INNOVARE JOURNAL OF HEALTH SCIENCES

Vol 14, 2026

ISSN - 2347-5536

Original Research

PREVALENCE AND PREDICTORS OF POSTPARTUM DEPRESSION AMONG MOTHERS WHO GAVE BIRTH IN THE LAST 12-MONTH GONDAR TOWN, ETHIOPIA 2022: A COMPARATIVE CROSS-SECTIONAL STUDY

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Received: 28 May 2025, Revised and Accepted: 10 April 2026

ABSTRACT

Objective: Postpartum depression (PPD) is a significant global public health concern, adversely affecting mothers, infants, and children's mental, physical, and social well-being. Despite its severe consequences, early identification, diagnosis, and treatment remain understudied. This study aimed to assess the prevalence and predictors of PPD among mothers who gave birth in the past 12 months in selected sub-cities of Gondar Town from June to August.

Method: A community-based comparative cross-sectional study was conducted among 855 women who delivered at health facilities, with a 1:2 ratio from private and governmental institutions. Descriptive statistics, bivariate, and multivariate logistic regression were employed to identify predictors of PPD ($p<0.05$, 95% confidence interval [CI]).

Results: The findings revealed an overall PPD prevalence of 26.8% (95% CI: 21.7–31.9), with higher rates in government facilities (29.5%) compared to private ones (21.4%). Key socio-demographic predictors included marital status (adjusted odds ratio [AOR]=5.43, 95% CI: 2.10–14.01), maternal education (AOR=6.26, 95% CI: 1.48–26.39), and employment status (AOR=0.47, 95% CI: 0.31–0.70). Obstetric factors such as pregnancy complications, abortion history (AOR=1.53, 95% CI: 1.01–2.33), unplanned pregnancy (AOR=2.57, 95% CI: 1.85–3.56), lack of husband support (AOR=0.30, 95% CI: 0.21–0.43), and family mental illness history (AOR=3.67, 95% CI: 1.23–10.98) were significantly associated with PPD.

Conclusion: The study concludes that PPD is prevalent, particularly in government health facilities. Collaborative efforts between healthcare providers and stakeholders are essential to mitigate PPD's impact. Recommendations emphasize strengthening mental health support systems in both private and public health facilities to enhance early detection and intervention strategies.

Keywords: Postpartum depression, Obstetric factors, Social support factors, Gondar town.

 DOI: http://dx.doi.org/10.22159/ijhs.2026.v14.55059. Journal homepage: https://innovareacademics.in/journals/index.php/ijhs

INTRODUCTION

Postpartum depression (PPD) is a mood disorder that occurs within the first 12 months following delivery and manifests as a variety of somatic and emotional symptoms [1]. Tearfulness, a sense of hopelessness, emotional liability, feelings of guilt, sleep problems, loss of appetite, recurrent thoughts of death, and the risk of the mother harming herself are all symptoms [2].

Maternal PPD is a major cause of non-obstetric postnatal maternal and child morbidity and mortality worldwide [3]. PPD is diagnosed in 10–15% of postnatal women in high-income countries and 30–60% of postnatal women in Sub-Saharan Africa [4]. "A thief that steals motherhood," as PPD has been described [5].

Postpartum depression is the most common psychiatric illness, and it's a huge public health issue that affects twice as many women as men during their childbearing years [6]. Biological, psychological, and social factors have all been linked to PPD. Social support from family members has a strong impact on PPD [7].

PPD has a significant impact on the quality of life of mothers, and the impact is even greater for new mothers [8]. Poor parenting, such as child abuse and neglect, low self-esteem and social interactions [9], risky behaviors, such as smoking, heavy drinking, and unsafe sex [10], as well as self-harm, suicidal ideation, and attempts have all been linked to PPD [11].

Early-onset PPD disorders may potentially impair infant feeding styles due to problems understanding hunger and distress cues from the newborn. Women who have been victimized severely and regularly during pregnancy and have been subjected to several forms of intimate partner violence (physical, sexual, and/or psychological) are more likely to develop PPD [12].

PPD is the most common type of depression in women all over the world [13]. Postpartum depression is linked to stressful events, a physical and emotional demands of pregnancy and caring for new newborns, and hormonal changes following delivery [6].

PPD impairs a mother's ability to respond to her child's needs, and in severe cases, postpartum psychosis, suicide, and infanticide are all possible outcomes [14].

PPD affects 4–63.9% of women worldwide, with significant differences between high-income, middle-income, and low-income countries [15]. Similarly, research suggests that in Africa, women suffer from PPD at a rate of 15–25%, according to studies [16].

Even though significant efforts are being made in Ethiopia to reduce maternal morbidity and mortality, some areas are being overlooked, like PPD, which has a prevalence ranging from 12.2 to 33.8% [6]. Regardless of the efforts made in Ethiopia, such a high prevalence of PPD may indicate that more research is needed.

The early detection of women with mild to moderate PPD symptoms is often overlooked. This leads to a delayed diagnosis and a higher risk of worsened PPD. Such late diagnosis of PPD has a negative impact not

only on the high rate of prevalence, but also on individual levels such as physical, psychological, and social well-being, health-care facility expenses, and family relationships [17].

METHOD

Study area and period

The study was conducted in Gondar Town and Amhara Regional State, Ethiopia. The district is found 700 km far from Addis Ababa, the capital city of Ethiopia. According to the city planning office, the town has a total population of 450,000. This study was conducted from July to September, 2022, to assess the prevalence and predictors for early diagnosis of PPD in mothers who gave birth in the last 12 months in selected sub-cities, Gondar town, Amhara region.

Study design

A community-based comparative cross-sectional study design was employed to analyze the PPD in Gondar town. The source populations were all mothers who gave birth in the last 12 months in Gondar town.

Study population and subjects

The study population was all mothers who gave birth in the last 12 months during the study period in Maraki, Lideta, and Azezo sub-cities. The study subjects were individuals who were selected using systematic random sampling in the study period.

Inclusion criteria

All mothers who gave birth in the last 12 months, those who are voluntary to participate, and those who are permanent residents of the study area were included in the study.

Exclusion criteria

Women below age 15 and women who are not voluntary to participate to the study.

Sample size determination

We calculate the sample size using two population proportions using the following assumptions and formula.

Assumptions

H_0: $P_1-P_2=0$ (There is no difference between place birth [private vs. public] and incidence of PPD)

H_A: $P_1-P_2 \neq 0$ (There is a difference between place birth [private vs. public] and incidence of PPD)

P_1=24% (community-based cross-sectional study done in Awi Zone, Amhara, Ethiopia) [2]

P_2=14% (derived from $p_1$woman who gives birth at private health facilities are 10% less risky to develop PPD as compared to woman give birth at public health)

Allocation ratio 1:2 (one from the private health facilities and 2 from public health facilities).

Proportion

Difference between two independent proportions.

Formula:

$$n=(Z_{\alpha/2}+Z_{\beta})^2\times(p_1[1-p_1]+p_2[1-p_2])/(p_1-p_2)^2$$

The results were n_1 (sample size for private health facilities)=185, n_2 (sample size for public)=370 n (total)=n_1+n_2,=185+370=555, considering design effect=1.5 and 5% of non-response rate, it becomes 860 total study participants, which is 287 participants from private health facilities and 573 from public health facilities.

Sampling procedures

Gondar town has a total of 6 sub-cities. From 6 sub cities, these three sub cities were selected randomly using the lottery method. From each selected sub cities, we will take all women (860) who gave birth in the last 12 months to represent the total population.

Dependent variables

PPD (yes/no).

Independent variables

Socio-demographic variables: Age, religion, marital status, educational level, occupation, and economic status. Obstetric variables: Parity, unplanned/unwanted pregnancy, unhealthy or hospitalizing a baby, mode of delivery, pregnancy complication or illness, History of Abortion, experienced death of baby. Previous psychiatric history: History of depression and family history of psychiatric problems, depression during pregnancy, history of psychiatric illness. Social support: Poor husband support, domestic violence, child birth without the presence of any relatives, unsatisfactory relationship with mother-in-law, unsatisfactory relationship with husband, poor social support.

Data collection procedures and instruments

Data were collected by data collectors from all eligible mothers using a pre-tested semi-structured interviewer-administered questionnaire that is adapted after thorough review of different literature related to the objectives of the study. Edinburgh postnatal depression scale was composed of 10 questions, each with four possible responses. Each response was assigned a score ranging from zero to three, indicating the severity of a symptom. The questionnaire was prepared first in English and translated into the local language, Amharic, then back to English by another person who had blinded for English version to check clarity of questionnaire.

Data quality control

Two BSc nurse's supervisor, 12 health extension and four volunteer data collectors were recruited. Training was given for data collectors and supervisors before data collection. The trained data collectors were supervised during data collection, and each questionnaire will be checked for completeness in a daily basis. Data entry was conducted and cross-checked. The questionnaire was pretested to check the response, language clarity, and appropriateness of the questionnaire, while the pretest was done outside the study area with 5% of sample size. Double entry was done by the principal investigator before analysis to correct any inconsistency. At the end of the pretest, depending on its outcome, the correction measures were undertaken.

RESULTS

Descriptive statistics

Obstetric characteristics of respondents who gave births in the last 12 months in Gondar town health facilities

Table 1 presents about obstetric characteristics of mothers who have given birth in health facilities at Gondar town Regards with previous experience of giving birth majority of mothers (n=855), 691 (80.8%) were multiparous women. Similarly, the majority of respondents were multiparous women who attended at government and private health facilities.

Regards with number children alive per a woman, among participants of the study (n=855), most of them, 709 (82.9%), have ≤2 children per a woman. Similarly, most of the mothers, 485 (85.1%) and 224 (78.6%) who attended at government (n=570) and private health facilities (n=285), respectively, have ≤2 children per a woman.

Most participants of the study (n=855), 716 (83.7%) and 769 (89.9%) has no history of pregnancy complication and history of abortion, respectively. And also related to kind of pattern of pregnancy, most 553 (64.7%) have planned to for their pregnancy. The left 302 (35.3%) of respondents had unintended pregnancy.

Regards with mode of delivery (n=855), majority of respondents, 518 (60.6%) has delivered through spontaneous vaginal delivery (SVD). And also 239 (28%) of women have delivered through cesarean delivery.

Table 1: Obstetric characteristics of respondents who gave births in the last 12 months in Gondar town city, 2022

Variable	Government (n=570)		Private (n=285)		Total (n=855)	
	f	%	f	%	f	%
1. Previous experience of giving birth						
Nulliparous	101	17.7	63	22.1	164	19.2
Multipara	469	82.3	222	77.9	691	80.8
2. How many numbers of children do you have alive?						
≤2	485	85.1	224	78.6	709	82.9
≥3	85	14.9	61	21.4	146	17.1
3. Did you have history of pregnancy complications?						
No	481	84.4	235	82.5	716	83.7
Yes	89	15.6	50	17.5	139	16.3
4. Did you have history of complicated labor?						
No	509	89.3	260	91.2	769	89.9
Yes	61	10.7	25	8.8	86	10.1
5. Did you have history of abortion?						
No	473	83.0	245	86.0	721	84.3
Yes	97	17.0	40	14.0	134	15.7
6. What kind of pattern in current pregnancy?						
Planned	349	61.2	204	71.6	553	64.7
Unintended	221	38.8	81	28.4	302	35.3
7. Mode of delivery						
SVD	361	63.3	157	55.1	518	60.6
CD	152	26.7	87	30.5	239	28.0
SVD+Instume	57	10.0	41	14.4	98	11.5
8. Newborn admission to NICU						
No	488	85.6	248	87.0	736	86.1
Yes	82	14.4	37	13.0	119	13.9

Survey 2022. NICU: Neonatal intensive care unit, SVD: Spontaneous vaginal delivery, CD: Cesarean delivery

The other obstetric characteristics of respondent is the admission of newborn to Neonatal Intensive Care Unit (NICU) (n=855) most of study participants, 736 (86.1%) has no experience of admission of newborn to NICU.

Psychosocial practices of study participants who gave births in the last 12 months at Gondar town health centers

Table 2 depicts the psychosocial characteristics of mothers who have given birth in Gondar town health facilities 2022.

Considering with the availability of the support of husband or partner (n=855), most mothers were replied as majority of husbands or partners 655 (76.6%) have supported mothers through giving child caring and other household activities. Similar characteristics have been existed among mothers attended at both government and private health facilities. The source of support in caring babies for both government and private health facilities was their husbands, which accounts 295 (51.8%) and 151 (53%), respectively.

Among the study participants from the total (n=855), most 792 (92.6%), from the government (n=570), 528 (92.6%), and from the private health facilities (n=285) 264 (92.6%) mothers replied as their husband or partner did not ever threatened to hurt them. In addition, the majority of respondents, 607 (71%), stated as there is not frequently marriage conflict between the mother and the husband/partner. However, 248 (29%) of mothers stated as marriage conflicts have presented with their spouses. Among government health facilities, 519 (91.1%) of respondents were not snapped or kicked by their partner of husband. The same is true for private health facilities, the majority 212 (74.4%) mothers were not kicked by their partner.

Level of PPD using Edinburgh PPD scale

Table 3 below describes the level of depression among women who give birth at health facilities for their last pregnancy. According to this data, as it is displayed in the following Table 3, 44 (5.1%) of the women categorized in severe depression and 185 (21.6%) of them as moderate depression category. Of the 855 respondents, 154 (18.0%) were categorized as having none or minimal depression (score 0–6), and 472 (55.2%) were categorized as having mild depression (score 7–13).

Moreover, the following Table 3 describes the level of depression by health facilities categorized as private and governmental health facilities to describe the relationship between models of care at health facilities with level of depression. Women who gave birth for their last pregnancy at governmental health facilities (n=570), 40 (7%) of them develop severe depression as women who gave birth at private health faculties (n=285), 4 (1.4%) develop severe depression level. Among mothers who attended at government health facilities, respondents, 128 (22.5%) were grouped under a moderate level of depression. Among mothers who attended private health facilities, 57 (20.0%) were classified as having moderate depression. The left 305 (53.5%) and 97 (17.0%) of mothers who attended at government health facilities were experienced mild depression and none/minimal depression level, respectively. Coming with mothers attended at private health facilities, 167 (58.6%) and 57 (20%) were categorized as mild depression and none/minimal depression level, respectively.

Inferential statistics

Factors associated with PPD among mothers who attend at government health facilities

On the final model, which is described below in Table 4, variables with p<0.2 in the binary logistic regression analysis were included to control for potential confounders.

Table 4 depicted that the inferential statistics of the dependent variable PPD and socio-demographic, obstetric and social support related variables on mothers who attend at government health facilities. From the total of 16 predictor variables, only 5 variables have significantly associated with the outcome variable at (95% confidence interval [CI], p<0.05). Among the socio-demographic variables, age of mothers, marital status, mothers education level, husband education level, maternal employment status, partner employment status, and monthly income of the family were entered to the bivariate analysis with (95% CI). Among those variables, (p<0.2) were used for multivariate logistic regression. Only husband education level doesn't include for multivariate analysis (p>0.2).

Therefore, the associated factors for PPD among mothers who attend government health facilities (n=570), was only marital status of

Table 2: Psychosocial support practices of study participants who gave births in the last 12 months at Gondar town health centers, 2022

Variable	Government (n=570)		Private (n=285)		Total (n=855)	
	F	%	F	%	F	%
1. Do you have the support of your husband partner?						
No	154	27.0	46	16.1	200	23.4
Yes	416	73.0	239	83.9	655	76.6
2. Has your husband or partner ever hit kicked slapped or otherwise physically?						
No	519	91.1	212	74.4	731	85.5
Yes	51	8.9	73	25.6	124	14.5
3. Has husband or partner ever threatened to hurt you?						
No	528	92.6	264	92.6	792	92.6
Yes	42	7.4	21	7.4	63	7.4
4. Has husband or partner ever forced you to do something sexually that made you?						
No	513	90.0	264	92.6	777	90.9
Yes	57	10.0	21	7.4	78	9.1
5. What is your source of help for the care of the baby?						
Husband	295	51.8	151	53.0	446	52.2
Relatives	146	25.6	65	22.8	211	24.7
Friends	7	1.2	3	1.1	10	1.2
Nanny/House-help	39	6.8	48	16.8	87	10.2
None	83	14.6	18	6.3	101	11.8
6. Do you have experience of frequent conflicts with spouses?						
No	394	69.1	213	74.7	607	71.0
Yes	176	30.9	72	25.3	248	29.0
7. You are happy with your relationship with your mother in law?						
No	324	56.8	152	53.3	476	55.7
Yes	246	43.2	133	46.7	379	44.3
8. During your pregnancy did you had sever feelings of sadness hopelessness?						
No	432	75.8	221	77.5	653	76.4
Yes	138	24.2	64	22.5	202	23.6
9. Do you have a family support						
No	10	1.8	7	2.5	17	2.0
Yes	560	98.2	278	97.5	838	98.0

Survey 2022

Table 3: Level of postpartum depression using Edinburgh postpartum depression scale among childbearing women who gave birth at health facilities in Gondar town, Ethiopia 2022

Level depression	Birth attended at government health facility (n=570)		Birth attended at private health facility (n=285)		Total births attended at health facilities (n=855)	
	f	%	f	%	f	%
None or minimal depression (0–6)	97	17.0	57	20.0	154	18.0
Mild depression (7–13)	305	53.5	167	58.6	472	55.2
Moderate depression (14–19)	128	22.5	57	20.0	185	21.6
Severe depression (20–30)	40	7.0	4	1.4	44	5.1
Total	570	100.0	285	100.0	855	100.0

Survey 2022

respondents. Mothers who have separated from their spouses had 1.47 times more likely to develop PPD than the single and married women (adjusted odds ratio [AOR]=1.47, 95% CI: 0.61, 3.54). In addition, divorced mothers who attend at government health facilities had 2.90 more likely to practice PPD than the single and married ones (AOR, 95%, CI: 1.18, 7.16).

Whereas, among obstetric factors, mothers who attend at government health facilities (n=570) only history of pregnancy complications and mode of delivery were significantly associated with PPD. Mothers with history of pregnancy complication had 2.89 times more likely to had depression than their counterparts (AOR=2.89, 95% CI: 1.70, 4.94). Moreover, mothers who have given a birth through SVD and instruments had 0.44 times more likely to depressed than mothers delivered through SVD (AOR=0.44, 95%, CI: 0.21, 0.95).

Factors associated with PPD among mothers who gave birth at private health facilities

On the final model, which is described below in Table 5, variables with p<0.2 in the binary logistic regression analysis were included to control for potential confounders.

Table 5 depicts the inferential statistics of the dependent variable PPD, and sociodemographic, obstetric, and social support-related variables on mothers who attend at private health facilities. From the total of 15 predictor variables, only five variables have significantly associated with the outcome variable at (95%CI, p<0.05).

Meanwhile, the associated factors of PPD among mothers who attend at private health facilities (n=285) were mothers' education level and mothers' employment status through multivariate logistic regression.

Table 4: Factors associated with PPD among mothers who attend at Government health facilities

Variable	PPDs Government		Crude OR	Adjusted OR
	No	Yes		
1. Marital status				
Single	37	16	1	1
Married	299	85	0.66 (0.35, 1.24)	0.69 (0.33, 1.45)
Divorced	21	24	2.64 (1.15, 6.05)*	2.90 (1.18, 7.16)*
Separated	32	19	1.37 (0.61, 3.11)	1.47 (0.61, 3.54)
Widowed	13	24	4.27 (1.7, 10.44)*	5.4 (2.03, 14.35)**
2. Mothers education				
Unable to read and write	28	14	1	1
Read and write	171	81	1.87 (0.60, 1.26)*	1.37 (0.64, 2.96)
Certificate	158	57	1.05 (0.59, 3.06)	1.28 (0.58, 2.82)
Degree	40	13	1.07 (0.50, 2.05)	1.11 (0.40, 3.07)
Masters	5	3	2.68 (0.73, 3.56)	2.28 (0.39, 13.14)
3. Maternal Employment status				
Housewife	204	86	1	1
Student	15	9	1.68 (0.73, 3.86)	1.40 (0.54, 3.63)
Employed	183	73	0.47 (0.31, 0.70)*	0.75 (0.45, 1.11)
4. Previous birth or not				
No	78	23	1	1
Yes	324	145	1.35 (0.78, 2.31)	1.35 (0.78, 2.31)
5. History of pregnancy complications				
No	359	122	1	1
Yes	43	46	3.15 (1.98, 5.00)*	2.8 (1.70, 4.94)**
6. History of abortion?				
No	346	127	1	1
Yes	56	41	2.46 (1.01, 3.21)*	1.52 (0.91, 2.53)
7. What kind of pregnancy?				
Planned	267	82	1	1
Unintended	135	86	1.34 (0.06, 2.99)*	2.31 (1.57, 3.41)
8. Mode of delivery				
SVD	267	94	1	1
CD	91	61	1.90 (1.28, 2.84)	1.56 (1.02, 2.40)
SVD+Instument	44	13	0.84 (0.43, 1.63)*	0.45 (0.22, 0.94)*
9. New born admission to NICU				
No	353	135	1	1
Yes	49	33	1.43 (0.61, 3.32)*	1.10 (0.61, 1.99)
10. Husband support				
No	78	76	1	1
Yes	324	92	0.29 (0.19, 0.43)	0.33 (0.22, 0.50)**
11. Has husband ever threatened to hurt you?				
No	380	148	1	1
Yes	22	20	2.01 (0.61, 3.27)	1.24 (0.60, 2.57)
12. Has husband forced you to do something sexually that made you?				
No	369	144	1	1
Yes	33	24	1.22 (0.05, 1.05)	1.67 (0.90, 3.09)
13. Do you experienced frequent conflicts with spouses?				
No	295	99	1	1
Yes	107	69	2.34 (0.67, 2.67)*	1.33 (0.87, 2.02)
14. Family support				
No	2	8	10 (2.10,47.60)	10.7 (1.65, 70.27)*
Yes	400	160	1	1

*Significant at (p<0.05), **significant at (p≤0.001). SVD: Spontaneous vaginal delivery, CD: Cesarean delivery, NICU: Neonatal intensive care unit, PPD: Postpartum depression, OR: Odds ratio

Surprisingly, mothers who had masters and above education level had 10.06 times more likely to postpartum depressed than mothers who cannot read and write (AOR=10.06, CI: 1.25, 80.74). What else, mothers who are employed under different sectors and attended at private health facilities had 0.24 times likely to develop PPD than unemployed mothers (AOR=0.24, 95% CI: 0.11, 0.5).

Considering with obstetric factors, mothers who had a history of pregnancy complications had 2.38 times more likely to develop PPD than the other ones (AOR=2.74, 95%, CI: 1.01, 5.51). Similarly, mothers with a history of abortion had 2.36 times more likely to practice PPD than mothers without a history of abortion (AOR=1.53, 95%, CI: 1.01, 2.33).

Factors associated with PPD among mothers who gave birth at both health facilities

On the final model, which is described below in Table 6, variables with p<0.2 in the binary logistic regression analysis were included to control for potential confounders.

Table 6 depicts the inferential statistics of the dependent variable PPD, and sociodemographic, obstetric, and social support-related variables on mothers who attend at government health facilities. From the total of 17 predictor variables, only 8 variables have significantly associated with the outcome variable at (95% CI, p<0.05).

Table 6 showed that the association between predictor variables and PPD among women who gave birth in the last 12 months at Gondar town health

Table 5: Factors associated with PPD among mothers who gave birth at private health facilities in Gondar town health facilities, 2022

Variable	PPDs private		Crude OR	Adjusted OR
	No	Yes		
1. Marital status				
Single	1	2	1	1
Married	186	44	0.49 (0.33, 1.45)	0.12 (0.01, 3.08)
Divorced	12	4	2.50 (1.18, 4.16)*	0.13 (0.0, 3.99)
Separated	19	5	2.37 (0.61, 3.44)*	0.19 (0.01, 5.14)
Widowed	6	6	5.4 (3.03, 6.35)*	1.39 (0.04, 42.72)
2. Mothers education				
Unable to read and write	14	6	1	1
Read and write	70	18	0.66 (0.35, 1.24)*	0.71 (0.22, 2.36)
Certificate	82	23	2.64 (1.15, 6.05)*	0.85 (0.26, 2.85)
Degree	55	9	1.37 (0.61, 3.11)	0.67 (0.14, 3.09)
Masters	3	5	4.27 (1.75, 10.44)	10.06 (1.25, 80.74)*
3. Maternal employment status				
Housewife	68	29	1	1
Student	5	6	1.42 (0.60, 3.38)	3.84 (0.79, 18.69)
Employed	151	26	0.95 (0.65, 1.37)	0.24 (0.11, 0.53)*
4. History of pregnancy complications?				
No	193	42	1	1
Yes	31	19	2.83 (1.75, 4.56)*	2.38 (1.17, 4.86)**
5. History of abortion?				
No	197	48	1	1
Yes	27	13	1.58 (0.98, 2.54)*	2.36 (1.01, 5.51)**
6. What kind of pregnancy?				
Planned	172	32	1	1
Unintended	52	29	1.31 (0.57, 2.21)*	0.34 (0.06, 1.99)
7. Mode of delivered childbirth?				
SVD	130	27	1	1
CD	65	22	2.32 (0.98, 2.37)	1.34 (0.68, 2.67)
SVD+Instument	29	12	1.54 (0.55, 3.95)	1.65 (0.72, 3.79)
8. Newborn admission to NICU				
No	200	48	1	1
Yes	24	13	1.20 (0.41, 2.99)	1.43 (0.61, 3.32)
9. Husband support				
No	25	21	1	1
Yes	199	40	0.29 (0.19,0.43)	0.22 (0.11, 0.46)**
10. Has husband ever threatened to hurt you?				
No	209	55	1	1
Yes	15	6	1.34 (0.60, 2.57)*	2.11 (0.61, 7.27)
11. Has husband forced you to do something sexually that made you?				
No	206	58	1	1
Yes	18	3	1.57 (0.90, 3.09)*	0.22 (0.04, 1.05)
12. Do you experience frequent conflicts in marriage?				
No	173	40	1	1
Yes	51	21	1.45 (1.87, 2.02)	1.34 (0.67, 2.67)
13. Do you have a history of psychiatric illness?				
No	219	59	1	1
Yes	5	2	0.33 (0.08, 2.22)	1.61 (0.28, 9.25)

*Significant at (p<0.05), **significant at (p≤0.001). PPD: Postpartum depression, OR: Odds ratio

facilities by incorporating total health facilities (n=855), government health facilities (n=570), and private health facilities (n=285).

The multivariate logistic regression output for overall health facilities indicated that among the socio-demographic variables, marital status, mother's education level, and maternal employment status were significantly associated with PPD of mothers who have given birth in Gondar town health facilities within 12 months (AOR, 95% CI, p<0.05). Widowed women has 5.43 times more likely to had PPD than single women (AOR=5.43, 95% CI: 2.10, 14.01) with p<0.05. Considering with mother's education level, mothers with masters and above education level were 6 times more likely depression than mothers with cannot read and write (AOR=6.26, 95% CI: 1.48, 26.39).

Table 6 also depicted that mothers with a history of pregnancy complication 2.74 times more likely to develop PPD (AOR=2.74, 95% CI: 1.79, 4.18) compared to their counter parts. Mothers with a history of abortion had 1.53 times more likely to practice PPD (AOR=1.53, 95%, CI: 1.01, 2.33). Regarding with pattern kind of pregnancy, mothers with unintended pregnancy had 2.57 times more likely to develop PPD than mothers with intended or planned pregnancy (AOR=2.57, 95%, CI: 1.85, 3.56).

For the total samples (n=855), the availability of the support of husband, husband's ever threatened behavior, husband's forced sexual relationship, experience of frequent conflicts in marriage, family member with a mental illness and history of psychiatric illness were identified variables that processed under bivariate logistic regression then significant value at (p<0.2) were further processed with multivariate logistic regression with p<0.05.

Except husband's/partner's forced sexuality behavior, all social support-related factors analyzed through multivariate logistic regression (n=855). From the multivariate logistic regression table among social support factors, only availability of the support of husband and family member with a mental illness was associated with PPD (AOR, 95%, CI, p<0.05).

Table 6: Factors associated with PPD among mothers who gave birth in Gondar town health facilities (G+P)

Variable	PPDs total		Crude OR	Adjusted OR
	No	Yes		
1. Marital status				
Single	38	18	1	1
Married	485	129	0.59 (0.30, 1.14)	0.79 (0.37, 1.71)
Divorced	33	28	2.58 (1.12, 5.98)*	1.45 (0.59, 3.56)*
Separated	51	24	1.36 (0.59, 3.11)	1.17 (0.50, 2.75)
Widowed	19	30	4.94 (1.98, 12.30)*	5.4 (2.10, 14.01)**
2. Mothers education				
Unable to read and write	42	20	1	1
Read and write	241	99	1.33 (0.63, 2.83)*	1.70 (0.69, 4.19)
Certificate	240	80	1.15 (0.53, 2.47)*	1.95 (0.75, 5.04)
Degree	95	22	0.96 (0.36,2.54)	2.11 (0.69, 6.45)
Masters	8	8	2.15 (0.39,11.67)	6.2 (1.48,26.39)**
3. Maternal Employment status				
Housewife	272	115	1	1
Student	20	15	1.32 (0.53,3.30)*	1.68 (0.73, 3.86)
Employed	334	99	0.67 (0.43,1.04)*	0.47 (0.31, 0.70)*
4. Previous birth or not				
No	128	36	1	1
Yes	498	193	2.03 (1.38, 3.21)	1.37 (0.64, 2.96)
5. History of pregnancy complications?				
No	552	164	1	1
Yes	74	65	2.95 (1.81,4.80)**	2.74 (1.79,4.18)**
6. History of abortion?				
No	544	177	1	1
Yes	82	52	1.50 (0.93,2.43)	1.53 (1.01, 2.33)*
7. What kind of pregnancy?				
Planned	439	114	1	1
Unintended	187	115	2.10 (1.44,3.07)*	2.57 (1.85, 3.56)*
8. Mode of delivery				
SVD	397	121	1	1
CD	156	83	2.32 (0.98, 2.37)	1.70 (0.69, 4.19)
SVD+Instument	73	25	0.31 (0.21, 0.95)	0.84 (0.43,1.63)
9. New born admission to NICU				
No	553	183	1	1
Yes	73	46	0.80 (0.61, 1.99)	1.15 (0.71, 1.87)
10. Support by husband				
No	103	97	1	1
Yes	523	132	0.27 (0.19,0.37)**	0.30 (0.21,0.43)**
11. Has husband ever threatened to hurt you?				
No	589	203	1	1
Yes	37	26	1.45 (0.51, 3.55)	1.25 (0.68, 2.29)
12. Has husband forced you to do something sexually that made you?				
No	575	202	1	1
Yes	51	27	1.03 (0.60, 1.99)	1.18 (0.67, 2.06)
13. Do you experience frequent conflicts with spouse?				
No	468	139	1	1
Yes	158	90	2.23 (1.87, 3.02)	1.32 (0.92, 1.88)
14. Family support				
No	7	10	1	1
Yes	619	219	4.16 (1.51,11.49)*	3.67 (1.23,10.98)*
15. Do you have history of psychiatric illness?				
No	619	222	1	1
Yes	7	7	1.24 (0.08, 2.45)	1.29 (0.36, 4.58)

*Significant at (p<0.05), **significant at (p≤0.001). PPD: Postpartum depression, OR: Odds ratio, NICU: Neonatal intensive care unit

Mothers with the availability of husbands support in child caring, and other household activities had 0.30 likely to develop PPD (AOR=0.30, 95%, CI: 0.21, 0.43). And also mothers with family member mental illness had 3.67 more likely to develop PPD (AOR=3.67, 95%, CI: 1.23, 10.98).

DISCUSSION

Prevalence of postnatal depression

The aim of this study was to assess the prevalence and associated factors of postnatal depression among women who gave birth in Gondar town health facilities. The overall prevalence of postnatal depression among mothers who gave birth at Gondar town (n=855) was 26.8% (21.7–31.9, 95% CI). And also the prevalence of postnatal depression among mothers who attended at government health facilities (n=570), was 29.5% with (24.0–34.9, 95% CI) and for private health facilities (n=285) was 21.4% (17.2–25.6, 95% CI).

Comparing prevalence of postnatal depression among mothers who attend at government health facilities with private health facilities, the prevalence of postnatal depression among mothers at government health facilities (29.5%) was higher than the overall prevalence (26.8%) and the private ones (21.4%).

The overall prevalence of PPD was similar with a study conducted at Gondar town 25% [6]. However, the reports of the current study were found to be higher compared to studies done in Canada 8.69% [18], New Delhi 12.75% [18], Kampala-Ugandan urban primary health care 6.1% [19], Gujarati 12.5% [20], Harare Ethiopia 13% [21], and 25% prevalence in Gonder [20]. The difference prevalence might be due to the socioemographic and economic difference between the countries and the cities.

Sociodemographic factors of PPD

Respects with sociodemographic factors, marital status, mothers' education level, and maternal employment status were significantly associated with PPD for the overall sample mothers who attend health facilities (n=855) in Gondar town ($p<0.05$). However, for mothers who attend at government health facilities (n=570), only the marital status of respondents was significantly associated with postnatal depression ($p<0.05$). What else, for the private health facilities (n=285), mothers' education level and mothers' employment status were significantly associated with postnatal depression at ($p<0.05$).

For the overall health facilities (n=855), statistical analysis indicated that mothers with widowed marital status 5.43 times more likely to had PPD than single women. This study finding has in line with a studying Uganda [22], Sudan [23], and Addis Ababa [24]. The similarity might be due to the similar due to globalization and accessibility of reproductive health information.

Regards with educational status, mothers with masters and above education level were 6 times more likely depressed than mothers with cannot read and write (n=855, $p<0.05$). The finding of the study was contradicted with a study released by the World Health Organization [25], Debre Tabor [26], and Addis Ababa [27]. Social consequences of poor education are obvious: Lack of education represents a diminished opportunity for person to access resources to improve their situation, Pakistan [28]. The contradiction might be due to the difference sample size and sampling procedures of those studies.

Furthermore, in this study, women who had employed in different sectors were 0.47 times more likely to develop PPD as compared to non-employed ones (n=855, $p<0.05$). This means that unemployed women had more likely to minimal or no depression than employed women. This finding of the study has contradicted with the study conducted in Sudan [23], Qatar [29], and Lebanon [30]. The difference could be due to socio-cultural difference of the country.

Obstetric factors of PPD

The statistical analysis result indicated that a history of pregnancy complications, a history of abortion, and pattern of pregnancy were significantly associated with PPD (n=855, $p<0.05$). Whereas, for government health facilities (n=570) postnatal depression had significantly associated with a history of pregnancy complications and mode of delivery ($p<0.05$). But also, pregnancy complication and history of abortion were significantly ($p<0.05$) associated factors of PPD of mothers who attend at private health facilities (n=285).

For the overall sample respondents (n=855) in the study included by the sampling procedure, the multivariate logistic regression result revealed that mothers with a history of pregnancy complication had 2.74 times more likely to develop PPD. This finding was supported by the study conducted in Bahir Dar Town [31], Debre Birhan [32], Egypt [24], Qatar [32], and Saudi Arabia [33]. The similarity might be due to the accessibility of information about reproductive health services, and it might be due to life similar socioeconomic development of the study area.

Moreover, mothers with a history of abortion had 1.53 times more likely to practice PPD than their counterparts. The study has in line with study Jeddah, western Saudi Arabia [34], Northern Viet Nam [35]. The similarity could be due to the study area urbanization level, as Gondar town is the second city of the country, it may had an opportunity to share information and accessibility of services related to pregnancy and abortion.

Moreover, pregnancy pattern had significantly associated with postnatal depression. Mothers with unintended pregnancy pattern had 2.57 times more likely to develop PPD than mothers with intended or planned pregnancy. This finding is consistent with study in Sudan [36], South Africa [37], and Istanbul Saudi Arabian [38]. The consistent study finding might be due to the same level of knowledge on pregnancy-related issues.

Psychosocial factors of postnatal depression

Toward the overall sample respondents (n=855) and mothers who attend at government health facilities (n=570), availability of the support of husband and family member with a mental illness was associated psychosocial factors of PPD ($p<0.05$). However, for the private health facilities (n=285), the multivariate logistic regression output showed that only availability of husband/partner support had significantly associated with PPD ($p<0.05$).

Hence, Mothers with non-availability of support of husbands were had 0.30 likely to develop PPD (n=855, $p<0.05$). The study had similar with study conducted at Nifas Silk Lafto sub-city [39], South Africa [2,40].

The study also revealed that mothers with family members of mental illness had 3.67 more likely to develop PPD. The study has consistent with studies conducted at Bahirdar town [31], Debrebirhan [32].

CONCLUSION

The study was conducted to assess the prevalence and associated factors of PPD among women who gave birth at with the last 12 months at Gondar town health facilities. Accordingly, the prevalence of postnatal depression was 26.8%. Moreover, the prevalence was categorized under government and private health facilities. The prevalence of postnatal depression of mothers attended at government health facilities was 29.5%, but for private health facilities, the prevalence was 21.4%. This refers to that postnatal depression was high at government health facilities than the private ones.

About sociodemographic variables of postnatal depression, marital status, mothers' education level status and maternal employment status were significantly associated with PPD for the overall sample respondents. But for mothers, who attend at government health facilities, only marital status of respondents was significantly associated with postnatal depression, and mothers who attend at private health facilities, mothers' education level and mothers' employment status were significantly associated with postnatal depression.

Whereas for obstetric variables of postnatal depression for the combined health facilities, the study findings indicated that history of pregnancy complications, history of abortion, and pattern of pregnancy were significantly associated with PPD.

Moreover, related to psychosocial variables of postnatal depression, availability of the support of husband and family member with a mental illness was associated with PPD among the overall mothers and mothers who attend only government health facilities.

RECOMMENDATIONS

Health care providers and stakeholders should work together to reduce the magnitude of postnatal depression at both government and private health facilities. Counseling service and other relevant services should be provided for the widowed mothers. To reduce depression among employed mothers, it should be better to increase the number of baby caring organizations and services. Creating supporting environment in the household between the husband and the mother should use as preventive strategy to reduce postpartum mechanism. As the study

revealed that a history of pregnancy complication, history of abortion, and pattern of pregnancy were the associated factors of PPD, healthcare practitioners and health extension workers should identify and delivering awareness creation and preventive mechanism toward PPD would be early stage of pregnancy.

Ethics approval and consent to participate

The study has got approval by College of Social Science and Humanities' ethical clearance committee at the University of Gondar. The study was commenced after written consent obtained from Gondar town administrative office. Written informed consent was not obtained from a parent or guardian for participants under 16 years old. However, each respondent was informed about the objective of the study and assurance of confidentiality.

ACKNOWLEDGMENT

Special thanks to the staff of population studies department to give me moral support for the completeness of the research.

AUTHORS' CONTRIBUTION

ETM. Conception and designing of the research design, preparation of questionnaire, training of data collectors, data collection, data entry, and conducting the analysis of the research. ETM. Data editing and cleaning. AMH. Also writing of the research and interpretation of the result. All authors have read and approved the manuscript and ensure that this is the case.

COMPETING INTEREST

There is no competing interest.

FUNDING

No funds are available.

AVAILABILITY OF DATA AND MATERIALS

All necessary data analyzed for this study are available in the Statistical Package for the Social Sciences readable format, and all of the findings are presented in figures and tables in the manuscript.

CONSENT TO PUBLISH

Not applicable in this section.

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