RESEARCH PAPER

Socio-Demographic and Obstetric Characteristics of Hyperglycemia in Pregnancy According to Glycemic Control

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ABSTRACT

Background:

Hyperglycemia in pregnancy is associated with significant maternal and neonatal complications and adequate glycemic control plays a crucial role in improving pregnancy outcomes. Socio-demographic and obstetric factors may influence glycemic control among affected women. This study aimed to assess the socio-demographic and obstetric characteristics of hyperglycemia in pregnancy according to glycemic control.

Methods:

This cross-sectional analytical study was conducted in the Department of Obstetrics and Gynecology at BIRDEM General Hospital, Dhaka, Bangladesh, from July 2020 to June 2021. A total of 267 pregnant women diagnosed with hyperglycemia in pregnancy and admitted for delivery were included. Participants with gestational age ≥28 weeks who provided informed consent were enrolled. Socio-demographic characteristics, obstetric history and diabetic information were analyzed using SPSS version 22. Chi-square test was used to assess associations, with $p<0.05$ considered statistically significant.

Results:

Among the 267 participants, 155 (58.1%) had uncontrolled glycemic status and 112 (41.9%) had acceptable control. Education level ($p=0.010$), occupation ($p=0.001$) and monthly family income ($p<0.001$) showed significant associations with glycemic control. Previous history of diabetes mellitus was also significantly associated with uncontrolled hyperglycemia (78.7% vs 53.6%, $p=0.001$; OR=3.1). Women managed with insulin were more likely to have uncontrolled glycemia compared to those managed with diet alone (70.5% vs 34.1%, $p<0.001$; OR=4.6).

Conclusion:

A substantial proportion of women with hyperglycemia in pregnancy had uncontrolled glycemic status. Socio-demographic factors and previous diabetes history significantly influenced glycemic control. Early identification and appropriate management are essential to improve maternal health outcomes.

Keywords: Hyperglycemia in pregnancy, gestational diabetes, glycemic control, socio-demographic factors, obstetric history.

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Introduction

Hyperglycemia in pregnancy (HIP) is a significant global health concern and is associated with adverse maternal and fetal outcomes [1]. It includes both gestational diabetes mellitus (GDM) and diabetes in pregnancy, conditions characterized by elevated blood glucose levels first detected during pregnancy or preexisting diabetes identified during gestation [2]. The prevalence of hyperglycemia in pregnancy has been increasing worldwide, largely due to rising rates of obesity, sedentary lifestyle, advanced maternal age and improved screening practices. In low- and middle-income countries, including Bangladesh, the burden of hyperglycemia in pregnancy is particularly concerning because of limited awareness, delayed diagnosis and inadequate glycemic control [3].

Hyperglycemia during pregnancy can lead to several complications affecting both the mother and the fetus [4]. Maternal complications include gestational hypertension, preeclampsia, increased risk of cesarean delivery and infections, while fetal and neonatal complications may include macrosomia, preterm birth, neonatal hypoglycemia, respiratory distress, congenital anomalies and increased perinatal mortality [5]. Effective glycemic control during pregnancy is therefore essential to reduce these adverse outcomes and improve both maternal and neonatal health [6].

Socio-demographic and obstetric characteristics play an important role in the development and management of hyperglycemia in pregnancy [7]. Factors such as maternal age, educational status, socioeconomic condition, parity, body mass index and previous obstetric history may influence both the occurrence of hyperglycemia and the ability to achieve adequate glycemic control [8]. Women from disadvantaged socio-demographic backgrounds may face barriers such as limited access to healthcare services, poor nutritional knowledge and inadequate antenatal care, which can negatively affect glycemic control during pregnancy [9].

Understanding the relationship between socio-demographic and obstetric factors and glycemic control among women with hyperglycemia in pregnancy is important for identifying high-risk groups and planning appropriate preventive and management strategies [10]. Early identification of these factors can help healthcare providers implement targeted interventions, improve antenatal monitoring and optimize pregnancy outcomes [11].

In Bangladesh, studies focusing on the socio-demographic and obstetric characteristics of women with hyperglycemia in pregnancy according to glycemic control are limited. Therefore, this study was conducted to assess the socio-demographic and obstetric characteristics of hyperglycemia in pregnancy according to glycemic control among women admitted for delivery in a tertiary care hospital. The findings of this study may contribute to better understanding of the factors associated with glycemic control and help guide strategies to improve maternal and neonatal outcomes.

Methodology & Materials

This cross-sectional analytical study was conducted in the Department of Obstetrics and Gynecology at Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Segunbagicha, Dhaka, Bangladesh. The study was carried out over one year from July 2020 to June 2021. The study population consisted of pregnant women diagnosed with hyperglycemia in pregnancy who were admitted for delivery at BIRDEM General Hospital. A total of 267 women with hyperglycemia in pregnancy, including both gestational diabetes mellitus and diabetes in pregnancy, were included in this study. Pregnant women diagnosed with hyperglycemia in pregnancy who were admitted for delivery, had a gestational age of ≥28 weeks and were willing to participate and provide informed consent were included in the study. However, women with multiple pregnancy, gestational age less than 28 weeks, severe co-morbidities such as cardiac failure, hepatic failure or renal failure, clinical vasculopathy, neuropathy and retinopathy, proteinuria greater than 2+ and hemoglobinopathies were excluded.

Data were collected using a semi-structured questionnaire and a predesigned data collection sheet. After obtaining informed written consent, eligible participants were enrolled consecutively during admission for delivery. Relevant clinical history, obstetric history and socio-demographic information were obtained through face-to-face interviews and review of hospital records. Clinical examination and

laboratory investigations were conducted to determine glycemic status, including fasting blood glucose, two-hour postprandial blood glucose and glycated hemoglobin (HbA1c) levels measured just before delivery. Participants were categorized into an acceptable glycemic control group and an uncontrolled glycemic control group according to predefined criteria based on fasting plasma glucose, postprandial glucose and HbA1c levels. Maternal outcomes including gestational hypertension, preeclampsia, premature rupture of membranes, urinary tract infection, genital tract infection, wound infection, postpartum hemorrhage and puerperal pyrexia were recorded.

Ethical approval was obtained from the Institutional Review Board of BIRDEM. Written informed consent was obtained from each participant before enrollment. Participants were informed about the objectives, procedures, potential benefits and risks of the study. Confidentiality and anonymity were maintained using unique identification numbers and participants were assured that refusal or withdrawal would not affect their treatment.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics were expressed as frequency and percentage for categorical variables and mean with standard deviation for continuous variables. Chi-square test was applied and a p-value less than 0.05 was considered statistically significant.

Results

Table I: Categorization of the study subjects according to socio-demographic baseline characteristics by group (n = 267)

Variable	Category	Acceptable control group (n=112)	Uncontrolled group (n=155)	p-value
Age	20–30 (low risk)	93 (43.9)	119 (56.1)	0.212
	<20 & >35 (high risk)	19 (34.5)	36 (65.5)	
	Mean ± SD	30.14±4.76	30.37±5.12	0.716
Education	≤ SSC	8 (22.2)	28 (77.8)	0.010
	> SSC	104 (45.0)	127 (55.0)	
Occupation	Unemployed	81 (38.0)	132 (62.0)	0.001
	Employed	31 (57.4)	23 (42.6)	
Monthly family income (taka)	≤ 30000	24 (25.3)	71 (74.7)	<0.001
	> 30000	88 (51.2)	84 (48.8)	
	Mean ± SD	48026.7 ± 19775.5	36638.7 ± 17385.9	<0.001
BMI	Underweight	1 (100.0)	0 (0.0)	0.260
	Normal weight	2 (20.0)	8 (80.0)	
	Overweight	43 (45.7)	51 (54.3)	
	Obese	66 (40.7)	96 (59.3)	
	Mean ± SD	30.74±4.39	31.20±4.04	0.379
Parity	Primipara	34 (52.3)	31 (47.7)	0.061
	Multipara	78 (38.6)	124 (61.4)	

Table I presents the categorization of 267 study subjects according to their baseline characteristics by glycemic control group (acceptable vs. uncontrolled). Among the participants, 112 had acceptable control and 155 had uncontrolled hyperglycemia. The mean age was similar between the acceptable (30.14±4.76 years) and uncontrolled (30.37±5.12 years) groups (p=0.716). Education level showed a significant association (p=0.010): among those with ≤ SSC education, 77.8% (28 out of 35) had uncontrolled hyperglycemia, compared to 55.0% (127 out of 231) in the > SSC group. Occupation was significantly different (p=0.001), with 62.0% of unemployed women (132 out of 213) having uncontrolled status versus 42.6% of employed women (23 out of 54). Monthly family income was strongly associated (p<0.001): 74.7% (71 out of 95) in

the ≤30,000 taka group were uncontrolled, compared to 48.8% (84 out of 172) in the >30,000 taka group; mean income was significantly lower in the uncontrolled group (36,638.7±17,385.9 taka) versus the acceptable group (48,026.7±19,775.5 taka) (p<0.001). BMI showed no significant difference (p=0.379), with mean BMI of 30.74±4.39 in acceptable and 31.20±4.04 in uncontrolled groups. Parity approached but did not reach statistical significance (p=0.061): 61.4% of multiparous women (124 out of 202) had uncontrolled status versus 47.7% of primiparous women (31 out of 65).

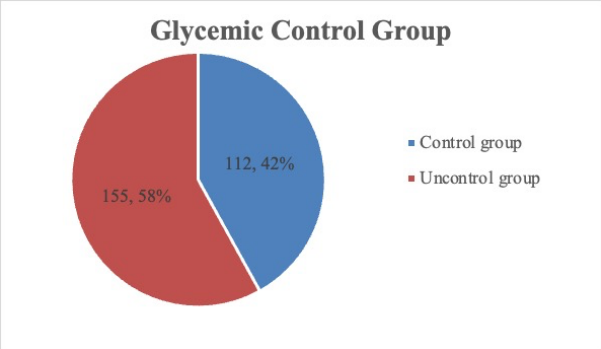

Figure 1: Distribution of study subjects according to glycemic control group (n = 267)

Figure 1 represents the distribution of the respondents according to glycemic control group, where more than half 155 (58.1%), respondents were in the uncontrolled group and 112 (41.95%) respondents were in the acceptable control group.

Table II: Categorization of the respondents according to previous obstetric history by glycemic control group (n=202)

Previous history	Glycemic control		p-value	OR (95 % CI)
	Acceptable Control (n=78)	Uncontrolled (n=124)		
Previous history of DM (Yes)	13 (21.3)	48 (78.7)	p=0.001	3.1 (1.5-6.3)
Previous history of DM (No)	66 (46.4)	75 (53.6)		
Macrosomic baby (Yes)	5 (41.7)	7 (58.3)	p=0.71	
Macrosomic baby (No)	73 (38.6)	117 (61.4)		
IUD (Yes)	3 (21.4)	11 (78.6)	p=0.171	
IUD (No)	75 (39.9)	113 (60.1)		
Neonatal death (Yes)	4 (36.4)	7 (63.6)	p=1.000	
Neonatal death (No)	74 (38.9)	117 (61.3)		
Congenital anomalies (Yes)	5 (71.4)	2 (28.6)	p=0.110	
Congenital anomalies (No)	73 (37.4)	122 (62.6)		
Abortion (Yes)	29 (40.8)	42 (59.2)	p=0.632	
Abortion (No)	49 (37.4)	82 (66.6)		

Table II categorizes the 202 multiparous respondents according to previous obstetric history by glycemic control group (acceptable control n=78, uncontrolled n=124). A significant association was observed for previous history of diabetes mellitus: among women with a prior history of DM, 78.7% (48 out of 61) had uncontrolled hyperglycemia compared to 53.6% (75 out of 141) without such history (p=0.001), with an odds ratio of 3.1 (95% CI: 1.5-6.3). History of a macrosomic baby showed no significant difference (p=0.713): 58.3% (7 out of 12) with prior macrosomia were uncontrolled versus 61.4% (117 out of 190) without. Intrauterine death (IUD) history was not statistically significant (p=0.171): 78.6% (11 out of 14) with previous IUD had uncontrolled control compared to 60.1% (113 out of 188) without. Neonatal death history showed no significant difference (p=1.000): 63.6% (7 out of 11) with prior neonatal death were uncontrolled versus 61.3% (117 out of 191) without. Congenital anomalies approached but did not reach statistical significance (p=0.110): interestingly, only 28.6% (2 out of 7) with a history of congenital anomalies had uncontrolled control versus 62.6% (122 out of 195) without. Abortion history

was not significant (p=0.632): 59.2% (42 out of 71) with prior abortion were uncontrolled compared to 66.6% (82 out of 131) without.

Table III: Categorization of the respondents according to diabetic information by glycemic control group (n=267)

DM	Glycemic control		p-value	OR (95 % CI)
	Acceptable Control (n=112)	Uncontrolled (n=155)		
On diet	60 (65.9)	31 (34.1)	p<0.001	4.6 (2.6-7.9)
Insulin	52 (29.5)	124 (70.5)		

Table III categorizes the 267 respondents according to diabetic information by glycemic control group (acceptable control n=112, uncontrolled n=155). Among women managed on diet alone, 65.9% (60 out of 91) had acceptable control and 34.1% (31 out of 91) had uncontrolled hyperglycemia. In contrast, among those requiring insulin, 29.5% (52 out of 176) had acceptable control while 70.5% (124 out of 176) had uncontrolled control. The association was highly significant (p<0.001), with an odds ratio of 4.6 (95% CI: 2.6-7.9), indicating that women on insulin were 4.6 times more likely to have uncontrolled hyperglycemia compared to those on diet management alone.

Discussion

Hyperglycemia in pregnancy is an important public health concern because of its association with adverse maternal and neonatal outcomes. Adequate glycemic control during pregnancy is essential to minimize these complications. The present study evaluated the socio-demographic and obstetric characteristics of women with hyperglycemia in pregnancy according to glycemic control. Among the 267 study participants, more than half (58.1%) had uncontrolled glycemic status while 41.9% had acceptable glycemic control. This relatively high proportion of uncontrolled hyperglycemia indicates the challenge of maintaining optimal glucose levels during pregnancy, particularly in developing countries.

In this study, the mean age of the participants was similar between the acceptable control group (30.14±4.76 years) and the uncontrolled group (30.37±5.12 years) and the difference was not statistically significant (p=0.716). Similar findings have been reported by Muche et al., who observed that maternal age alone was not always a significant determinant of glycemic control among pregnant women with diabetes [12]. However, advanced maternal age has been widely recognized as a risk factor for the development of gestational diabetes and related complications.

Education level showed a significant association with glycemic control in the present study (p=0.010). Among women with education ≤SSC, 77.8% had uncontrolled hyperglycemia compared with 55.0% among those with education >SSC. This finding suggests that lower educational attainment may limit awareness and understanding of diabetes management during pregnancy. Similar observations were reported by Reza et al., who found that educational status significantly influenced glycemic control among diabetic patients in Bangladesh [13]. Women with higher educational levels tend to have better health awareness and adherence to treatment recommendations.

Occupation was also significantly associated with glycemic control (p=0.001). In this study, 62.0% of unemployed women had uncontrolled hyperglycemia compared to 42.6% of employed women. This may reflect differences in socioeconomic status, health literacy and access to healthcare services. Studies by Iwanowicz-Palus et al. and Elsaba et al. emphasized that social support, self-efficacy and socioeconomic conditions play important roles in diabetes self-management during pregnancy [14,15].

Monthly family income was strongly associated with glycemic control in this study (p<0.001). Women with lower family income (≤30,000 taka) had a higher proportion of uncontrolled hyperglycemia (74.7%) compared to those with higher income (48.8%). Moreover, the mean monthly income was significantly lower in the uncontrolled group (36,638.7±17,385.9 taka) than in the acceptable control group (48,026.7±19,775.5 taka). These findings are consistent with the study by Hussain et al., who reported that socioeconomic factors significantly influence the risk and management of gestational diabetes [16].

Body mass index (BMI) did not show a significant difference between the two groups (p=0.379) in the present study. Although obesity is a recognized risk factor for gestational diabetes, some studies have also reported non-significant associations between BMI and

glycemic control once diabetes is established. Similar findings were reported by Muche et al., where BMI was associated with the development of gestational diabetes but not always with glycemic control status [17].

Regarding obstetric history, the present study demonstrated that a previous history of diabetes mellitus was significantly associated with uncontrolled glycemia (p=0.001). Among women with a prior history of diabetes, 78.7% had uncontrolled hyperglycemia compared to 53.6% without such history (OR=3.1). This suggests that women with preexisting or recurrent diabetes during pregnancy may have greater difficulty maintaining adequate glucose levels. Similar observations were reported by Agbozo et al. and Egbe et al., who identified previous diabetes and obstetric history as important predictors of glycemic status in pregnancy [18,19].

The current study also found a strong association between treatment modality and glycemic control. Women managed with diet alone had a higher proportion of acceptable glycemic control (65.9%), whereas those requiring insulin had a significantly higher proportion of uncontrolled hyperglycemia (70.5%) ($p<0.001$; OR=4.6). This finding likely reflects the fact that patients requiring insulin usually have more severe hyperglycemia. Kara et al. also reported that higher HbA1c and glucose levels were associated with more complicated diabetic pregnancies and increased risk of adverse fetal outcomes [20].

Limitations of the study

This study has several limitations that should be considered when interpreting the findings. First, the study was conducted in a single tertiary care hospital, which may limit the generalizability of the results to the broader population. Second, the cross-sectional design restricts the ability to establish causal relationships between socio-demographic, obstetric factors and glycemic control. In addition, some information such as previous obstetric history and socio-demographic data relied partly on patient recall and hospital records, which may introduce recall or reporting bias.

Conclusion

The present study demonstrated that a considerable proportion of women with hyperglycemia in pregnancy had uncontrolled glycemic status. Socio-demographic factors such as education level, occupation and family income showed significant associations with glycemic control, while a previous history of diabetes mellitus was also an important obstetric determinant. These findings highlight the importance of improving awareness, strengthening antenatal care and providing targeted support for high-risk pregnant women. Early identification and effective management of hyperglycemia during pregnancy are essential to achieve optimal glycemic control and improve maternal and neonatal outcomes.

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Conflicts of interest

There are no conflicts of interest.

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