














Exploring the burden of postpartum depression in urban Bangladesh: Prevalence and its associations with pregnancy-related factors from a cross-sectional study

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Abstract

Background and Aims: Postpartum depression (PPD) is a globally recognized public health concern, yet research focusing on women in urban areas of Bangladesh remains unexplored. This study aimed to address this research gap by investigating the prevalence and associated factors of PPD within the first 2 years after childbirth.

Methods: A cross-sectional study was conducted, enrolling 259 women (26.66 ± 4.57 years) residing in urban areas who were attending healthcare delivery centers. Sociodemographic factors, child-related issues, pregnancy-related complications, and PPD using the Edinburgh Postnatal Depression Scale (EPDS) were used for data collection. Data analysis involved the application of χ^2 tests and logistic regression analysis using SPSS software.

Results: This study found a 60.6% prevalence of PPD using a cutoff of 10 (out of 30) on the EPDS scale. Logistic regression analysis identified several significant factors associated with PPD, including high monthly family income (odds ratio [OR] = 47.51, 95% confidence interval [CI]: 8.34–270.54, $p < 0.001$), income dissatisfaction (OR = 14.28, 95% CI: 4.75–42.87, $p < 0.001$), up to two gravidities (OR = 2.94, 95% CI = 1.25–6.90, $p = 0.013$), pregnancy-related complications (OR = 2.70, 95% CI = 1.05–6.96, $p = 0.039$), increased antenatal care visits, and higher childbirth expenses.

Conclusion: This study underscores the high prevalence of PPD among urban mothers in Bangladesh. The identified risk factors emphasize the need for targeted mental health initiatives, specifically tailored to support the vulnerable group. Implementing such initiatives can effectively address the challenges posed by PPD and enhance the well-being of postpartum women in urban areas.

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KEYWORDS

ANC visits, C-section, depression, postpartum depression, pregnancy

1 | INTRODUCTION

Depression, a prevalent mental disorder, is characterized by persistent feelings of sadness and loss of interest in daily activities for a minimum duration of at least 2 weeks. The American Psychiatric Association has identified various symptoms associated with depression, including changes in appetite, disrupted sleeping patterns, decreased ability to concentrate, heightened anxiety, feelings of hopelessness, and, in severe cases, suicidal ideation.¹ It is worth noting that existing literature suggests a potential gender disparity in the prevalence of depression, with women potentially experiencing higher rates of the condition than men.² Postpartum depression (PPD) specifically refers to major depressive disorder experienced by women following childbirth.³ Recent studies have reported the global prevalence of PPD to be approximately 17.22%⁴ and 17.7%,⁵ based on systematic reviews encompassing studies from multiple countries. However, the prevalence of PPD in Southeast Asian countries, ranging from 4.4% to 57.7%, is significantly higher,⁶ indicating a considerable magnitude of the problem in this region.

Several studies have focused on investigating PPD, shedding light on its prevalence and associated factors. For instance, a population-based study conducted in Sri Lanka reported a PPD prevalence of 9.4% using a cutoff score of 9 on the Edinburgh Postnatal Depression Scale (the scale that was used in this study), while the prevalence decreased to 5.6% with a cutoff score greater than or equal to 10.⁷ In the Kingdom of Saudi Arabia, a study found an alarmingly high prevalence of 75.7% among mothers in their first year after childbirth.⁸ However, at 7.4%, the prevalence was comparatively lower among Eritrean participants,⁹ and a study among Turkish women reported a prevalence of 15.4% for PPD.¹⁰ Factors such as maternal mortality, infant mortality, and women of childbearing age working 40 h or more per week were significantly associated with PPD.⁵ Additional factors linked to PPD include antenatal depression, unwanted pregnancy, poverty, preference for infant's gender, education level, social support, pregnancy plan, financial difficulties, living conditions,^{5,11} and blunted hair cortisol, cortisone, and progesterone secretions.³

Although PPD has been studied in Bangladesh, most research has focused on rural areas. For instance, a population-based study among rural women indicated that 11% exhibited depressive symptoms, 35% experienced anxiety symptoms, and 3.4% had both depressive and anxiety symptoms during 2–3 months postpartum.¹² Similarly, a community-based cohort study conducted in a rural subdistrict of Bangladesh reported a postnatal depression prevalence of 22% at

6–8 weeks postpartum,¹³ whereas a history of mental illness, depression during pregnancy, and strained relationships with mothers-in-law were identified as significant predictors of PPD. However, there is a scarcity of research on PPD in urban areas of Bangladesh. Notably, a study conducted in an urban slum in Dhaka city reported a prevalence of 39.4% for PPD within 1 year after childbirth and highlighted risk factors such as job involvement following childbirth, job loss due to pregnancy, history of miscarriage, stillbirth or child death, unwanted pregnancy, management of delivery costs, depressive symptoms during pregnancy, and intimate partner violence.¹⁴ Another study in the urban areas reported that the PPD to be 22%.¹⁵ However, limited research has been conducted in urban areas, including participants who came for treatment in healthcare facilities. The previous studies were only conducted in a single city (e.g., Dhaka) or in rural Bangladesh. Therefore, data from other major cities in the country are limited. It is anticipated that urban women within 2 years of the postpartum period would have a higher prevalence of postpartum depression. Therefore, the present study aims to investigate the prevalence of PPD and its associated factors among women utilizing urban healthcare facilities, providing a comprehensive understanding of the magnitude of PPD among this population.

2 | METHODS

2.1 | Study design, participants, and procedure

A cross-sectional study was conducted between September 2022 and February 2023, employing convenience sampling approach. Data collection involved face-to-face interviews utilizing a semi-structured questionnaire. The study utilized purposive sampling to gather data from specific locations in Dhaka, including Shaheed Suhrawardy Medical College and Hospital, Dhaka Central International Medical College and Hospital and Savar Upazila Health Complex, Pabna Medical College and Hospital in Pabna and Fatikchhari Upazila Health Complex in Chittagong. The inclusion criteria for participants were as follows: (i) postpartum mothers with a child under 2 years of age, and (ii) attending selected healthcare facilities. Participants were excluded if (i) the child was older than 2 years, (ii) the child had physical or mental disabilities, or (iii) the mother refused to participate in the study. The team members involved in this project were trained for data collection and approached the study subjects for interviews.

2.2 | Sample size estimation

The sample size was calculated based on an estimated prevalence of 11%.¹²

$$n = \frac{z^2 p(1-p)}{d^2}$$

Here, n = estimated sample size, p = 11%, d = 5% margin of error with a 95% confidence interval. After considering a 10% nonresponse rate, the required sample size for the study was determined to be 166. The present study included 259 participants, indicating an adequate sample size.

2.3 | Measures

2.3.1 | Child-related information

This study collected child-related information, including age, birth weight, gender, gender satisfaction, presence of birth defects, feeding method (breastfeeding, formula feeding, or both), satisfaction with breastfeeding, and potential feelings of inferiority (guilt feelings and/or shame) due to inadequate breastfeeding.

2.3.2 | Sociodemographic information

Mother's sociodemographic variables used in this study included age, self-rated height and weight, education level (no formal education, primary level, secondary level, higher secondary, graduate and above), monthly family income, satisfaction with monthly family income, type of family (nuclear or joint), and occupation (housewife, employee, and others).

2.3.3 | Pregnancy-related information

This study also collected pregnancy-related information from mothers, including chronic illness (excluding the below-mentioned complications), history of infertility, gravidity (the number of times that a woman has been pregnant), complications during pregnancy (gestational diabetes, gestational hypertension, eclampsia, oligohydramnios, placenta previa, intrauterine growth retardation, etc.), history of miscarriage, number of miscarriages, antenatal care visit (ANC) history, childbirth methods, and expenditure during childbirth.

2.3.4 | Depression

Postpartum depression was evaluated using the Edinburgh Postnatal Depression Scale (EPDS).¹⁶ This standardized questionnaire consists of 10 items (e.g., "You have been able to laugh and see the funny side of things"), rated on a 4-point Likert scale. The total score ranges

from 0 to 30, with higher scores indicating a higher degree of depressive symptoms. The scale was validated in the Bangladeshi sample,¹⁷ and a cutoff score of 10 was used to identify symptoms of depression among postpartum mothers. In the Bangla validation, a sensitivity of 89% and specificity of 87% was found for this cutoff point.¹⁷ The present study achieved a Cronbach's α of 0.95 for the EPDS, which was better than the Bangla-validated version (0.84).

2.4 | Ethical considerations

The Helsinki Declaration of 2013 was conscientiously adhered to ensure that the human participants were treated with the utmost care and respect.¹⁸ Before data collection, ethical clearance was obtained from the relevant institutions. The study obtained ethical approval from the Institutional Ethical Committee of the Patuakhali Science and Technology University with an approval number PSTU/IEC/2022/32 (9). Before requesting the participants to enroll in the study, a comprehensive briefing session was held to inform them about the study's objectives, and the right to participate or withdraw at any point, among other relevant matters. Finally, a written and/or verbal consent form was obtained from each participant to affirm their willingness to participate in the survey.

2.5 | Statistical analysis

After data collection, the responses were entered into *Google Forms* and subsequently cleaned and prepared for formal analysis using *Microsoft Excel 2019*. The *Statistical Package for the Social Sciences (SPSS)* version 25 was employed for data analysis. Descriptive statistics (frequency and percentages, mean, standard deviation) and inferential statistics (chi-square and logistic regression) were utilized in the study. The chi-square test determined the association between postpartum depression and the study variables. Logistic regression was used to identify factors associated with postpartum depression. Results from logistic regression were reported as unadjusted and adjusted odds ratios. Significant variables from the unadjusted model were entered into the adjusted model for a better model fit. All statistical tests had a significance level set at $p < 0.05$, with a 95% confidence interval.

3 | RESULTS

3.1 | Characteristics of the participants

The mean age of the child was 6.29 (± 4.96) months. Results suggested that 45.3% of the participant's children were aged between >3 and 9 months, 67.1% had 0 to 3 kg birth weight, 55% were boys, 95% of mothers were satisfied with the newborn gender, 94.9% child did not have any birth defect, 71% child received only breast milk, 74.5% of mothers were satisfied with the breast-feeding

TABLE 1 Association between child-related information and depression.

Variables	Total (n, %)	Depression (n = 157) Yes (n, %)	χ^2 Value (p Value)
Child age (mean \pm SD = 6.29 \pm 4.96)			
0–3 months	86 (33.2)	55 (64)	15.017 (0.001)
>3–9 months	120 (45.3)	82 (68.3)	
>9–24 months	53 (20.5)	20 (37.7)	
Childbirth weight			
0–3 kg	159 (67.1)	100 (62.9)	0.585 (0.445)
more than 3 kg	78 (32.9)	53 (67.9)	
Child gender			
Boy	142 (55)	88 (62)	0.166 (0.684)
Girl	116 (45)	69 (59.5)	
Mother satisfaction with child's gender			
Yes	245 (95)	154 (62)	8.201 (0.004)
No	13 (5)	3 (23.1)	
Birth defect			
Yes	13 (5.1)	9 (69.2)	0.396 (0.529)
No	243 (94.9)	147 (60.5)	
Feeding method			
Breast milk	184 (71)	110 (59.8)	0.832 (0.732)
Formula milk	25 (9.7)	17 (68)	
Both	50 (19.3)	30 (60)	
Breastfeeding method satisfaction			
Yes	193 (74.5)	109 (56.5)	5.441 (0.020)
No	66 (25.5)	48 (72.7)	
Inferiority due to inadequate breastfeeding			
Yes	61 (55.5)	46 (75.4)	6.002 (0.014)
No	49 (45.5)	26 (53.1)	

Abbreviation: SD, standard deviation.

method, and 55.5% were suffering from inferiority due to inadequate breast milk received by their children (Table 1). In addition, the distribution of the mother's sociodemographic information was reported in Table 2. The mean maternal age was 26.66 (\pm 4.57) years. About half of the mothers were overweight (47.1%), 37.2% had bachelor and above education level, 59.5% had a monthly family income of 15,000–30,000 BDT, 44.7% were satisfied with their family income, 67.8% belonged to the nuclear family, and 57.5% of women were homemakers in profession (Table 2). Table 3 reported the distribution of pregnancy-related characteristics of the participants. About 23.1% were found suffering from any chronic illness

TABLE 2 Association between mothers' sociodemographic information and depression.

Variable name	Total (n, %)	Depression (n = 157) Yes (n, %)	χ^2 Value (p Value)
Maternal age (mean \pm SD = 26.66 \pm 4.57)			
\leq 24 years	82 (31.9)	36 (43.9)	16.288 (<0.001)
25–29 years	100 (38.9)	64 (64)	
\geq 30 years	75 (29.2)	56 (74.7)	
Body mass index			
Underweight	7 (3.1)	2 (28.6)	31.578 (<0.001)
Normal weight	48 (21.3)	22 (45.8)	
Overweight	106 (47.1)	90 (84.1)	
Obese	64 (28.4)	36 (56.3)	
Mothers' education level			
Up to the primary level	41 (15.9)	11 (26.8)	49.265 (<0.001)
Secondary level	76 (29.5)	35 (46.1)	
Higher secondary	45 (17.4)	29 (64.4)	
Bachelor and above	96 (37.2)	81 (84.4)	
Monthly family income			
Up to 15,000 (<140 USD; low)	48 (19.8)	15 (31.3)	34.566 (<0.001)
15,001–30,000 (140–275 USD; middle)	144 (59.5)	94 (65.3)	
>30,001 (>275 USD; high)	50 (20.7)	44 (88)	
Satisfy with their family income			
Yes	113 (44.7)	52 (46)	21.136 (<0.001)
No	140 (55.3)	104 (74.3)	
Family type			
Nuclear	175 (67.8)	115 (65.7)	5.397 (0.020)
Joint	83 (32.2)	42 (50.6)	
Occupation			
Housewife	149 (57.5)	73 (49)	22.212 (<0.001)
Employed	67 (25.9)	55 (82.1)	
Others	43 (16.6)	29 (67.4)	

Abbreviation: SD, standard deviation.

during pregnancy, 12.1% had a history of infertility, 74.5% had up to two gravidities, and 32.4% had pregnancy-related complications. About one-fourth (23.8%) had a history of miscarriage, and of which 69.1% had a one-time miscarriage. About 43.7% had an antenatal visit 5–10 times, 59.7% had a C-section childbirth method, and 54.2% had an expenditure of up to 20,000 BDT (Table 3).

TABLE 3 Association between pregnancy-related information and depression.

Variable name	Total (n, %)	Depression (n = 157) Yes (n, %)	χ^2 Value (p Value)
Chronic illness			
Yes	59 (23.1)	46 (78)	9.110 (0.003)
No	196 (76.9)	110 (56.1)	
History of infertility			
Yes	31 (12.1)	28 (90.3)	12.674 (<0.001)
No	226 (87.9)	129 (57.1)	
Gravidity			
Up to 2	190 (74.5)	126 (66.3)	8.289 (0.004)
>2	65 (25.5)	30 (46.2)	
Pregnancy complications			
Yes	83 (32.4)	69 (83.1)	24.621 (<0.001)
No	173 (67.6)	88 (50.9)	
History of miscarriage			
Yes	61 (23.8)	40 (65.6)	0.609 (0.435)
No	195 (76.2)	117 (60)	
Number of miscarriages			
One time	47 (77.0)	33 (70.2)	0.609 (0.456)
Two times	12 (19.7)	6 (50.0)	
More than 2 times	2 (3.3)	1 (50.0)	
ANC visits			
Up to four times	35 (14.7)	7 (20)	71.652 (<0.001)
5–10 times	104 (43.7)	51 (49)	
More than 10 Times	99 (41.6)	91 (91)	
Mode of delivery			
Normal	104 (40.3)	49 (47.1)	13.802 (<0.001)
C-section	154 (59.7)	108 (70.1)	
Expenditure during childbirth (BDT)			
0–20,000	129 (54.2)	60 (46.5)	40.832 (<0.001)
>20,000–40,000	79 (33.2)	68 (88.1)	
>40,000	30 (12.6)	26 (86.7)	

3.2 | Association between child-related information and depression

Table 1 reported the association between the child-related information and depression. Results suggested that child age being less than 9 months were associated with higher rate of postpartum depression ($\chi^2 = 15.017$, $p = 0.001$). The prevalence of PPD was 62%, which was higher than those who were not satisfied (23.1%; $\chi^2 = 8.201$,

$p = 0.004$). Similarly, those mothers who were not satisfied with breastfeeding method reported higher rate of PPD (72.7% vs. 56.5%; $\chi^2 = 5.441$, $p = 0.020$). In addition, mothers feeling inferior due to inadequate breastfeeding had 75.4% PPD, and it was 53.1% for those who were not ($\chi^2 = 6.002$, $p = 0.014$) (Table 1).

3.3 | Association between mothers' sociodemographic information and depression

Table 2 reported the association between mothers' sociodemographic information and depression. Results indicated that higher maternal age ($\chi^2 = 16.288$, $p < 0.001$), higher body mass index ($\chi^2 = 31.578$, $p < 0.001$), and higher education level ($\chi^2 = 49.265$, $p < 0.001$) had higher PPD rates. Besides, those who belonged to a higher income family ($\chi^2 = 34.566$, $p < 0.001$), had less family income satisfaction ($\chi^2 = 21.136$, $p < 0.001$), and from nuclear family type ($\chi^2 = 5.397$, $p = 0.020$) had reported more PPD rates. Finally, those mothers who were employed reported a higher prevalence rate than others ($\chi^2 = 22.212$, $p < 0.001$) (Table 2).

3.4 | Association between pregnancy-related information and depression

Table 3 reported the association between mother's pregnancy-related information and depression. Results suggested that those mothers with a chronic illness had higher PPD prevalence rates than those were not (78% vs. 56.1%; $\chi^2 = 9.110$, $p = 0.003$); and it was consistent for other variables, for instance, history of infertility (90.3% vs. 57.1%; $\chi^2 = 12.674$, $p < 0.001$), gravidity (66.3% vs. 46.2%; $\chi^2 = 8.289$, $p = 0.004$), and pregnancy complications (83.1% vs. 50.9%; $\chi^2 = 24.621$, $p < 0.001$). Those mothers with more than 10 times ANC visits had a prevalence of 91%, while 49% and 20% were reported for 5–10 times, and up to four times, respectively ($\chi^2 = 71.652$, $p < 0.001$). The mode of delivery being C-section had higher depression rate compared with those with normal childbirth methods (70.1% vs. 47.1%; $\chi^2 = 13.802$, $p < 0.001$). Besides, expending less money for childbirth was found associated with less depression rate ($\chi^2 = 40.832$, $p < 0.001$) (Table 3).

3.5 | Child-related risk factors for depression

Table 4 reported the factors associated with child-related information and depression. In the unadjusted model, a child aged 0–3 months and >3 to 9 months were at an increased risk of mother's depression by 2.92 times (odds ratio [OR] = 2.92, 95% 1.44–5.94), and 3.56 times (OR = 3.56, 95% CI: 1.81–6.99) times, respectively ($p < 0.001$), compared to those who were >9 to 24 months. In addition, mothers satisfied with their child's gender were at 5.64 times (OR = 5.46, 95% confidence interval [CI]: 1.51–21.03, $p = 0.010$) higher risk of developing depression than those who were

TABLE 4 Child-related risk factors for depression.

Variable name	Unadjusted model		Adjusted model	
	OR; 95% CI	p Value	OR; 95% CI	p Value
Child age				
0–3 months	2.92 (1.44–5.94)	0.001	2.19 (0.71–6.80)	0.078
>3–9 months	3.56 (1.81–6.99)		3.40 (1.17–9.87)	
>9–24 months	Reference		Reference	
Child gender satisfaction				
Yes	5.64 (1.51–21.03)	0.010	2.70 (0.42–17.30)	0.292
No	Reference		Reference	
Breastfeeding satisfaction				
Yes	0.48 (0.26–0.89)	0.021	0.79 (0.13–4.55)	0.794
No	Reference		Reference	
Inferiority due to inadequate breastfeeding				
Yes	2.71 (1.20–6.09)	0.016	2.04 (0.34–12.05)	0.428
No	Reference		Reference	

Abbreviations: CI, confidence interval; OR, odds ratio.

not. Mothers with a feeling of inferiority due to inadequate breastfeeding were more likely to suffer from depression (OR = 2.71, 95% CI: 1.20–6.09, $p = 0.016$). In addition, those mothers who were not satisfied with the breast milk feeding were at 2.08 times higher risk of depression compared to those who were satisfied ($p = 0.021$). However, in the adjusted model, none of the variables were significantly associated with PPD (Table 4).

3.6 | Sociodemographic risk factors for depression

Table 5 reported the factors associated between mothers' socio-demographic information and depression. In the unadjusted model, the risk of depression was significantly increased with age. Results showed that mothers aged 25–29 years and ≥ 30 years were at 2.27 times (OR = 2.27, 95% CI: 1.25–4.12) and 3.76 times (OR = 3.76, 95% CI: 1.91–7.42) higher risk of depression than mothers aged ≤ 24 years, respectively ($p < 0.001$). Overweight mothers were at 4 times (OR = 4.11, 95% CI: 2.01–8.42, $p < 0.001$) more likely to develop depressive symptoms compared to obese mothers. However, underweight and healthy mothers were less likely to suffer from depressive symptoms than the obese ones. The higher the education level, the higher the depression was found among mothers. Mothers who studied up to secondary level were at 2.32 times (OR = 2.32, 95% CI: 1.02–5.31) higher risk of depression, while the odds were 4.94 (OR = 4.94, 95% CI: 1.96–12.42) and

14.72 times (OR = 14.72, 95% CI: 6.08–35.63) higher for higher secondary level and bachelor and above level educated mothers, respectively ($p < 0.001$). In addition, high monthly family income significantly increased the risk of depression among mothers (OR = 16.13, 95% CI: 5.65–46.05 for >30,000 monthly family income; and OR = 4.13, 95% CI: 2.05–8.33 for 15,001–30,000 monthly family income). Participants who were not satisfied with their monthly family income were at 3.38 times (OR = 3.38, 95% CI: 1.99–5.75, $p < 0.001$) more likely to be depressed than satisfied mothers. Furthermore, mothers from nuclear families were 1.87 times (OR = 1.87, 95% CI: 1.10–3.18, $p = 0.021$) more likely to be depressed than mothers from joint families. Employed mothers had higher odds of depression compared to other professional mothers (OR = 2.21, 95% CI: 0.90–5.40, $p < 0.001$). However, in the adjusted model, monthly family income and satisfaction with their income were significantly associated. More specifically, women who had high monthly family income were at higher risk of depression (OR = 47.51, 95% CI: 8.34–270.54, $p < 0.001$ for >30,000 monthly family income) compared to lower monthly income family. Income dissatisfaction also increased the risk of suffering from depression among women (OR = 14.28, 95% CI: 4.75–42.87, $p < 0.001$) (Table 5).

3.7 | Pregnancy-related risk factors for depression

Table 6 reported the factors associated between pregnancy-related information with depression. In the unadjusted model, participants who suffered from chronic illness had a history of infertility and had complications related to pregnancy were at 2.76 times (OR = 2.76, 95% CI: 1.40–5.44, $p = 0.003$), 7.01 times (OR = 7.01, 95% CI: 2.07–23.75, $p = 0.002$), and 4.76 times (OR = 4.76, 95% CI: 2.49–9.09, $p < 0.001$) more likely to develop depressive symptoms, respectively compared to those who were not. Participants who conceived more than two times were at a lower risk of depression than those who conceived up to two times (OR = 2.29, 95% CI: 1.29–4.07, $p = 0.004$). In addition, those who had few ANC visits were at a lower risk of suffering from depression compared to those who had more than 10 times ANC visits ($p < 0.001$). Mothers who had vaginal delivery were less likely to develop depressive symptoms than C-section mothers (OR = 0.37, 95% CI: 0.22–0.63, $p < 0.001$). The higher the expenditure, the higher the risk of suffering from depression ($p < 0.001$).

In the adjusted model, participants who conceived more than two times were at a lower risk of depression than those who conceived up to two times (OR = 2.94, 95% CI: 1.25–6.90, $p = 0.013$). Suffering from pregnancy-related complications also increased the depression risk among women (OR = 2.70, 95% CI: 1.05–6.96, $p = 0.039$). In addition, those who had few ANC visits were at a lower risk of suffering from depression compared to those who had more than 10 times ANC visits ($p < 0.001$). The higher the expenditure, the higher the risk of suffering from depression ($p < 0.001$) (Table 6).

TABLE 5 Sociodemographic risk factors for depression.

Variable name	Unadjusted model		Adjusted model	
	OR; 95% CI	p Value	OR; 95% CI	p Value
Maternal age (year)				
≤24	Reference	<0.001	Reference	0.502
25–29	2.27 (1.25–4.12)		0.78 (0.28–2.16)	
≥30	3.76 (1.91–7.42)		1.48 (0.51–4.33)	
Body mass index				
Underweight	0.31 (0.05–1.72)	<0.001	0.92 (0.09–8.68)	0.064
Normal weight	0.65 (0.31–1.39)		1.10 (0.36–3.34)	
Overweight	4.11 (2.01–8.42)		3.39 (1.27–9.04)	
Obese	Reference		Reference	
Mothers' education level				
Up to the primary level	Reference	<0.001	Reference	0.352
Secondary level	2.32 (1.02–5.31)		1.02 (0.28–3.68)	
Higher secondary	4.94 (1.96–12.42)		1.96 (0.48–7.90)	
Bachelor and above	14.72(6.08–35.63)		2.95 (0.62–13.99)	
Monthly family income				
Up to 15,000 (140 USD; low)	Reference	<0.001	Reference	<0.001
15,001–30,000 (140–275 USD; middle)	4.13 (2.05–8.33)		15.16 (3.97–57.91)	
>30,000 (>275 USD; high)	16.13 (5.65–46.05)		47.51 (8.34–270.54)	
Income satisfaction				
Yes	Reference	<0.001	Reference	<0.001
No	3.38 (1.99–5.75)		14.28 (4.75–42.87)	
Family type				
Nuclear	1.87 (1.10–3.18)	0.021	1.80 (0.73–4.43)	0.196
Joint	Reference		Reference	
Occupation				
Housewife	0.46 (0.22–0.94)	<0.001	0.91 (0.26–3.19)	0.989
Employed	2.21 (0.90–5.40)		0.98 (0.21–4.53)	
Others	Reference		Reference	

Abbreviations: CI, confidence interval; OR, odds ratio.

4 | DISCUSSION

The aim of this study was to explore the prevalence of depression and its associated factors among postpartum women in urban areas of Bangladesh. The results revealed a high prevalence of PPD, with 60.6% of the participants experiencing depressive symptoms, this could be because of considering sample with 2 years of postpartum period and other reasons. Several factors were found to be associated with PPD, including higher monthly family income, income dissatisfaction, lower frequency of gravidity, having pregnancy complications, higher frequency of ANC visits, and higher expenditure during childbirth.

Comparing the findings of the current study with previous studies conducted in various settings provides valuable insights into the prevalence of postpartum depression. Studies conducted in rural areas of Bangladesh have reported lower rates of depression among postpartum women compared to the present study. For instance, one study found that 11% of women had PPD,¹² while another study reported a prevalence of 51.7%.¹⁹ In urban areas, PPD was reported in 22%,¹⁵ and 34.9% in the first 12 months following the childbirth,¹⁴ indicating a higher magnitude of PPD in the present study. Similarly, a study conducted in India reported a lower prevalence of PPD (22%) compared to the current study,²⁰ whereas it ranged between 4.4%

TABLE 6 Pregnancy-related risk factors for depression.

Variable name	Unadjusted model		Adjusted model	
	OR; 95% CI	p Value	OR; 95% CI	p Value
Chronic illness				
Yes	2.76 (1.40–5.44)	0.003	1.80 (0.64–5.08)	0.264
No	Reference		Reference	
History of infertility				
Yes	7.01 (2.07–23.75)	0.002	1.33 (0.27–6.63)	0.721
No	Reference		Reference	
Gravidity				
Up to 2	2.29 (1.29–4.07)	0.004	2.94 (1.25–6.90)	0.013
>2	Reference		Reference	
Pregnancy-related complications				
Yes	4.76 (2.49–9.09)	<0.001	2.70 (1.05–6.96)	0.039
No	Reference		Reference	
ANC visits				
Up to four times	0.02 (0.01–0.06)	<0.001	0.07 (0.02–0.23)	<0.001
5–10 times	0.08 (0.03–0.19)		0.22 (0.08–0.56)	
More than 10 times	Reference		Reference	
Mode of delivery				
Normal	0.37 (0.22–0.63)	<0.001	2.23 (0.86–5.6)	0.108
C-section	Reference		Reference	
Expenditure during childbirth (BDT)				
0–20,000	0.13 (0.04–0.40)	<0.001	0.22 (0.04–1.02)	0.021
>20,000–40,000	0.95 (0.27–3.25)		1.08 (0.24–4.84)	
>40,000	Reference		Reference	

Abbreviations: CI, confidence interval; OR, odds ratio.

and 57.7% in Southeast Asian countries.⁶ Considering the prevalence reported in the recent meta-analyses of PPD studies, it is also indicative that the current study participants were more prone to depression, for instance, global pooled prevalence was reported ranging between 17.22%⁴ and 17.7%.⁵ However, these variations in prevalence rates may be attributed to several factors, including differences in sample size, study settings, consideration of sample with different time-frames after delivery, measurement tools and cutoffs, as well as the influence of the COVID-19 pandemic. It is worth noting that a recent systematic review and meta-analysis highlighted a high prevalence of PPD during the COVID-19 pandemic.²¹ The concerns and worries associated with COVID-19, such as the fear of self-infection and anxieties about the well-being of the baby, may have contributed to the increased risk of depression among the participants in this study. A previous study demonstrated that worries related to COVID-19 increased the risk of depression by 1.71 times.²² The findings emphasize the need for comprehensive and context-specific approaches to address PPD, taking into account

the unique circumstances and challenges faced by women in urban areas, including the potential influence of the COVID-19 pandemic on their mental well-being.

In this study, monthly family income was found to have a significant association with postpartum depression. Surprisingly, participants with higher monthly family income were more likely to suffer from depression compared to those with lower family income. This finding contradicts previous studies from elsewhere, which have reported that lower annual income is associated with a higher likelihood of PPD.²³ Similar findings have been reported in other studies conducted in Bangladesh.^{12,24} A study conducted in rural of the country suggested that poor socioeconomic status increased the risk of depression by 2.62 times among mothers.²⁵ The experience of postpartum depression among women in urban areas may be influenced by a complex interplay of factors, including the need to balance childcare responsibilities with work commitments, sleep quality, household chores, and social support from partner and friends.²⁶ Additionally, being unpaid during the maternal leave of

employed mother may also exacerbate the risk of PPD taking into account the financial burden.²⁷ Moreover, the satisfaction with monthly family income was found to be a contributing factor in the present study, as participants who were not satisfied with their income had a higher risk of PPD compared to those who were satisfied.

Health status during the pregnancy period appears to increase the likelihood of PPD suffering of the women. For instance, pregnancy-related complications emerged as a significant factor associated with PPD in this study, aligning with findings from previous research. Notably, a 3.40 times higher risk of postpartum depression among those who experienced complications compared to those who did not was found previously,²⁸ whereas depression severity was reported increasing with a higher number of complications.²⁹ Furthermore, the association between complications and PPD may stem from the mothers' concerns regarding their newborn child's health and the additional physical, emotional, and financial burden associated with managing complications and childbirth. These challenges can elevate the risk of developing PPD.³⁰ Therefore, it is crucial to prioritize comprehensive support and care for women who have experienced pregnancy-related complications to mitigate the potential impact on their psychological well-being.

The frequency of ANC visits was found to be significantly associated with postpartum depression in this study. Contrary to expectations, it was observed that fewer ANC visits were associated with a lower likelihood of experiencing depression among postpartum women. This finding diverges from the results of previous studies. For instance, a study conducted in Northwest Ethiopia reported that women who had no ANC visits had a four-fold higher risk of PPD compared to those who attended regular ANC visits.³¹ The contrasting results could be attributed to the underlying reasons for ANC visits. In this study, women who had more frequent ANC visits during pregnancy might have been seeking care for pregnancy-related complications. Besides, unintended pregnancy could increase the risk of maternal complications, leading to PPD.²⁹ On the other hand, women who had fewer ANC visits may have had relatively uncomplicated pregnancies, leading to a lower likelihood of experiencing PPD. However, the relationship between ANC visits and PPD is complex and can be influenced by various factors such as cultural norms, healthcare access, and individual circumstances. Further study is needed to explore the underlying mechanisms and to better understand the role of ANC visits in the development of PPD. Additionally, it would be beneficial to consider the specific context and characteristics of the population being studied to gain a comprehensive understanding of the association between ANC visits and mental health outcomes among postpartum women.

The association between health expenditure during childbirth and the risk of postpartum depression observed in this study, provides valuable insights into the financial implications of different modes of delivery. Specifically, it was found that higher health expenditure, particularly associated with cesarean section deliveries, increased the likelihood of experiencing PPD, which is consistent to previous study results.³² Mothers who underwent cesarean sections

incurred higher expenses due to prolonged hospital stays and additional medical procedures compared to those who had a normal vaginal delivery. The financial burden associated with cesarean sections, including hospital bills, medication costs, and postoperative care, may contribute to increased stress and anxiety, which can subsequently elevate the risk of developing postpartum depression. Thus, previous studies have consistently highlighted the association between cesarean section and PPD. For example, a study has shown that women who underwent cesarean sections are 1.26 times more likely to experience PPD compared to those who had a vaginal delivery.³³ This association can be attributed to various factors, including the physical recovery process, emotional adjustment to the surgical procedure, and the potential disruption of the mother–infant bonding experience. Therefore, it is crucial for healthcare providers and policymakers to be aware of the financial implications of different modes of delivery and their potential impact on postpartum mental health. Efforts should be made to provide adequate support, both emotionally and financially, to mothers who undergo cesarean sections, as they may be at a higher risk of experiencing postpartum depression. Additionally, further research is needed to explore the underlying mechanisms linking health expenditure, mode of delivery, and postpartum depression, to inform targeted interventions and support strategies for at-risk mothers.

While this study provides valuable insights into the prevalence and associated factors of postpartum depression among urban women in Bangladesh, it has several limitations. The cross-sectional nature of the study prevents the establishment of causal associations. Further research using longitudinal designs is necessary to explore the temporal relationships between the identified risk factors and PPD. This study did not consider variables like history of mental health suffering, which could have the influence on reoccurrence of depression. Besides, the study did not specifically investigate the impact of COVID-19 on maternal depression, which could be a potential area for future research. Moreover, the study focused on women from three major cities in Bangladesh (Dhaka, Chittagong, and Pabna) and used a convenience sampling technique, which may limit the generalizability of the findings. Further studies with larger and more diverse samples, employing robust methodologies and nationwide coverage, are warranted to provide a more comprehensive understanding of postpartum depression in Bangladesh.

5 | CONCLUSIONS

The present study highlights a significant prevalence of depressive symptoms among postpartum women, affecting more than half of the participants, this could be because of considering sample with 2 years after pregnancy and other causes. The identified factors associated with postpartum depression, including high monthly family income, income dissatisfaction, gravidity, pregnancy complications, antenatal care visits, C-section delivery, childbirth expenses, and so on emphasize the need for targeted interventions and support for this vulnerable population. To address these findings, healthcare

providers and policymakers should prioritize the implementation of comprehensive prenatal care programs, promoting regular antenatal visits, and addressing financial burdens faced by postpartum women. Additionally, considering the integration of mindfulness-based intervention programs can offer potential benefits in reducing postpartum depression and enhancing the overall well-being and quality of life for women during this critical period. Future research should delve deeper into the complex interplay of socioeconomic factors and mental health outcomes, while also exploring other potential strategies to effectively prevent and manage postpartum depression. By addressing these factors and implementing appropriate interventions, we can work towards improving the mental health outcomes of postpartum women and fostering a supportive environment for their well-being.

AUTHOR CONTRIBUTIONS

This study was initially conceptualized by all the team members except Mark M. Kaggwa & Nitai Roy in several group meeting, although they contributed later. The project was implemented by Most Sabiha Sultana, Jyotie Malakar, Saad Bin Bahar, Imtiaz Uddin, Murshida Murshida, Mst. Morsheda Akter, Mst. Mohsina Begum, Tasmin Sayeed Nodi, Abdullah Al Habib, and they participated in the data collection and management. Firoj Al-Mamun, Mark M. Kaggwa, Nitai Roy & MAM supervised the project. The initial draft of this study was written in the group meeting with the lead of FAM. Extensive edits and reviews were done by other authors, especially Mohammed A. Mamun. All authors approved the final version.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data sets will be made available to appropriate academic parties upon request from the corresponding author.

ETHICS STATEMENT

The present study was conducted in accordance with the Declaration of Helsinki 2013. Before data collection, ethical clearance was obtained from the relevant institutions. The study obtained ethical approval from the Institutional Ethical Committee of the Patuakhali Science and Technology University with an approval number PSTU/IEC/2022/32 (9).

TRANSPARENCY STATEMENT

The lead author Firoj Al-Mamun affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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