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Research Paper

Mistreatment during health facility-based childbirth and symptoms suggestive of postpartum depression in low resource settings

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ABSTRACT

Introduction: Postpartum depression (PPD) is a substantial public health concern among mothers in sub-Saharan Africa but may be underestimated due to limited screening and treatment. Mistreatment during facility-based childbirth has been associated with PPD in prior studies, yet evidence on which mistreatment types are linked to greater PPD symptom severity remains limited. This study assessed the association between mistreatment during facility childbirth and PPD symptoms.

Methods: A multi-center, cross-sectional study was conducted among 414 postpartum women recruited from selected urban public health facilities using stratified systematic random sampling. Binary logistic regression model was used to estimate adjusted odds of symptoms suggestive of PPD among women reporting mistreatment during childbirth. Poisson regression with robust standard errors was used to assess differences in Edinburgh Postnatal Depression Scale (EPDS) total scores according to reported exposure to specific forms of mistreatment. Adjusted measures with 95% confidence intervals (CIs) were reported, with statistical significance set at $p < 0.05$.

Results: Among the 400 postpartum women included in the final analysis, 15.00% (95% CI: 11.65%–18.88%) had symptoms suggestive of PPD. In adjusted analyses, expressed as adjusted mean ratios (aMRs), physical abuse (aMR = 1.37; 95% CI: 1.07–1.74), stigma and discrimination (aMR = 1.28; 95% CI: 1.06–1.54), verbal abuse (aMR = 1.12; 95% CI: 1.01–1.24), and poor provider rapport (aMR = 1.12; 95% CI: 1.00–1.25) were significantly associated with higher expected EPDS total scores. Physical restraint was not significantly associated with expected EPDS total scores (aMR = 1.34; 95% CI: 1.00–1.81).

Conclusions: PPD symptoms were more prevalent among women who reported mistreatment during facility-based childbirth, and symptom severity differed by type of mistreatment. Strengthening respectful maternity care, addressing inequities, and fostering supportive community environments may help reduce institutional violence and the burden of PPD symptoms.

1. Introduction

Postpartum depression (PPD) is one of the most common mental health disorders affecting women during the perinatal period, affecting >10 % of mothers worldwide (Bai et al., 2023). In low resource settings, where cost-effective preventive measures, screening tools, and treatment options for PPD are limited, the condition often remains undetected and undertreated (Hawkins, 2023). This results in preventable

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adverse outcomes, including poor mother-baby attachment, individual harm (Hanif, 2021), and impaired child growth and development, such as emotional regulation issues in children (Saharoy et al., 2023).

PPD affects 22 % of postpartum women in sub–Saharan Africa (SSA), though this figure is likely underestimated due to inadequate screening and limited access to postnatal care. (Nweke et al., 2024; Tessema et al., 2020). In Ethiopia, where 81 % of women do not receive adequate postnatal care (Fetene and Gebremedhin, 2022), pooled estimates indicate that about 23 % of postpartum women experience PPD (Tolossa et al., 2020). This indicates that life stressors, complications during pregnancy and childbirth complications, unwanted pregnancies, infant loss, marital dissatisfaction, spousal violence, lack of social support, and a history of depression are important factors for PPD in Ethiopia (Ayen et al., 2024; Tolossa et al., 2020).

Economically, the impact of perinatal depression in LMICs is substantial, estimated at $16.5 billion for a single birth cohort (Bauer et al., 2024). By 2050, global incidence of major depressive disorder (MDD) will reach approximately 97.04 million cases, with the highest burdens anticipated in resource limited areas, particularly SSA (Wang et al., 2025). Social and economic inequities, constrained health systems, and violence against women further exacerbate adverse health, developmental, and economic outcomes for mothers and children (Limenih et al., 2024).

PPD has been reported in more than one-third of women who experienced abuse and disrespect during childbirth, with higher rates among those exposed to physical and verbal abused (Guure et al., 2023). However, substantial evidence gaps remain regarding the relationship between mistreatment during childbirth and subsequent PPD, particularly as prior research has failed to capture the multifaceted, context-specific risk factors and outcomes in low- and middle-income countries (LMIC) settings (Paiz et al., 2022; Shiva et al., 2021; Sobey, 2002). Moreover, in many LMICs, healthcare delivery models often fail to incorporate routine PPD screening, integrated follow-up, and culturally sensitive care (Sobey, 2002). Recognizing these challenges, the World Health Organization (WHO), United Nations Population Fund (UNFPA), and the United States Agency for International Development (USAID) launched a high-level technical consultancy in September 2021 to examine the link between the poor treatment of women during childbirth and its impact on maternal mental health outcomes (Maternal Mental Health Techinical Consultation, 2021).

Respectful maternity care (RMC) is recognized as a universal human right and is crucial for improving maternal health outcomes ("Respectful Maternity Care," 2023; Window et al., 2023). Despite this, a significant proportion of women globally experience various forms of mistreatment, driven by Poor interpersonal communication and behavior by healthcare staff, Structural failures, lack of supplies, and understaffing that create an environment where poor care becomes systemic, and a lack of awareness among women regarding their rights (Kasaye et al., 2024; Liu et al., 2024). Research from the LMICs shows that over a third of women in these countries reported mistreatment during childbirth (Mahase, 2019). In Ethiopia, nearly half of mothers' report maltreatment during facility-based childbirth, a factor that not only discourages institutional deliveries and continuity of care, but also leads to psychological trauma and increased risk for PPD (Bohren et al., 2019; Kassa and Husen, 2019; Paiz et al., 2022).

Given the rising rates of facility-based childbirth alongside health system challenges in Ethiopia, there is a critical knowledge gap about the relationship between mistreatment during facility childbirth and PPD. This study aims to assess this association, examining whether specific components of mistreatment are linked to worsened postpartum depressive symptoms.

Based on existing literature on obstetric violence and perinatal mental health outcomes, we hypothesize that women who experience mistreatment during childbirth will have significantly higher odds of developing PPD compared to those who do not. In addition, women who experience any form of mistreatment during facility-based childbirth such as physical abuse, verbal abuse, or lack of supportive care will demonstrate significantly higher odds of developing postpartum depressive symptoms compared to those who do not.

2. Materials and methods

2.1. Study area and period

The study was conducted in the Eastern Tigray Zone of the Tigray region, northern Ethiopia, with Adigrat town as one of the principal urban centers in the zone. The zone borders Eritrea to the north, afar region to the east, the Southeastern Zone to the south, and the Central Zone to the west. Based on the Ethiopian Statistical Service projected population (July 2024), the Eastern Tigray Zone has an estimated total population of 1036,316, comprising 494,584 males and 541,732 females (Ethiopian Statistical Service Projected Population, 2024). The zone includes public health facilities of different service levels (general hospital, primary hospitals, and health centers) that provide maternal and child health services, including routine postnatal care and limited mental health services. Data were collected from March 2025 to 15 June 2025.

2.2. Study design and reporting

An institution-based, multi-center cross-sectional study was conducted among postpartum women attending maternity-related postnatal services in selected urban public health facilities in Eastern Tigray Zone, Tigray region, northern Ethiopia. The manuscript reporting was structured in line with the STROBE guidance for cross-sectional studies to ensure transparent reporting of the study setting, participant selection, measurement, and analytic approaches (Elm et al., 2007).

2.3. Source and study populations

The source population was all postpartum women residing in urban settings of Eastern Tigray Zone who attended public health facilities for postnatal care and/or child immunization services during the study period. The study population comprised postpartum women who presented to the selected urban public health facilities during data collection and met the eligibility criteria.

2.4. Eligibility criteria

Postpartum women were eligible if they had lived in the selected cities/towns for at least six months before data collection, were between 2 and 8 weeks postpartum at the time of interview and provided informed consent to participate. Participants were excluded if they had lived in the area for less than six months and documented or self-reported clinician diagnosis of a severe mental health disorder (e.g., psychotic disorder or bipolar disorder) prior to the index pregnancy. History of depression prior to the index pregnancy was measured and considered as a potential confounder in multivariable analyses.

2.5. Sample size determination and sampling technique

The sample size was estimated using G*Power version 3.1.9.7 (Faul et al., 2007). The calculation assumed a small-to-moderate effect size ($w = 0.20$), 80 % statistical power, a 5 % level of significance (two-sided), and inflation for the multi-center sampling context using a design effect of 1.5, with an additional 15 % allowance for potential non-response. The final required sample size was 414 participants.

2.6. Sampling technique

A stratified, multi-stage sampling approach was used. First, urban public health facilities in Eastern Tigray Zone were stratified by level of

care (general hospital, primary hospital, and health center). From each stratum, facilities were selected using a simple random method: one general hospital, two primary hospitals, and three health centers.

Second, the total sample size ($n = 414$) was allocated to each selected facility using probability proportional to size (PPS) based on the average monthly delivery or postnatal service workload reported in the six months before data collection. Using the reported monthly client volumes, the allocation resulted in the following facility quotas: Adigrat General Hospital ($n = 216$), Hawzien Primary Hospital ($n = 96$), Fatsi Primary Hospital ($n = 48$), Teklesweat Health Center ($n = 18$), Edaga Hamus Health Center ($n = 17$), and Wukro Health Center ($n = 19$) (Fig. 1).

Third, within each facility, systematic random sampling technique was applied to recruit eligible women attending postnatal care visits and/or child immunization services in the 2–8-week postpartum window. For each site, the sampling interval (k) was calculated as the expected number of eligible postpartum attendances during the data collection period divided by the allocated sample size for that facility ($k = N/n$). A random start between 1 and k was selected each day using the facility register to identify the first participant, and then every k^{th} eligible woman was approached thereafter until the quota was achieved.

To reduce social desirability and interviewer influence, recruitment and interviews were conducted by trained data collectors not employed at the study facilities, and women were approached only after completion of routine clinical services. All consent and interviews were conducted in a private area to ensure confidentiality.

2.7. Study variables

The primary outcome was symptoms suggestive of PPD, analyzed as a binary variable (Yes/No). The secondary outcome was the EPDS total score (0–30), treated as an integer symptom score. The primary exposure was mistreatment during facility-based childbirth (Yes/No overall and by mistreatment domains). Other independent variables included socioeconomic and sociodemographic characteristics (e.g., age, education, employment, household characteristics), obstetric factors (e.g., parity, mode of birth, pregnancy intention, complications), psychosocial factors (e.g., social support, marital satisfaction), spousal violence (self-reported), and anxiety symptoms.

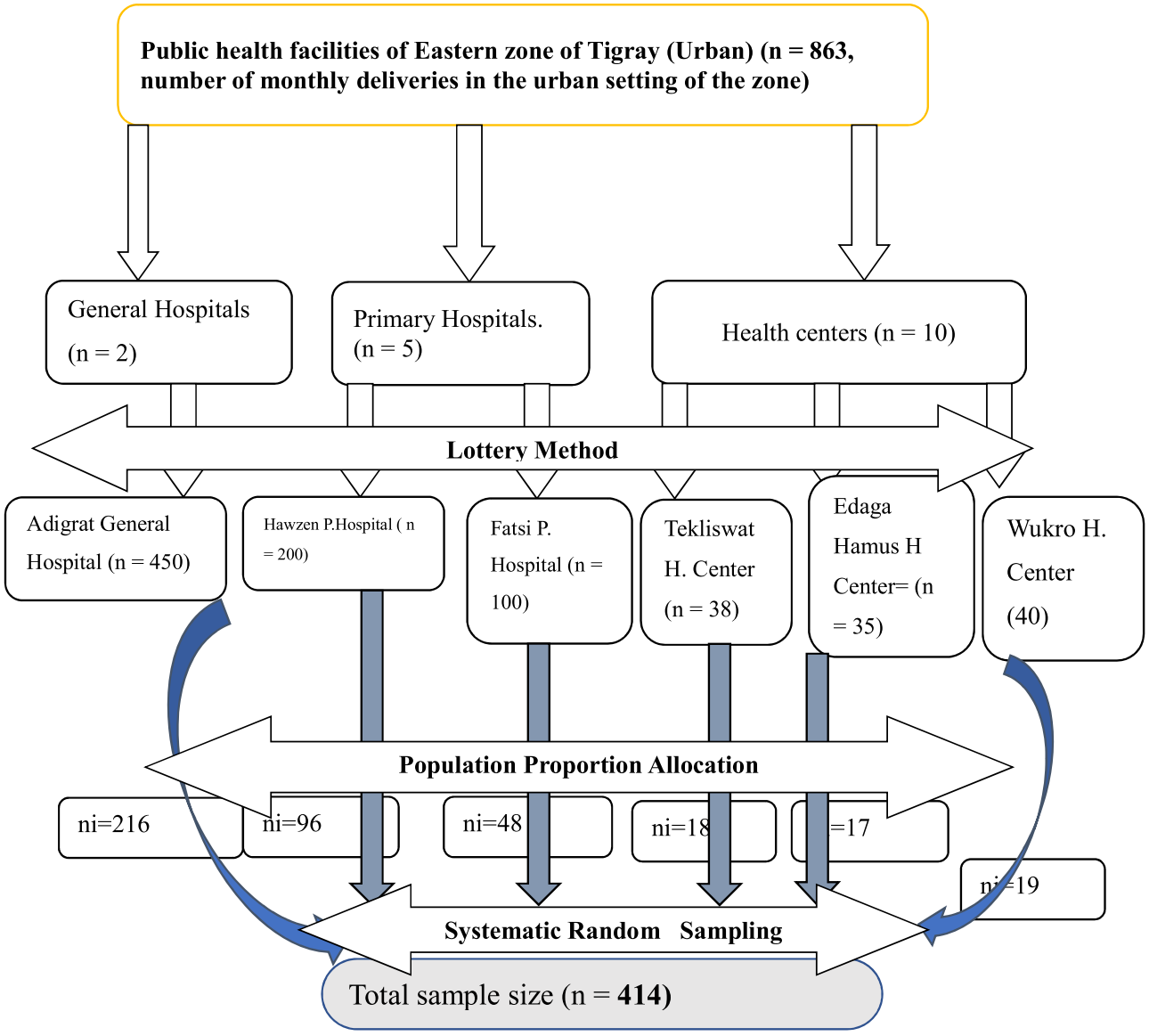

Fig. 1. Schematic presentation of sampling procedure for the study to assess the relationship between mistreatment of women during health facility-based childbirth and postpartum depression among women in selected urban public health facilities in the Eastern zone of Tigray, northern Ethiopia, in 2024.

2.8. Operational definitions and measurement of key variables

2.8.1. Postpartum depression symptoms (EPDS)

Symptoms suggestive of PPD were assessed using the Edinburgh Postnatal Depression Scale (EPDS), a 10-item screening tool widely used to identify symptoms of depression and anxiety during pregnancy and the postpartum period (Cox et al., 1987). The EPDS asks women to report how they felt over the previous seven days and has been validated for perinatal use in Ethiopia (Hanlon et al., 2008).

Each of the 10 items is scored from 0 to 3, yielding a total score range of 0–30 (Tulane University School of Medicine, 2024). Scoring requires attention to reverse-coded items because not all questions are graded in the same direction. Specifically, items 1, 2, and 4 are scored in the standard direction (first response option = 0; last option = 3), while items 3, 5, 6, 7, 8, 9, and 10 are reverse scored (first response option = 3; last option = 0) (Tulane University School of Medicine, 2024). The EPDS total score was computed as the sum of the ten item scores.

For the binary outcome, women were classified as having symptoms suggestive of PPD if their EPDS score was ≥ 11, consistent with evidence indicating that this threshold provides a strong balance of sensitivity and specificity for major depression screening in pregnant and postpartum populations (Levis et al., 2020). Internal consistency reliability in this sample (Cronbach's alpha) was 0.63 for EPDS, 0.35 for MSSS, 0.73 for the mistreatment items, and 0.49 for GAD-2; therefore, EPDS and MSSS showed low-to-moderate internal consistency and results involving these scales should be interpreted cautiously. For MSSS, negatively worded items were reverse coded prior to summation. MSSS total scores were calculated only when 6 of 6 items were non-missing; otherwise MSSS was set to missing. Internal consistency was computed on complete item responses (Bohren et al., 2019; Cox et al., 1987; Webster et al., 2000).

2.9. Mistreatment during facility-based childbirth

Mistreatment during childbirth was measured using an evidence-informed and validated tool aligned with the current conceptual typology of mistreatment and respectful maternity care (Bowser D, Hill K, 2010; World Health Organization, 2014). The questionnaire captured multiple domains of mistreatment consistent with the literature on disrespect and abuse during facility-based childbirth, including both interpersonal and health system dimensions (Bohren et al., 2019; Bowser D, Hill K, 2010).

For analysis, mistreatment indicators were grouped into domains reflecting common categories described in the literature (e.g., physical abuse, verbal abuse, stigma/discrimination, failure to meet professional standards, lack of consent, poor provider–woman rapport, and health-system constraints) (Bohren et al., 2019, 2015; Bowser D, Hill K, 2010). Each domain comprised multiple verification items with dichotomous responses ("Yes"/ "No"). A woman was considered to have experienced a given mistreatment domain if she responded "Yes" to at least one item within that domain; overall mistreatment was defined as "Yes" to at least one item in any domain (Bohren et al., 2019, 2015).

Each domain comprised multiple verification items with dichotomous responses ("Yes"/ "No"). A woman was considered to have experienced a given mistreatment domain if she responded "Yes" to at least one item within that domain; overall mistreatment was defined as "Yes" to at least one item in any domain.

2.9.1. Social support (Maternity social support scale)

Items were scored on a five-point Likert scale and summed to create a total score (range 6–30). Following common scoring conventions, social support was classified as low (<19), medium to high (19–30) (Webster et al., 2000).

Perceived social support was assessed using the Maternity Social Support Scale (MSSS), a six-item tool originally developed for use in pregnancy and early motherhood (Webster et al., 2000). Items were scored on a five-point Likert scale and summed to create a total score (range 6–30). Following common scoring conventions, social support was classified as low (<19), medium to high (19–30) (Webster et al., 2000).

2.9.2. Anxiety symptoms (GAD-2)

Anxiety symptoms were screened using the Generalized Anxiety Disorder 2-item scale (GAD-2), derived from brief validated screening approaches for anxiety (Kroenke et al., 2009). Each item is scored from 0 ("not at all") to 3 ("nearly every day") over the previous two weeks, producing a total score range of 0–6. A cut-off score of ≥ 3 was used to indicate probable anxiety symptoms warranting further assessment (Kroenke et al., 2009).

2.10. Other covariates

Sociodemographic and obstetric variables were collected using a structured questionnaire, including maternal age, maternal and partner education, marital status, employment status, parity, pregnancy intention, place and mode of birth, and self-reported pregnancy/childbirth complications. Spousal violence was measured as self-reported experience of physical, emotional, and/or sexual violence during pregnancy or the postpartum period (Yes/No).

2.11. Data collection instrument and procedure

2.11.1. Data collection tools and procedures

Data were collected through interviewer-administered questionnaires programmed on android tablets using Kobo Toolbox, which supports offline data capture with secure upload when internet connectivity becomes available (Harvard Humanitarian Initiative, KoBo-Toolbox. Cambridge, MA, 2005). The questionnaire was administered in the local language, Tigrigna. The instruments were translated and adapted using standard forward translation and review procedures, consistent with recommended approaches for cross-cultural adaptation of health measurement tools (Beaton et al., 2000). Five trained mental health professionals (psychiatric nurses), employed outside the study recruitment sites, conducted the interviews. Women attending postpartum check-ups or child immunization services within 2–8 weeks of delivery were invited to participate.

2.11.2. Data quality assurance and management

A structured quality assurance plan was implemented throughout the study. Data collectors received four days of intensive training on study objectives, informed consent procedures, interviewing techniques, confidentiality, and management of sensitive topics (including distress and spousal violence disclosures). The questionnaire was pre-tested in non-study facilities within the eastern zone of Tigray, and feedback was used to refine question sequencing, wording, and skip logic. Supervisors conducted field monitoring visits, observed interviews periodically, and reviewed uploaded records daily to check completeness, skip patterns, and internal consistency. To protect confidentiality, no direct personal identifiers were collected in the electronic questionnaire. Completed forms were uploaded to the secure Kobo server and were accessible only to authorized study personnel.

2.12. Data processing and statistical analysis

2.12.1. Data management and statistical analysis

Data were exported from Kobo Toolbox to a clean dataset format and analyzed in SAS version 9.4 (SAS Institute Inc., 2013). Descriptive statistics were computed for all variables. Continuous variables were summarized using means with standard deviations or medians with interquartile ranges as appropriate, and categorical variables were summarized using frequencies and percentages. The EPDS total score was calculated by summing the item scores after applying the required

reverse scoring for items 3 and 5–10 (Tulane University School of Medicine, 2024). The binary PPD outcome was defined as EPDS ≥ 11 (Levis et al., 2020).

To examine associations between mistreatment during childbirth and symptoms suggestive of PPD (EPDS ≥ 11), bivariable and multivariable logistic regression models were fitted to estimate crude and adjusted odds ratios (AORs) with 95 % confidence intervals. Candidate covariates were identified a priori based on prior evidence and a conceptual model of PPD and mistreatment. To maintain parsimony given the number of outcome events, the final multivariable model adjusted for maternal age group, marital status, family financial support, pregnancy intention, spousal violence, maternal social support, and suggestive symptoms of GAD, with mistreatment during childbirth included as the primary exposure (Hanlon et al., 2008; Levis et al., 2020; World Health Organization, 2022).

To assess differences in EPDS total score (0–30) according to mistreatment exposure and mistreatment domains, Poisson regression models with a log link were fitted and exponentiated coefficients were interpreted as ratios of mean EPDS scores (expected score ratios). Robust (empirical/sandwich) standard errors were obtained using generalized estimating equations (GEE) with an independent working correlation structure. GEE model fit was summarized using QIC and QICu for model comparison. Missing data were assessed for each variable; because missingness was minimal, analyses used complete-case records for multivariable models. All hypothesis tests were two-sided, and statistical significance was declared at $p < 0.05$. No clustering or survey-weighted procedures were applied; all analyses were conducted under the assumption of independent observations.

3. Results

3.1. Baseline profile of postpartum women

A total of 414 postpartum women were initially approached, of whom 400 completed the interview, yielding a response rate of 96.62 %. The overall median maternal age was 28 years (IQR: 25–32) and was similar across groups (median 27.5 years [IQR: 25–32] among women with PPD symptoms vs. 28 years [IQR: 25–32] among women without symptoms). Unintended pregnancy was significantly more common among women with PPD symptoms compared to those without symptoms (26.67 % vs. 10.00 %; $p < 0.001$). Similarly, symptoms suggestive of GAD were more prevalent in the PPD group (23.33 % vs. 10.00 %; $p = 0.003$). Mistreatment during childbirth was reported by 58.25 % of the participants overall and was slightly more frequent among women with PPD symptoms than among those without (66.67 % vs. 56.76 %); however, this difference did not reach statistical significance ($p = 0.152$). Among the 400 postpartum women included in the final analysis, 60 (15.0 %; 95 % CI: 11.65 %–18.88 %) had symptoms suggestive of PPD, while 340 (85.0 %) did not. Symptoms suggestive of PPD were observed in 17.17 % (95 % CI: 12.33 % – 22.01 %)) of women mistreated during childbirth (Table 1).

3.2. Factors associated with symptoms suggestive of PPD

Multivariable logistic regression was conducted using complete cases ($n = 373$), with 27 observations excluded due to missing values. After adjustment for maternal age group, marital status, family financial support, pregnancy intention, spousal violence, maternal social support, and suggestive symptoms of GAD, mistreatment during childbirth was not significantly associated with symptoms suggestive of PPD (AOR = 1.24; 95 % CI: 0.65–2.36). Lack of family financial support remained independently associated with lower odds of depressive symptoms (AOR = 0.46; 95 % CI: 0.25–0.87). Unintended pregnancy (AOR = 2.21; 95 % CI: 0.94–5.20) and suggestive symptoms of GAD (AOR = 2.17; 95 % CI: 0.97–4.85) were associated with higher odds of depressive symptoms, although confidence intervals included the null. Other covariates,

Table 1
Baseline profile of postpartum women attending maternity care in selected urban public health facilities in the Eastern zone of Tigray, northern Ethiopia, in 2025 ($n = 400$).

Baseline variables	Categories	Total $n = 400$n (%)	Symptoms suggestive of PPD, n (%)		p-value
			Yes $n = 60$ (15 %)	**No** $n = 340$ (85 %)	
Maternal age, in complete years, median (IQR)		28 (25–32)	27.5 (25–32)	28 (25–32)	
Maternal age	15–24	86 (21.50)	14 (23.33)	72 (21.18)	0.932[a]
	25–34	246 (61.50)	36 (60.00)	210 (61.76)	
	≥ 35	68 (17.00)	10 (16.67)	58 (17.06)	
Current marital status	Married	364 (91.00)	47 (78.33)	317 (93.24)	0.001*[b]
	Single/ cohobating	20 (5.00)	7 (11.67)	13 (3.82)	
	Separated	13 (3.25)	6 (10.00)	7 (2.06)	
	Widowed	3 (0.75)	0 (0.00)	3 (0.88)	
Highest maternal educational status	No formal education	11 (2.75)	0 (0.00)	11 (3.24)	0.059[a]
	Primary education	98 (24.50)	21 (35.00)	77 (22.65)	
	Secondary education	233 (58.25)	28 (46.67)	205 (60.29)	
	Tertiary education	58 (14.50)	11 (18.33)	47 (13.82)	
Highest partner's educational status	No formal education	5 (1.25)	1 (1.67)	4 (1.18)	0.449[b]
	Primary education	71 (17.75)	12 (20.00)	59 (17.35)	
	Secondary education	206 (51.50)	34 (56.67)	172 (50.59)	
	Tertiary education	118 (29.50)	13 (21.67)	105 (30.88)	
Current working status	Full-time	55 (13.75)	15 (25.00)	40 (11.76)	0.01*[a]
	Part-time	73 (18.25)	6 (10.00)	67 (19.71)	
	Not working	272 (68.00)	39 (65.00)	233 (68.53)	
Family provision of financial support	No	242 (60.50)	26 (43.33)	216 (63.53)	0.003*[a]
	Yes	158 (39.50)	34 (56.67)	124 (36.47)	
Ability to manage monthly income	Difficult all the time	30 (7.50)	6 (10.00)	24 (7.06)	0.002*[a]
	Difficult sometimes	167 (41.75)	37 (61.67)	130 (38.24)	
	Easy	85 (21.25)	6 (10.00)	79 (23.24)	
	Not bad	118 (29.50)	11 (18.33)	107 (31.47)	
Satisfaction with marital relationship	Yes	361 (90.25)	50 (83.33)	311 (91.47)	0.050[a]
	No	39 (9.75)	10 (16.67)	29 (8.53)	
Parity	Primipara	120 (30.00)	20 (33.33)	100 (29.41)	0.541[a]
	Multipara	280 (70.00)	40 (66.67)	240 (70.59)	

(continued on next page)

Table 1 (*continued*)

Baseline variables	Categories	Total *n* = 400n (%)	Symptoms suggestive of PPD, n (%)		p-value
			Yes *n* = 60 (15 %)	**No** *n* = 340 (85 %)	
Pregnancy intention	Intended	350 (87.50)	44 (73.33)	306 (90.00)	<0.001**[a]
	Unintended	50 (12.50)	16 (26.67)	34 (10.00)	
Place of childbirth	Hospital	266 (66.50)	38 (63.33)	228 (67.06)	0.821[b]
	Health center	121 (30.25)	21 (35.00)	100 (29.41)	
	Home	3 (0.75)	0 (0.00)	3 (0.88)	
	Unknown	10 (2.50)	1 (1.67)	9 (2.65)	
Mode of childbirth	Vaginal delivery	324 (81.00)	53 (88.33)	271 (79.71)	0.288[a]
	Cesarean section	46 (11.50)	4 (6.67)	42 (12.35)	
	Instrumental delivery	30 (7.50)	3 (5.00)	27 (7.94)	
Spousal violent experience	Yes	57 (14.25)	12 (20.00)	45 (13.24)	0.167[a]
	No	343 (85.75)	48 (80.00)	295 (86.76)	
History of obstetric complications	Yes	161 (40.25)	27 (45.00)	134 (39.41)	0.416[a]
	No	239 (59.75)	33 (55.00)	206 (60.59)	
Mistreatment during childbirth	Yes	233 (58.25)	40 (66.67)	193 (56.76)	0.152[a]
	No	167 (41.75)	20 (33.33)	147 (43.24)	
Maternal social support (*n* = 373)	Low	106 (28.42)	21 (38.89)	85 (26.65)	0.065[a]
	Moderate to high	267 (71.58)	33 (61.11)	234 (73.35)	
Suggestive symptoms of GAD	Yes	48 (12.00)	14 (23.33)	34 (10.00)	0.003*[a]
	No	352 (88.00)	46 (76.67)	306 (90.00)	

Abbreviations: GAD: Generalized Anxiety Disorder; IQR=Interquartile Range; PPD: Postpartum depression.

Notes.

[a] p-value from Pearson chi-square test.

[b] p-value from Fisher's exact test.

Women with and without PPD symptoms differed at baseline in terms of marital, current working status, financial support from family, ability to manage monthly income, pregnancy intention (previous index pregnancy), and symptoms of generalized anxiety disorder (GAD) ($p < 0.05$).

including being unmarried, experiencing spousal violence, and having low maternal social support, were not statistically significant in the adjusted model (Table 2).

3.2.1. Mistreatment subtypes and EPDS total score (postpartum depression symptom severity)

Significant associations were observed between an EPDS score ≥ 11 and reported physical abuse ($p < 0.001$), physical restraint ($p = 0.020$), stigma and discrimination ($p < 0.001$), failure to meet professional standards ($p = 0.003$), and poor provider-patient rapport ($p = 0.016$). Conversely, neither verbal abuse ($p = 0.382$) nor health system constraints ($p = 0.072$) were significantly associated with symptoms suggestive of PPD (Table 3).

Table 2

Factors identified and retained for multivariable modeling of postpartum depression symptoms among postpartum women attending maternity care in selected urban public health facilities in the Eastern zone of Tigray, northern Ethiopia, in 2025 (n = 373).[1,2,3.]

Variables	Categories	Logistic regression model analysis		
		Bi-variable analysis COR (95 % CI)	Multivariable analysis AOR (95 % CI)	p-value [4]
Maternal age group	15–24	ref	ref	
	25–34	0.88 (0.45, 1.73)	1.00 (0.46, 2.22)	0.992
	≥ 35	0.89 (0.37, 2.14)	0.73 (0.26, 2.03)	0.541
Current marital status	Married	ref	ref	
	Not married	3.81 (1.81, 8.04) **	1.92 (0.72, 5.09)	0.191
Family provision of financial support	Yes	ref	ref	
	No	0.44 (0.25, 0.77) *	0.46 (0.25, 0.87)	0.016
Pregnancy intention	Intended	ref	ref	
	Unintended	3.27 (1.67, 6.42) **	2.21 (0.94, 5.20)	0.070
Spousal violent experience	No	ref	ref	
	Yes	1.64 (0.81, 3.32)	1.71 (0.78, 3.77)	0.181
Maternal social support	Moderate to high	ref	ref	
	Low	1.75 (0.96, 3.19)	1.48 (0.76, 2.89)	0.251
Mistreatment during childbirth	No	ref	ref	
	Yes	1.52 (0.85, 2.72)	1.24 (0.65, 2.36)	0.513
Suggestive symptoms of GAD	No	ref	ref	
	Yes	2.74 (1.37, 5.49) *	2.17 (0.97, 4.85)	0.060

Abbreviations

COR = crude odds ratio; AOR = adjusted odds ratio; CI = confidence interval; ref = reference category.

Notes.

[1] The multivariable model was estimated using complete cases ($n = 373$); 27 observations were excluded due to missing values.

[2] Multivariable model fit: likelihood ratio χ^2 (df = 9) = 26.89, $p = 0.002$; Hosmer–Lemeshow χ^2 (df = 7) = 8.90, $p = 0.260$.

[3] After addressing multicollinearity, these variables were retained as the minimal adjustment set to control for confounding.

[4] p-values correspond to Wald tests for each AOR comparing the listed category to the reference category (category-specific; not Type 3).

*$p < 0.05$; **$p < 0.001$.

To assess the association between specific forms of mistreatment during health facility-based childbirth and PPD symptom severity, a Poisson regression model with a log link was fitted to the EPDS total score (range 0–30) ($n = 400$). Adjusted mean ratio (aMR) are interpreted as the ratio of expected mean EPDS scores comparing women who reported a given mistreatment subtype with those who did not, holding the other mistreatment domains constant.

In the adjusted analyses, physical abuse was significantly associated with higher EPDS scores: women who reported physical abuse had a 37

Table 3
Association between specific mistreatment domains during health facility-based childbirth and postpartum depressive symptom severity (EPDS total score, 0–30) in Eastern Zone, Tigray, northern Ethiopia, 2025 ($n = 400$).

Variables	Categories	Frequency, n (%)	EPDS ≥ 11 p-value [§]	Poisson Regression Analysis of EPDS total score (0–30) [1,2]		
				cMR (95 % CI) [†]	aMR (95 % CI) [‡]	Adjusted model p-value [¶]
Physical abuse	No	381 (95.25)		ref	ref	
	Yes	19 (4.75)	< 0.001	1.57 (1.24, 1.98)	1.37 (1.07, 1.74)	0.012
Physical restraint	No	392 (98.00)		ref	ref	
	Yes	8 (2.00)	0.020	1.81 (1.39, 2.34)	1.34 (1.00, 1.81)	0.053
Verbal abuse	No	260 (65.00)		ref	ref	
	Yes	140 (35.00)	0.382	1.24 (1.14, 1.35)	1.12 (1.01, 1.24)	0.025
Stigma and discrimination	No	370 (92.50)		ref	ref	
	Yes	30 (7.50)	<0.00	1.43 (1.24, 1.66)	1.28 (1.06, 1.54)	0.010
Failure to meet professional standards	No	340 (85.00)		ref	ref	
	Yes	60 (15.00)	0.003	1.24 (1.09, 1.41)	0.94 (0.79, 1.11)	0.451
Poor rapport (women/providers)	No	270 (67.50)		ref	ref	
	Yes	130 (32.50)	0.016	1.28 (1.17, 1.39)	1.12 (1.00, 1.25)	0.049
Health system conditions/constraints	No	274 (68.50)		ref	ref	
	Yes	126 (31.50)	0.072	1.18 (1.07, 1.30)	1.03 (0.92, 1.15)	0.582

Abbreviations: cMR = crude mean ratio (ratio of expected mean EPDS scores); aMR = adjusted mean ratio; CI = confidence interval; ref = reference category; EPDS = Edinburgh Postnatal Depression Scale.
Notes.
[1] EPDS total score (a summed score, range 0–30) and exponentiated Poisson coefficients are interpreted as ratios of mean EPDS scores (expected score ratios), not incidence rates.
[2] Poisson models were fitted using GEE with an independent working correlation structure and empirical (sandwich) standard errors and multicollinearity was low (VIF range = 1.17–1.73).
[†] cMR from bivariable Poisson GEE models (one predictor at a time); mean ratio = exp (β), 95 % CI = exp (Wald 95 % confidence limits).
[‡] aMR from a multivariable Poisson GEE model including all seven mistreatment domains simultaneously (mutually adjusted for co-occurring mistreatment domains only).
[§] p-values for EPDS ≥11 correspond to the association between each mistreatment domain and symptoms suggestive of postpartum depression (EPDS ≥11); Fisher's exact test (two-sided) was used for 2 × 2 tables, except overall mistreatment where Pearson chi-square was used.
[¶] p-values correspond to the multivariable Poisson GEE model (Wald Z test).
*$p < 0.05$, ** $p < 0.001$. Model fit (multivariable GEE): QIC = −4382.61; QICu = −4384.87.

% higher expected EPDS total score compared with those who did not (aMR = 1.37; 95 % CI: 1.07–1.74). Physical restraint was associated with a 34 % higher expected EPDS total score (aMR = 1.34; 95 % CI: 1.00–1.81), although this association was marginal. Among the non-physical forms of mistreatment, verbal abuse was associated with a 12.0 % higher expected EPDS total score (aMR = 1.12; 95 % CI: 1.01–1.24), stigma and discrimination with a 28 % higher expected EPDS total score (aMR = 1.28; 95 % CI: 1.06–1.54) and poor rapport between women and providers with a 12.0 % higher expected EPDS total score (aMR = 1.12; 95 % CI: 1.00–1.25). In contrast, health system conditions and constraints (aMR = 1.03; 95 % CI: 0.92–1.15) and failure to meet professional standards of care (aMR = 0.94; 95 % CI: 0.79–1.11) were not significantly associated with EPDS total score after adjustment (Table 3).

4. Discussion

In this cross-sectional study of postpartum women attending public health facilities in Eastern Tigray, 15 % exhibited symptoms suggestive of PPD. While overall mistreatment during childbirth was not independently associated with PPD after adjustment, specific forms, particularly physical abuse, stigma and discrimination, and poor provider-patient rapport, were significantly associated with greater symptom severity, with increases in EPDS scores ranging from 12 % to 37 %.

In the adjusted model, mistreatment during childbirth was not statistically associated with symptoms suggestive of PPD (While the point estimate suggests a 24 % increase in the odds of symptoms, the relationship did not reach statistical significance, potentially indicating that the effect of mistreatment is attenuated by other stronger predictors like spousal violence and anxiety). However, specific forms of mistreatment during childbirth such as physical abuse, verbal abuse, stigma and discrimination, and poor rapport with healthcare providers were all strongly linked to higher EPDS scores, with increases ranging from 12 % to 37 %. This suggests that while general dissatisfaction might be masked by other stressors like anxiety, direct personal violations during birth are still major drivers of the depressive symptoms.

These associations possibly come from erosion of women's self-esteem and sense of worth caused by negative experiences, which contribute to feelings of shame, guilt, and hopelessness. In low-resource environments where abusive behaviors are prevalent and support systems are fragile, affected women often become socially isolated and without help, exacerbating depressive symptoms. Additionally, such mistreatment can provoke psychosocial stress and hormonal imbalances during the postpartum period, further contributing to the onset and severity of PPD symptoms.

Previous studies investigating the association between forms of mistreatment during childbirth and PPD in LMICs have linked it with vulnerabilities during childbirth, frustrations about women's expectations, the divergence between expectations and abusive experiences, triggering of hormonal imbalances (Guure et al., 2023; Paiz et al., 2022), erosion of women's trust in health services, inadequate support due to early discharge and lack of timely assistance during childbirth, with humiliation and mistreatment triggering trauma (Conceição et al., 2023; Guure et al., 2023; Leite et al., 2020; Paiz et al., 2022).

Our study employed a validated instrument specifically designed to evaluate mistreatment during facility-based childbirth within maternity care services in sub-Saharan Africa (Bohren et al., 2019). This instrument comprises seven components, distinguishing it from other surveys investigating the association between mistreatment and PPD. Consistent with other research, the absence of a standardized tool to measure this complex and multifaceted latent construct is acknowledged (Leite et al., 2020; Paiz et al., 2022). Additionally, we utilized an EPDS cutoff score of ≥11, selected for its optimal balance of sensitivity and specificity as demonstrated in a recent meta-analysis (Levis et al., 2020). Nonetheless, variations in cutoff points across studies may limit the comparability of our findings with those reported elsewhere.

A secondary analysis of the WHO community survey conducted in low-income settings, including Ghana, Guinea, Myanmar, and Nigeria, demonstrated an association between mistreatment and the development of PPD (Guure et al., 2023). Specifically, women who experienced physical abuse were >50 % more likely to develop PPD (OR: 1.57, 95 % CI: 1.19–2.06), those who experienced verbal abuse had over 40 % increased odds of developing PPD (OR: 1.42, 95 % CI: 1.18–1.69), and those subjected to stigma or discrimination had >60 % higher odds of developing PPD (OR: 1.69, 95 % CI: 1.03–2.78), compared to their counterparts who did not experience such forms of mistreatment (Guure et al., 2023). However, comparisons between these studies should be made with caution. While the multi-country study used the Patient Health Questionnaire (PHQ-9) to assess depression, our study utilized the EPDS, which may capture different dimensions of PPD. Our findings align with longitudinal evidence from Ethiopia and Guinea. That study similarly demonstrated that specific forms of mistreatment significantly drive depressive symptoms. Specifically, stigma and discrimination were associated with a 36.5 % increase in expected depression scores, followed by physical abuse (23.4 %), poor provider-patient rapport (17.2 %), and verbal abuse (12.0 %) (Asefa et al., 2026). Findings from upper middle-income countries such as Brazil indicate that exposure to verbal violence is associated with more than a 50 % increased likelihood of developing moderate (PPD) (OR = 1.58; 95 % CI: 1.06–2.33) and nearly a 70 % higher likelihood of severe PPD (OR = 1.69; 95 % CI: 1.06–2.70) (Mesenburg et al., 2018). Additionally, experiencing physical violence more than doubles the risk of severe PPD (OR = 2.28; 95 % CI: 1.26–4.12) (Mesenburg et al., 2018). Other studies from Brazil have reported a PPD prevalence exceeding 50 % among women who suffered physical, verbal, or neglectful violence during childbirth (Souza et al., 2017). Moreover, women who experienced mistreatment during childbirth showed a significantly higher prevalence of symptoms suggestive of PPD (Paiz et al., 2022).

The current study also identified factors such as no provision of family financial support, unintended pregnancy and suggestive symptoms of GAD associated with higher odds of symptoms indicative of PPD. These factors have also been reported in other studies determining determinants of conditions indicative of probable PPD (Cho et al., 2022; Nweke et al., 2024; Tolossa et al., 2020) underscoring fostering preconception counseling, reducing financial strain and screening for other mental health disorders exacerbating PPD.

The findings of this study pointed out the urgent need for educating healthcare workers, and health system administrators on the effects of mistreatment during childbirth, as such institutional violences in obstetric care are often normalized in low-resource settings. Additionally, efforts must prioritize the implementation of respectful maternity care through comprehensive training that empowers providers to deliver harmonized and woman-centered care. Integrating routine psychosocial support and mental health screening during pregnancy and the postpartum period is essential to identify and support women at risk of PPD as early as possible. Future research should focus on developing and evaluating effective interventions to prevent mistreatment and improve service quality, thereby reducing perinatal mental health risks.

4.1. Strengths and limitations

By modeling each category of mistreatment (such as physical abuse, verbal abuse, stigmatization, and discrimination, failure to uphold professional care standards, poor rapport between women and healthcare providers, and constraints related to health facilities and systemic limitations) as separate predictors, our analytic strategy enabled the precise evaluation of the individual effect of each mistreatment type on PPD symptoms.

Another strength of this study is its methodological rigor, demonstrated by data collection conducted by mental health experts who received specialized training in mental health and psychosocial support, including the mental health gap intervention. These experts were equipped to provide immediate support and referrals for women experiencing grief related to depressive symptoms. Additionally, continuous quality control was maintained, and interviews were conducted between two and eight weeks postpartum. This helps to minimize potential biases associated with immediate postpartum distress, fatigue, and recall bias.

A limitation of this study is the low postpartum follow-up rate in Ethiopia. Since our focus was limited to women who attended postpartum visits, this may have affected the internal validity to some extent, as women who utilize postpartum care might systematically differ from those who do not. The women's previous mental health status and exposure to spousal violence were assessed through self-report without distinguishing between different types within each condition, which may limit comparability and in-depth understanding. Additionally, variation in measurement tools across studies for the latent variable of mistreatment during childbirth, along with the use of a slightly lower EPDS cut-off point (≥11) despite its balanced sensitivity and specificity may restrict comparability of findings and warrant cautious interpretation.

Because the primary analyses did not explicitly account for potential within-facility correlation, standard errors may be underestimated if responses were clustered by health facility. Furthermore, since the study was facility-based, it may be subject to selection bias. Women who experienced the most severe forms of mistreatment might avoid returning for postnatal care. Thus, our findings likely represent a conservative estimate of the true extent of mistreatment during childbirth in this region.

5. Conclusion and recommendations

While overall mistreatment during facility-based childbirth was not independently associated with symptoms suggestive of PPD after adjustment, specific forms of mistreatment were significantly associated with higher PPD scores. PPD scores differ significantly according to women's experiences with various forms of mistreatment. Therefore, promoting respectful maternity care during childbirth, addressing economic inequities, and fostering supportive communities are recommended to eliminate institutional violence in obstetric care and reduce the burden of PPD.

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Ethical considerations

Ethical approval was obtained from the relevant institutional ethics review body (AGU/RCSD/DDM-6723034). Written informed consent was obtained from all participants before data collection. Participants were interviewed privately, and confidentiality was strictly maintained. In line with recommended perinatal mental health integration practices, women who screened positive for severe symptoms (including any affirmative response to self-harm thoughts on EPDS item 10) were counselled and referred to available clinical mental health services for further evaluation and care.

Data sharing statement

All relevant data are within the manuscript and its supporting information files.

CRediT authorship contribution statement

Meresa Berwo Mengesha: Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hagos Mehari**

Mezgebo: Writing – review & editing, Validation, Supervision, Methodology. **Gessessew Teklebrhan Gebrehiwot:** Writing – review & editing, Validation, Supervision, Resources, Methodology. **Haftom Tesfay Gebremedhin:** Writing – review & editing, Supervision, Methodology, Data curation. **Etsay Weldekidan Tsegay:** Writing – review & editing, Supervision, Methodology, Investigation. **Natnael Etsay Assefa:** Writing – review & editing, Supervision, Methodology, Formal analysis. **Abadi Hailay Atsbaha:** Writing – review & editing, Supervision, Methodology. **Hiluf Ebuy Abraha:** Writing – review & editing, Visualization, Software, Methodology, Formal analysis, Data curation. **Zenawi Hagos Gufue:** Writing – review & editing, Validation, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare no conflict of interest.

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