5±5.8	30.3±4.6	28.8±4.2		F= 3.2	*0.039
PIH						
Yes	17(36.2)	20(42.6)	10(21.3)	47(100)	$\chi^2=12.5$	*0.002
No	23(14.4)	107(66.9)	30(18.8)	160(100)		
PROM						
Yes	4(36.4)	6(54.5)	1(9.1)	11(100)	$\chi^2= 2.4$	0.292
No	36(18.4)	121(61.7)	39(19.9)	196(100)		
Oligohydramnios						
Yes	6(46.2)	4(30.8)	3(23.1)	13(100)	$\chi^2= 7.3$	*0.025
No	34(17.5)	123(63.4)	37(19.1)	194(100)		
Polyhydramnios						
Yes	7(21.2)	21(63.6)	5(15.2)	33(100)	$\chi^2= 0.45$	0.795
No	33(19.0)	106(60.9)	35(20.1)	174(100)		
Genitourinary tract infection						
Yes	8(66.7)	3(25.0)	1(8.3)	12(100)	$\chi^2= 8.3$	*0.001
No	32(16.4)	124(63.6)	39(20.0)	195(100)		
Mode of delivery						
Yes	39(19.5)	124(62.0)	37(18.5)	200(100)	$\chi^2= 2.5$	0.276
No	1(14.3)	3(42.9)	3(42.9)	7(100)		

Chi-square and One-way ANOVA test done, *statistically significant value

Table 4: Association of fetal outcomes with their gestational age at delivery (n=207)

Variables	Gestational age at delivery				χ^2 value	p-value
	Pre term	Early term	Full term	Total		
Birth weight (in kg)						
<2.5	21(45.7)	16(34.8)	9(19.6)	46(100)	29.2	*0.001
2.5-4.0	18(11.5)	108(68.8)	31(19.7)	157(100)		
>4.0	0(0.0)	1(25.0)	3(75.0)	4 (100)		
APGAR score depressed (< 7)						
Yes	13(50.0)	12(46.2)	1 (3.8)	26(100)	19.2	*0.001
No	27(14.9)	115(63.5)	39 (21.5)	181(100)		
Hypoglycemia after birth						
Yes	0(0.0)	8(80.0)	2(20.0)	10(100)	2.6	0.269*
No	40(20.3)	119(60.4)	38(19.3)	197(100)		
Neonatal jaundice						
Yes	11(36.6)	17(56.7)	2(6.7)	30(100)	8.4	*0.014
No	29(16.4)	110(62.1)	38(21.5)	177(100)		
RDS						
Yes	13(65.0)	6(30.0)	1(5.0)	20(100)	29.8	*0.001
No	27(14.4)	121(64.7)	39(20.9)	187(100)		
NICU admission						
Yes	23(42.6)	22(40.7)	9(16.7)	54(100)	25.7	*0.001
No	17(11.1)	105(68.6)	31(20.3)	153(100)		

Chi-square test done, *Statistically significant value

Discussion:

In the study, participants were categorized as preterm (<37 weeks), early term (37–38 weeks), and full term (39–40 weeks). Women ≥36 years had the highest proportion of preterm deliveries (39.1%), and the mean maternal age was significantly higher in preterm deliveries (31.5±5.8 years) compared to early-term (30.3±4.6) and full-term deliveries (28.8±4.2) (p= 0.039), consistent with previous studies showing increased risk of gestational diabetes with advancing maternal age.^{7,13}

PIH was significantly associated with gestational age at delivery. Among women with PIH, 36.2% delivered preterm compared to 14.4% of women without PIH (p= 0.002), indicating that PIH increases the risk of early delivery. Oligohydramnios also showed a significant association, with 46.2% of affected women delivering preterm versus 17.5% without the condition (p= 0.025). Similarly, genitourinary tract infections were strongly associated with preterm delivery; 66.7% of women with infections delivered preterm compared to 16.4% without infections (p= 0.001), consistent with other studies reporting increased operative delivery among women with GDM.^{14,15}

Fetal outcomes varied significantly with gestational age. Preterm neonates had higher rates of low birth weight (45.7%), depressed APGAR scores (50%), respiratory distress syndrome (65%), and NICU admissions (42.6%), while macrosomia was predominantly observed in full-term deliveries (75.0%). Neonatal jaundice was also more common in early-term infants (56.7%, $p=0.014$). Hypoglycemia after birth showed no significant association with gestational age ($p=0.269$). These findings align with previous evidence indicating that hyperglycemia in pregnancy increases the risk of adverse neonatal outcomes including macrosomia, RDS, and NICU admission.¹⁶⁻¹⁸

This study assessed the association between gestational age at delivery and fetomaternal outcomes in 207 women with hyperglycemia in pregnancy at BIRDEM, Dhaka. Conducted at a single tertiary hospital with a relatively small sample, the findings may have limited generalizability. Also, the cross-sectional design prevents establishing causality, and dependence on hospital records and self-reported data may introduce information bias.

Conclusion:

This study indicates that hyperglycemia in pregnancy is associated with increased risks of preterm delivery and adverse fetomaternal outcomes. Maternal complications such as PIH, oligohydramnios, and genitourinary infections were allied to earlier deliveries, while preterm and early-term neonates experienced higher rates of low birth weight, low APGAR scores, jaundice, respiratory distress, and NICU admission. Advanced maternal age was also associated with higher risk of preterm delivery. In the Bangladesh context, these findings highlight the need for early identification, close monitoring, and timely management of women with hyperglycemia during pregnancy. Strengthening prenatal care, providing targeted interventions for high-risk mothers, and ensuring adequate neonatal support can help reduce adverse outcomes.

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