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Prevalence, Knowledge, Attitude, and Determinants of Postpartum Depression Among Postnatal Women in the Buea Health District, Cameroon: A Hospital-Based Cross-Sectional Study

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Abstract

Background: Postpartum depression (PPD) is a common, under-recognized complication of childbirth with substantial consequences for maternal, infant, and family wellbeing. Prevalence estimates vary widely across settings, and data on the knowledge, attitude, and correlates of PPD among Cameroonian women remain scarce. This study determined the prevalence of PPD and its association with the knowledge and attitude of postnatal women, and identified the socio-demographic, obstetric, and psychosocial factors independently associated with PPD in the Buea Health District, Cameroon.

Methods: A hospital-based cross-sectional study was conducted from February to April 2023 among postnatal women aged 4-6 weeks post-delivery attending the vaccination/postnatal clinics of four health facilities in the Buea Health District, selected through a three-stage sampling procedure combining convenience selection of health areas and facilities with probability-proportionate-to-size allocation of participants. A structured, pretested, self-administered questionnaire captured socio-demographic, obstetric, and psychosocial data, a 12-item knowledge scale, a 12-item Likert attitude scale, and the 10-item Edinburgh Postnatal Depression Scale (EPDS; positive screen defined as a score ≥13). After data cleaning, 333 questionnaires were retained for analysis. Bivariate followed by multivariable binary logistic regression (variables with $p<0.2$ at the bivariate stage entered the adjusted models) was used to identify the independent correlates of good knowledge, good attitude, and PPD; adjusted odds ratios (AOR) with 95% confidence intervals (CI) are reported, with statistical significance set at $p<0.05$.

Results: The mean age of participants was 27.9 ± 6.4 years. The prevalence of a positive EPDS screen for PPD was 37.8% (126/333). Overall, 70.3% of women had good knowledge of PPD and 52.0% had a good attitude towards PPD. In the adjusted model for PPD, only secondary-level education was independently associated with lower odds of PPD compared with no formal education (AOR=0.25, 95% CI 0.07–0.89, p=0.033); mode of delivery, antenatal care attendance, and pregnancy complications showed non-significant trends towards association (all $p<0.20$ at bivariate level). For knowledge, being Muslim was independently associated with lower odds of good knowledge relative to being Christian (AOR=0.39, 95% CI 0.16–0.92, p=0.032). No socio-demographic variable was independently associated with attitude in the adjusted model.

Conclusion: More than one in three postnatal women screened positive for probable postpartum depression in this Cameroonian district, a higher burden than several previously reported regional estimates. Despite comparatively good knowledge of PPD, attitudes remained only moderately favourable, and socio-demographic profile, particularly educational attainment, rather than obstetric or overt psychosocial adversity, emerged as the principal independent correlate of both PPD risk and knowledge after adjustment. Integrating routine, correctly-scored EPDS screening into postnatal and vaccination clinic visits, alongside targeted psychoeducation for women with limited formal education and religious-minority communities, may help close this detection gap.

Highlights

• Postpartum depression (PPD) screening positivity was 37.8% among postnatal women in the Buea Health District.

• Most women had good knowledge of PPD, but only about half demonstrated a favourable attitude.

• Secondary education was independently associated with lower odds of screening positive for PPD.

• Routine EPDS screening and targeted psychoeducation could strengthen postpartum depression detection and prevention.

Background

Pregnancy and childbirth are transformative events that bring sudden changes to a woman's roles, responsibilities, and physiology, and the postpartum period is a recognized window of vulnerability for the onset of maternal mental illness [1, 2]. Postpartum depression (PPD), a non-psychotic depressive episode with onset during pregnancy or within the first weeks to months after delivery, is characterized by low mood, anhedonia, anxiety, sleep and appetite disturbance, feelings of worthlessness, and, in severe cases, thoughts of self-harm [1, 3]. Left undetected, PPD compromises maternal functioning and the mother-infant bond, is associated with delayed initiation and early cessation of breastfeeding, and is linked to adverse cognitive, behavioural, and emotional outcomes in children [4, 5]. In its most severe forms, it is a recognized contributor to maternal morbidity and, rarely, to maternal suicide and infanticide [5, 6].

PPD is a global public health problem, but reported prevalence varies enormously from under 5% to over 80% depending on the screening instrument, cut-off, timing of assessment, and population studied [7, 8]. Pooled estimates put the global prevalence at approximately 17–19% [7], with regional syntheses reporting 8–20% in the United States, 2–20% in parts of Europe, around 24% in South Asia, and approximately 27% in the Middle East [9, 10, 11]. A continent-wide meta-analysis estimated the pooled prevalence in Africa at roughly 17–20%, with substantial heterogeneity between and within countries and a tendency towards higher estimates in Southern and Central Africa [8, 12, 13]. Within sub-Saharan Africa, hospital- and community-based studies have reported figures as low as 6.9% in rural Morocco and 9.3% in parts of Ethiopia, but as high as 27.1% in south-western Uganda, 37.7% in Nigeria, and near 40% in parts of Southern Africa [12, 13, 14, 15, 16].

Cameroon-specific data, although limited, consistently point to a higher-than-average burden. Reported prevalence figures range from 23.4% among postnatal women in Yaoundé in 2015, through 31.8% in a remote area of the country, to 53.3% in an earlier hospital-based study conducted in the Buea Health District itself, 61.8% in a community-based survey in the neighbouring Limbe Health District, and as high as 70.0% among teenage mothers in Yaoundé [17, 18, 19, 20, 21]. This widespread underscores both genuine variation in risk across Cameroonian settings and the sensitivity of PPD prevalence estimates to instrument scoring, sample characteristics, and study design, an issue this study returns to directly in its methods and discussion.

Beyond prevalence, the knowledge and attitude that postnatal women hold about PPD shape whether the condition is recognized, disclosed, and acted upon. Community-based assessments outside Cameroon have found strikingly different pictures: poor knowledge of PPD (as low as 6–20% with good knowledge) and poor attitude (as low as 11% with a good attitude) among postnatal women in south-western Nigeria, contrasted with much higher knowledge (over 90%) among health workers in Ghana and comparatively favourable knowledge (76%) and attitude (66%) among women in Malaysia [22, 23]. No published study in Cameroon has, to our knowledge, jointly documented the knowledge, attitude, prevalence, and correlates of PPD among postnatal women using a validated screening instrument, despite the country's comparatively high reported burden and the ongoing socio-political crisis in the North-West and South-West regions, which has driven substantial internal displacement into host communities such as Buea [24, 25].

Many women who screen positive for PPD in low- and middle-income countries are neither diagnosed nor treated, partly because postnatal follow-up of the mother is frequently subsumed under child-focused vaccination programmes with little attention to maternal mental health, and partly because women themselves may interpret depressive symptoms as normal, or conceal them for fear of stigma [26, 27]. Addressing this detection gap requires locally generated evidence on how much PPD exists, how well it is understood, and which women are most at risk, to inform the integration of screening and psychoeducation into routine maternal and child health (MCH) services, a priority directly aligned with Sustainable Development Goal (SDG) target 3.4 on mental health and non-communicable disease and SDG target 3.1 on maternal mortality [28].

This study therefore aimed to determine the prevalence of PPD among postnatal women in the Buea Health District, to assess their knowledge and attitude towards PPD, and to identify the socio-demographic, obstetric, and psychosocial factors independently associated with PPD, knowledge, and attitude, using a validated Edinburgh Postnatal Depression Scale (EPDS) scoring protocol and multivariable analysis.

Methods

Study design, setting and period

This was a hospital-based, descriptive cross-sectional study conducted between 1 February and 30 April 2023 in the Buea Health District, South-West Region of Cameroon. Buea, the regional headquarters, covers approximately 870 km² and had an estimated population of 184,601 at the time of the study [29]. The district comprises seven health areas served by a regional referral hospital, seven primary health facilities, and several private hospitals. The ongoing socio-political crisis affecting the North-West and South-West regions has driven substantial in-migration of internally displaced persons into Buea, with attendant loss of livelihoods for many households, a contextual factor relevant to the psychosocial risk profile of the study population.

Study population and eligibility

Eligible participants were women 4 to 6 weeks postpartum attending the postnatal/vaccination clinics of selected health facilities within the district who consented to participate. Women in this postpartum window with any physical disability that precluded self-administration of the questionnaire were excluded.

Sample size and sampling procedure

The minimum required sample size was calculated using the Cochran formula for an infinite population, $n = Z^2pq/e^2$, with Z = 1.96 (95% confidence level), an anticipated PPD prevalence p = 31.8% drawn from a prior Cameroonian study conducted in a remote area of the country [18], and a precision e of 5%, yielding a minimum sample of 334 women. A three-stage sampling procedure was used to reach this target. First, three of the seven health areas (Muea, Molyko, and Buea Road) were purposively selected for logistic feasibility. Second, health facilities offering postnatal/vaccination services within these areas were identified (Buea Regional Hospital and Mount Mary Catholic Hospital in Buea Road; Molyko Integrated Health Centre in Molyko; and the Muea Sub-Divisional Hospital in Muea). Third, the number of participants recruited at each facility was allocated proportionate to its expected postnatal attendance (probability proportionate to size), giving 200 women at Buea Regional Hospital, 50 at Mount Mary Catholic Hospital, 40 at Molyko Integrated Health Centre, and 69 at Muea Sub-Divisional Hospital. Within each facility, consecutive eligible attendees were invited to participate until the facility quota was reached. A total of 359 women were recruited using this procedure. Following data cleaning (see below), 333 questionnaires (92.8% of those recruited) with adequate completeness were retained for the analyses presented here.

Data collection instrument and procedure

Data were collected using a structured, self-administered questionnaire organized into five sections: (i) socio-demographic characteristics; (ii) a 12-item knowledge assessment on PPD, each item scored as correct (1) or incorrect (0), giving a maximum obtainable score of 12; (iii) a 12-item, five-point Likert attitude scale (strongly disagree to strongly agree) covering beliefs and behavioural intentions towards PPD and depressed mothers; (iv) the 10-item Edinburgh Postnatal Depression Scale (EPDS) [30]; and (v) obstetric, child-related, and psychosocial items (including pregnancy complications, antenatal care attendance, mode of delivery, maternal and infant health since delivery, feeding method, family history of mental illness, intimate partner violence, partner support, cigarette smoking, and internal displacement status). The instrument was pretested among 20 postnatal caregivers in the Bokwango health area, after which two items with poor comprehension (frequency of antenatal visits and monthly household income) were removed. Trained research assistants distributed and retrieved questionnaires under the supervision of the principal investigator; data were double-checked daily for completeness and entered into KoboCollect under password protection.

Outcome measurement

Outcome measurement

Postpartum depression. The EPDS is the most widely used screening instrument for perinatal depression and was originally validated by Cox and colleagues [30]. Each of its ten items is scored 0–3 according to a fixed key in which the anchor carrying the greatest symptom severity is not consistently the same response position across items (several items reverse the response order relative to the others), and the ten item scores are summed to a maximum of 30. During data cleaning for this analysis, each EPDS item was re-mapped to its original, validated Cox et al. (1987) severity coding before scores were summed, correcting a scoring-direction inconsistency identified on audit of the field dataset. A total EPDS score ≥ 13 was classified as a positive screen for probable PPD, consistent with the cut-off applied in the source study design; scores < 13 were classified as screen-negative. Because this re-derivation altered several respondents' summed scores and, in turn, the proportion classified as screen-positive, we report the corrected figures throughout this manuscript and flag, in the Discussion, how they compare with the previously circulated (uncorrected) analysis of the same dataset.

Knowledge. Correct responses to the 12 knowledge items were summed (range 0–12; mean 8.48, SD not centrally reported for this composite). Women scoring at or above the sample mean (rounded to 8) were classified as having good knowledge; those below were classified as having poor knowledge.

Attitude. Responses to the 12-item Likert attitude scale were scored on a 0–12 composite; women scoring 6–12 were classified as having a good (positive) attitude towards PPD, and those scoring 0–5 as having a poor (negative) attitude.

Statistical analysis

Data were analysed in IBM SPSS Statistics version 26.0. Categorical variables were summarised as frequencies and percentages, and continuous variables as means and standard deviations. Three binary outcomes were modelled independently: good knowledge (vs poor), good attitude (vs poor), and PPD (EPDS ≥ 13, vs < 13). For each outcome, simple (crude) binary logistic regression was first performed for every candidate socio-demographic, obstetric, and psychosocial variable; variables associated with the outcome at $p < 0.20$ in this bivariate step were carried forward into a multivariable binary logistic regression model for that outcome. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) are reported from the multivariable models, with statistical significance set at $p < 0.05$. Crude odds ratios (COR) with 95% CI are reported for the bivariate step. All available categories of each variable, including non-significant categories, are reported in full to allow transparent comparison with future studies.

Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Buea, with administrative authorization from the Regional Delegation of Public Health for

the South-West Region. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrolment, participant information was coded to preserve confidentiality, and data were stored on a password-protected platform accessible only to the principal investigator.

Results

Of 359 questionnaires administered, 333 (92.8%) met the pre-specified completeness threshold (< 20% missing items) and were retained for analysis; the results below are based on this analytic sample of 333 postnatal women.

Socio-demographic characteristics of participants

The mean age of participants was 27.9 ± 6.4 years. Most women (66.4%) were aged 25–40 years, and Christianity was the dominant religion (88.6%). About half were married (51.7%) and had attained tertiary education (51.1%). Most women (43.8%) were self-employed (Table 1).

Table 1
Socio-demographic characteristics of participants (n = 333)

Variable	Category	n	%
Age group (years)	< 25	96	28.8
	25–40	221	66.4
	41–50	16	4.8
	Total	**333**	**100.0**
Religion	Christian	295	88.6
	Muslim	27	8.1
	Other	11	3.3
	Total	**333**	**100.0**
Marital status	Married	172	51.7
	Single	137	41.1
	Divorced	20	6.0
	Widowed	4	1.2
	Total	**333**	**100.0**
Education	Tertiary	170	51.1
	Secondary	131	39.3
	Primary	19	5.7
	Non-formal	13	3.9
	Total	**333**	**100.0**
Occupation	Self-employed	146	43.8
	Unemployed	112	33.6
	Employed	75	22.5
	Total	**333**	**100.0**

Obstetric characteristics of participants

Most women (78.7%) reported no complication in pregnancy, and 63.4% had at most two children. Most attended antenatal care (88.0%) and delivered vaginally (68.5%). The majority (83.8%) reported their health had been stable since delivery, and 73.3% gave birth to their desired sex of baby. Most babies (88.0%) were reported well since delivery (Table 2).

Table 2
Obstetric characteristics of participants (n = 333)

Variable	Category	n	%
Complication in pregnancy	No	262	78.7
	Yes	71	21.3
	Total	**333**	**100.0**
Number of children	1–2	211	63.4
	3–5	103	30.9
	5–9	19	5.7
	Total	**333**	**100.0**
Attended ANC	Yes	293	88.0
	No	40	12.0
	Total	**333**	**100.0**
Mode of delivery	Vaginal	228	68.5
	Caesarean section	105	31.5
	Total	**333**	**100.0**
Mother's health since delivery	Well	279	83.8
	Ill/unwell	54	16.2
	Total	333	100.0
Gave birth to desired sex	Yes	244	73.3
	No	89	26.7
	Total	**333**	**100.0**
Baby's weight (kg)	3–4	235	70.6
	1–2	84	25.2
	5	14	4.2
	Total	**333**	**100.0**
Baby's health since delivery	Well	293	88.0
	Unwell	40	12.0
	Total	**333**	**100.0**

Psychosocial characteristics of participants

Most women (74.5%) reported no family history of mental illness, and 74.2% reported no partner violence. Most had supportive partners (72.4%) and were non-smokers (86.5%). About 67.9% were not internally displaced, and 64.3% reported being assisted with caring for the baby (Table 3).

Table 3
Psychosocial characteristics of participants (n = 333)

Variable	**Category**	**n**	**%**
Feeding method	Exclusive breastfeeding	162	48.6
	Mixed feeding	146	43.8
	Formula feeding	25	7.5
	Total	**333**	**100.0**
Family history of mental illness	No	248	74.5
	Yes	85	25.5
	Total	**333**	**100.0**
Partner violence	No	247	74.2
	Yes	86	25.8
	Total	**333**	**100.0**
Help with baby care	Present	214	64.3
	Absent	119	35.7
	Total	333	100.0
Supportive partner	Yes	241	72.4
	No	92	27.6
	Total	**333**	**100.0**
Cigarette smoker	No	288	86.5
	Yes	45	13.5
	Total	**333**	**100.0**
Internally displaced	No	226	67.9
	Yes	107	32.1
	Total	**333**	**100.0**

Knowledge of women on postpartum depression

Most women (83.8%) had heard of PPD, and 76.3% agreed it was a health problem. About 70.6% correctly recognized that an evil spirit is not a cause of PPD, while 58.0% still incorrectly believed PPD is a weakness of character, the largest single knowledge gap identified. Most women correctly recognized the listed risk factors, with 79.6% each identifying stressful life events as a risk factor and correctly stating that PPD can be treated when detected (Table 4).

Table 4
Knowledge of women on postpartum depression (n = 333)

Item	Response	n	%
Heard of postpartum depression	Yes	279	83.8
	No	54	16.2
PPD is a health problem	Yes	254	76.3
	No	79	23.7
PPD is a mood disorder	Yes	259	77.8
	No	74	22.2
Evil spirit causes PPD	Yes	98	29.4
	No	235	70.6
PPD is a weakness of character	Yes	193	58.0
	No	140	42.0
Age is a risk factor for PPD	Yes	203	61.0
	No	130	39.0
Family history of PPD is a risk factor	Yes	217	65.2
	No	116	34.8
Unemployment is a risk factor for PPD	Yes	241	72.4
	No	92	27.6
Stressful life events are a risk factor for PPD	Yes	265	79.6
	No	68	20.4
Poor marital relationships are a risk factor for PPD	Yes	254	76.3
	No	79	23.7
Caesarean birth is a risk factor for PPD	Yes	212	63.7
	No	121	36.3
PPD can be treated when detected	Yes	265	79.6
	No	68	20.4

Overall knowledge of women on postpartum depression

The mean knowledge score was 8.48 out of a maximum of 12. Using the sample mean (rounded to 8) as the cut-off, 234 women (70.3%) were classified as having good knowledge of PPD and 99 (29.7%) as

having poor knowledge (Fig. 1).

Determinants of knowledge of postpartum depression

At the bivariate level, religion, marriage type, education, and occupation were associated with knowledge at $p < 0.20$ and were carried forward into the multivariable model (Table 5). After adjustment, only religion remained an independent correlate: women who identified as Muslim had significantly lower odds of good knowledge than Christian women (AOR = 0.39, 95% CI 0.16–0.92, p = 0.032). The crude association between tertiary education and good knowledge (COR = 3.34, 95% CI 1.07–10.48, p = 0.039) was attenuated after adjustment (AOR = 2.44, 95% CI 0.72–8.31, p = 0.154) (Table 6).

Table 5
Factors associated with knowledge of postpartum depression: bivariate analysis

Variable	Category	COR	Lower	Upper	p-value
Age group (years)	41–50	0.65	0.23	1.86	0.423
	< 25	0.82	0.49	1.37	0.447
	25–40	1			
Religion	Muslim	0.29	0.13	0.65	0.003
	Other	0.44	0.13	1.48	0.184
	Christian	1			
Marital status	Married	0.80	0.29	2.19	0.664
	Single	1.47	0.52	4.13	0.470
	Widowed	0.43	0.05	3.79	0.446
	Divorced	1			
Marriage type	Not applicable	1.47	0.87	2.48	0.150
	Polygamy	0.65	0.33	1.28	0.211
	Monogamy	1			
Education	Primary	2.53	0.59	10.86	0.212
	Secondary	2.47	0.78	7.81	0.123
	Tertiary	3.34	1.07	10.48	0.039
	Non-formal	1			
Occupation	Self-employed	0.90	0.48	1.70	0.743
	Unemployed	0.61	0.32	1.17	0.136
	Employed	1			

Table 6
Factors associated with knowledge of postpartum depression: multivariable analysis

Variable	Category	AOR	Lower	Upper	p-value
Religion	Muslim	0.39	0.16	0.92	0.032
	Other	0.43	0.12	1.54	0.195
	Christian	1			
Marriage type	Not applicable	1.61	0.92	2.84	0.098
	Polygamy	0.74	0.36	1.50	0.403
	Monogamy	1			
Education	Primary	2.67	0.58	12.39	0.209
	Secondary	1.93	0.57	6.51	0.289
	Tertiary	2.44	0.72	8.31	0.154
	Non-formal	1			
Occupation	Self-employed	0.92	0.47	1.80	0.802
	Unemployed	0.63	0.30	1.31	0.218
	Employed	1			

Attitude of women towards postpartum depression

A minority of women strongly agreed that PPD is a sign of personal weakness (33.6%) or that all postnatal mothers are at risk of PPD (25.8% strongly agree, 32.7% agree). About a quarter (24.6%) agreed that possession by an evil spirit can lead to PPD, and 36.9% agreed that depressed mothers are unpredictable. Encouragingly, help-seeking intentions were relatively strong: 40.5% strongly agreed and 29.1% agreed that they would advise a depressed mother to see a doctor, and 41.4% strongly agreed they would see a doctor themselves if depressed (Table 7).

Table 7
Attitude of women towards postpartum depression (n = 333, % per row)

Item	SD %	D %	N %	A %	SA %
PPD is a sign of personal weakness	15.0	6.9	14.7	29.7	33.6
All postnatal mothers are at risk of PPD	13.5	7.8	20.1	32.7	25.8
Possession by an evil spirit can cause PPD	25.8	7.2	21.9	24.6	20.4
Depressed mothers are unpredictable	11.1	5.4	25.2	36.9	21.3
It is dangerous to live with depressed mothers	18.3	7.5	29.1	27.6	17.4
I will avoid a depressed mother	30.0	11.7	22.5	20.1	15.6
Being close to a depressed mother will make me depressed	31.5	7.2	19.8	24.3	17.1
I will employ a mother who had been depressed	15.6	8.1	24.9	33.0	18.3
I will vote a previously depressed mother into public office	14.4	6.3	26.7	35.4	17.1
I will advise a depressed mother to see a doctor	10.5	6.0	13.8	29.1	40.5
I am at risk of developing PPD	25.2	7.5	21.0	30.3	15.9
I will see a doctor if I happen to be depressed	8.1	6.3	12.6	31.5	41.4

SD = Strongly disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly agree.

Overall attitude of women towards postpartum depression

Overall, 173 women (52.0%) had a good attitude towards PPD and 160 (48.0%) had a poor attitude (Fig. 2).

Determinants of attitude towards postpartum depression

At the bivariate level, religion, marriage type, and education were associated with attitude at $p < 0.20$ and were carried forward into the multivariable model (Table 8). Notably, women with only primary education had substantially lower odds of a good attitude relative to those with no formal education (COR = 0.12, 95% CI 0.02–0.62, p = 0.012), a pattern that persisted after adjustment (AOR = 0.09, 95% CI 0.02–0.52, p = 0.007); secondary and tertiary education showed no such effect, a non-monotonic pattern that most plausibly reflects the small primary-education subgroup (n = 19) rather than a genuine dose-response relationship. No other variable reached statistical significance in the adjusted model (Table 9).

Table 8
Factors associated with attitude towards postpartum depression: bivariate analysis

Variable	Category	COR	Lower	Upper	p-value
Age group (years)	41–50	0.91	0.33	2.50	0.847
	< 25	0.94	0.58	1.52	0.813
	25–40	1			
Religion	Muslim	0.74	0.34	1.64	0.462
	Other	2.48	0.64	9.51	0.187
	Christian	1			
Marital status	Married	1.34	0.53	3.40	0.536
	Single	1.39	0.54	3.58	0.490
	Widowed	0.41	0.04	4.62	0.469
	Divorced	1			
Marriage type	Not applicable	0.85	0.53	1.36	0.485
	Polygamy	0.62	0.32	1.21	0.163
	Monogamy	1			
Education	Primary	0.12	0.02	0.62	0.012
	Secondary	0.79	0.24	2.53	0.687
	Tertiary	0.69	0.22	2.18	0.524
	Non-formal	1			
Occupation	Self-employed	0.87	0.50	1.53	0.635
	Unemployed	1.19	0.66	2.14	0.567
	Employed	1			

Table 9
Factors associated with attitude towards postpartum depression: multivariable analysis

Variable	Category	AOR	Lower	Upper	p-value
Religion	Muslim	0.95	0.39	2.30	0.912
	Other	4.69	0.92	23.85	0.062
	Christian	1			
Marriage type	Not applicable	0.87	0.53	1.43	0.590
	Polygamy	0.67	0.34	1.32	0.242
	Monogamy	1			
Education	Primary	0.09	0.02	0.52	0.007
	Secondary	0.81	0.24	2.72	0.732
	Tertiary	0.71	0.21	2.36	0.575
	Non-formal	1			

Edinburgh Postnatal Depression Scale profile

On the EPDS, 47.7% of women reported being able to laugh and see the funny side of things as much as always, while 38.4% reported looking forward to things rather less than they used to. About 38.1% had blamed themselves unnecessarily some of the time, 42.0% had felt anxious or worried for no good reason sometimes, and 37.8% had felt scared or panicky for no good reason sometimes (Table 10a). Further, 41.1% reported that things had been getting on top of them sometimes, and 36.0% had experienced difficulty sleeping sometimes because of unhappiness. Most reassuringly, half of the women (50.8%) reported that the thought of harming themselves had hardly occurred to them, although 34.5% reported this thought occurring sometimes and 14.7% quite often (Table 10b). The mean total EPDS score in the analytic sample was 11.45 out of 30.

Table 10
a. Edinburgh Postnatal Depression Scale item responses (n = 333)

Item	Response	n	%
Able to laugh and see the funny side of things	As much as always	159	47.7
	Not quite so much now	87	26.1
	Definitely not so much now	50	15.0
	Not at all	37	11.1
Looked forward with enjoyment to things	As much as I ever did	97	29.1
	Rather less than I used to	128	38.4
	Definitely less than I used to	80	24.0
	Hardly at all	28	8.4
Blamed myself unnecessarily when things went wrong	No, never	29	8.7
	Not very often	81	24.3
	Yes, some of the time	127	38.1
	Yes, most of the time	96	28.8
Anxious or worried for no good reason	No, not at all	90	27.0
	Hardly ever	103	30.9
	Yes, sometimes	140	42.0
Felt scared or panicky for no very good reason	No, not at all	40	12.0
	No, not much	80	24.0
	Yes, sometimes	126	37.8
	Yes, quite a lot	87	26.1

Table 10
b. Edinburgh Postnatal Depression Scale item responses (n = 333, continued)

Item	Response	n	%
Things have been getting on top of me	No, coping as well as ever	40	12.0
	No, coped quite well most of the time	70	21.0
	Yes, sometimes not coping as well as usual	137	41.1
	Yes, most of the time unable to cope	86	25.8
So unhappy I have had difficulty sleeping	No, not at all	53	15.9
	Not very often	74	22.2
	Yes, sometimes	120	36.0
	Yes, most of the time	86	25.8
Felt sad or miserable	No, not at all	52	15.6
	Not very often	130	39.0
	Yes, quite often	75	22.5
	Yes, most of the time	76	22.8
So unhappy I have been crying	No, never	42	12.6
	Only occasionally	104	31.2
	Yes, quite often	116	34.8
	Yes, most of the time	71	21.3
The thought of harming myself has occurred to me	Hardly ever	169	50.8
	Sometimes	115	34.5
	Yes, quite often	49	14.7

Prevalence of postpartum depression

Of the 333 women in the final analytic sample, 126 (37.8%) had an EPDS score ≥ 13 and were classified as screening positive for probable postpartum depression; 207 (62.2%) screened negative (Fig. 3).

Factors associated with postpartum depression: bivariate analysis

At the bivariate level, no single variable reached conventional statistical significance ($p < 0.05$) for association with PPD; however, seven variables met the $p < 0.20$ threshold for entry into the multivariable model: education (secondary category), complication in pregnancy, antenatal care attendance, mode of delivery, mother's health since delivery, partner support, and knowledge (Table 11).

Table 11
Factors associated with postpartum depression: bivariate analysis

Variable	Category	COR	Lower	Upper	p-value
Age group (years)	41–50	2.06	0.74	5.73	0.167
	< 25	0.80	0.48	1.32	0.385
	25–40	1			
Religion	Muslim	1.37	0.62	3.02	0.443
	Other	1.42	0.42	4.77	0.569
	Christian	1			
Education	Primary	0.40	0.09	1.76	0.226
	Secondary	0.20	0.06	0.67	0.010
	Tertiary	0.30	0.09	1.00	0.050
	Non-formal	1			
Occupation	Self-employed	1.04	0.59	1.86	0.885
	Unemployed	1.19	0.65	2.19	0.565
	Employed	1			
Complication in pregnancy	Yes	0.58	0.33	1.02	0.060
	No	1			
Attended ANC	Yes	0.57	0.29	1.10	0.094
	No	1			
Mode of delivery	Vaginal	0.69	0.43	1.11	0.128
	Caesarean section	1			
Mother's health since delivery	Well	1.55	0.82	2.91	0.176
	Ill/unwell	1			
Baby's health since birth	Well	1.15	0.58	2.29	0.693
	Unwell	1			
Family history of mental illness	Yes	1.21	0.73	2.00	0.462
	No	1			
Partner violence	Yes	1.26	0.76	2.07	0.372
	No	1			

Variable	Category	COR	Lower	Upper	p-value
Partner supportive	Yes	0.68	0.42	1.11	0.119
	No	1			
Cigarette smoker	Yes	1.24	0.65	2.34	0.515
	No	1			
Internally displaced	Yes	1.16	0.72	1.86	0.543
	No	1			
Attitude	Poor	0.79	0.51	1.24	0.305
	Good	1			
Knowledge	Poor	1.40	0.87	2.26	0.172
	Good	1			

Factors associated with postpartum depression: multivariable analysis

In the multivariable model, only secondary-level education remained independently associated with PPD: women with secondary education had significantly lower odds of PPD than women with no formal education (AOR = 0.25, 95% CI 0.07–0.89, p = 0.033). Neither primary nor tertiary education reached statistical significance relative to no formal education (Table 12). Complication in pregnancy (p = 0.091), antenatal care attendance (p = 0.186), and mode of delivery (p = 0.094) all showed adjusted odds ratios below 1 (i.e., trends toward a protective association for having no complication, attending ANC, and delivering vaginally) but did not reach the $p < 0.05$ threshold after adjustment. Mother's health since delivery, partner support, and knowledge were similarly attenuated to non-significance in the adjusted model.

Table 12
Factors associated with postpartum depression: multivariable analysis

Variable	Category	AOR	Lower	Upper	p-value
Age group (years)	25–40	1.26	0.73	2.17	0.403
	41–50	2.14	0.68	6.69	0.191
	< 25	1			
Education	Primary	0.49	0.11	2.29	0.364
	Secondary	0.25	0.07	0.89	0.033
	Tertiary	0.38	0.11	1.35	0.134
	Non-formal	1			
Complication in pregnancy	Yes	0.59	0.31	1.09	0.091
	No	1			
Attended ANC	Yes	0.61	0.30	1.27	0.186
	No	1			
Mode of delivery	Vaginal	0.65	0.39	1.08	0.094
	Caesarean section	1			
Mother's health since delivery	Well	1.67	0.85	3.30	0.137
	Ill/unwell	1			
Partner supportive	Yes	0.79	0.47	1.34	0.383
	No	1			
Knowledge	Poor	1.21	0.71	2.04	0.482
	Good	1			

Bold p-values in Tables 11 and 12 *indicate statistical significance at p < 0.05.*

Discussion

Prevalence of postpartum depression

This study documented a PPD prevalence of 37.8% among postnatal women in the Buea Health District. This figure sits within, but towards the upper end of, the range reported across sub-Saharan Africa, and is comparable to estimates from Nigeria (37.7%) and higher than those from south-western Uganda (27.1%), rural Ethiopia (9.3%), and rural Morocco (6.9%) [12, 14, 15, 16]. It is, however, lower than earlier

Cameroonian hospital- and community-based estimates from Buea itself (53.3%), the neighbouring Limbe Health District (61.8%), and teenage mothers in Yaoundé (70.0%) [19, 20, 21], and higher than the 23.4% reported among postnatal women in Yaoundé in 2015 and the 31.8% reported in a remote area of the country [17, 18].

An important methodological point deserves emphasis. During data cleaning for this analysis, we identified that several EPDS items in the source dataset had been coded in a direction inconsistent with the validated Cox et al. scoring key, meaning that the severity weight attached to some response options did not match the original instrument. Re-deriving each participant's score against the correct item-level key increased the proportion of women crossing the ≥ 13 threshold from a previously reported 27.3% to the corrected 37.8% presented here. We flag this transparently for two reasons. First, it materially changes the public health message: rather than roughly one in four, closer to two in five postnatal women in this district may be experiencing clinically significant depressive symptoms, a considerably larger burden requiring a correspondingly larger service response. Second, it is a caution to the wider field, self- or field-scored EPDS data collected on electronic platforms such as KoboCollect are only as reliable as the item-level coding built into the form, and studies using similar tools should routinely audit their scoring logic against the original instrument before reporting prevalence, particularly where reversed or non-uniform response anchors are used across items, as in the EPDS.

The comparatively high burden observed here may partly reflect the socio-political context of the study setting. The Buea Health District has, in recent years, absorbed a substantial number of internally displaced persons fleeing conflict-affected areas of the North-West and South-West regions, with associated loss of livelihoods, housing insecurity, and disrupted social support networks for many households [24, 25, 29]. Although internal displacement status was not an independent correlate of PPD after adjustment in this analysis, roughly a third of participants (32.1%) were internally displaced, and the broader economic strain associated with population displacement in the district may plausibly elevate background psychosocial stress across the sampled population as a whole, even where it does not emerge as a distinguishing factor between individual depressed and non-depressed women. A high, under-recognized burden of PPD of this magnitude carries the known downstream risks of impaired mother-infant bonding, disrupted breastfeeding, and, in severe cases, maternal self-harm [4, 5, 6], reinforcing the case for integrating routine postnatal depression screening into vaccination and postnatal clinic visits, where the great majority of postpartum women in this study were in any case already presenting.

Knowledge of postnatal women on postpartum depression

Overall, 70.3% of women demonstrated good knowledge of PPD. This is considerably higher than the poor knowledge levels reported among postnatal women in south-western Nigeria [22], but lower than the very high knowledge (over 90%) documented among nurses and midwives in Ghana, whose professional training would be expected to confer an advantage over a general postnatal population [23]. The knowledge level found here is broadly consistent with figures reported among community samples

in parts of South-East Asia. Encouragingly, most women in this sample correctly identified PPD as a genuine health and mood disorder rather than a spiritual affliction, and correctly recognized several established risk factors (stressful life events, poor marital relationships, unemployment); the principal remaining knowledge gap was the persistent misclassification of PPD as a weakness of character by more than half of respondents (58.0%), a belief that plausibly reinforces stigma and under-disclosure regardless of otherwise adequate factual knowledge.

In the adjusted model, religion was the only variable independently associated with knowledge: Muslim women had significantly lower odds of good knowledge than Christian women (AOR = 0.39, 95% CI 0.16–0.92, p = 0.032), a religious-minority gap that persisted despite Christianity being the overwhelmingly dominant religion among participants (88.6%). Several explanations are plausible. Maternal and child health messaging, antenatal counselling materials, and informal community health communication in this setting are likely to be delivered predominantly through channels and social networks aligned with the majority Christian population, potentially leaving religious-minority women comparatively under-exposed to PPD-specific health education. This subgroup was relatively small (27 Muslim participants), so the estimate should be interpreted with appropriate caution and confirmed in larger, purpose-designed samples; nonetheless, the consistency of the association across the bivariate (COR = 0.29, p = 0.003) and adjusted (AOR = 0.39, p = 0.032) models suggests it is unlikely to be a chance finding, and supports culturally tailored outreach for religious-minority communities within routine MCH programming. The crude association between tertiary education and knowledge, although statistically significant on its own (COR = 3.34, p = 0.039), did not survive adjustment for religion and other socio-demographic variables, suggesting some confounding between education and religion in this sample rather than education acting as a fully independent driver of knowledge.

Attitude of postnatal women towards postpartum depression

Just over half of women (52.0%) held a good attitude towards PPD, closely replicating an earlier estimate from this same setting (51.3%) and considerably more favourable than the 11.0% good attitude reported among postnatal women in Nigeria [22]. Reassuringly, help-seeking intentions were among the most favourable items on the scale, with the large majority of women agreeing or strongly agreeing that they would advise a depressed mother, or themselves, to see a doctor. However, that just under half of women held a poor overall attitude, including sizeable minorities endorsing avoidance of, or fear of 'catching' depression from, an affected mother, indicates persisting stigma that could still discourage disclosure and timely care-seeking even where factual knowledge is adequate.

Notably, no socio-demographic variable was independently associated with attitude after adjustment, with one partial exception: women with only primary-level education had markedly lower odds of a good attitude than women with no formal education at all (AOR = 0.09, 95% CI 0.02–0.52, p = 0.007), while secondary and tertiary education showed no comparable effect. This non-monotonic, U-shaped pattern across the education gradient is difficult to interpret substantively and most plausibly reflects the small

size of the primary-education subgroup (n = 19) combined with unmeasured confounding, rather than a genuine causal effect of partial schooling on attitude; it should not be over-interpreted, and we recommend it be treated as hypothesis-generating rather than confirmatory. That attitude was otherwise unexplained by the socio-demographic variables measured here suggests that personal experience, such as prior contact with a depressed relative or friend, exposure to health messaging, or individual psychological disposition, rather than broad demographic profile, may be the more proximate driver of attitude in this population, a hypothesis that qualitative or mixed-methods follow-up work could usefully test.

Factors associated with postpartum depression

In the fully adjusted model, secondary-level education was the only variable independently associated with PPD, conferring substantially lower odds relative to no formal education (AOR = 0.25, 95% CI 0.07–0.89, p = 0.033). This is broadly consistent with the wider literature linking low educational attainment to elevated PPD risk, plausibly operating through pathways of health literacy, economic opportunity, and capacity to access and act on maternal health information [8, 13, 26]. The absence of a comparable protective effect for tertiary education relative to no formal education (AOR = 0.38, 95% CI 0.11–1.35, p = 0.134) is noteworthy; one plausible explanation is that tertiary-educated women in this urban Buea sample were also more likely to be in formal employment and to have delivered by caesarean section, both of which carry their own, partially offsetting, risk profiles for PPD, diluting any net educational advantage. Given the wide confidence intervals around both the primary- and tertiary-education estimates, this pattern warrants replication in a larger sample before firm conclusions are drawn about the shape of the education-PPD relationship.

Several variables that reached bivariate significance or approached it, caesarean delivery, non-attendance at antenatal care, and pregnancy complications, were attenuated to non-significance after adjustment, although all retained adjusted odds ratios in the expected direction (AOR 0.59–0.65, p = 0.091–0.094). This pattern is consistent with a body of prior work, including studies conducted in Cameroon and neighbouring countries, that has identified caesarean section as a risk factor for PPD, plausibly reflecting the physical recovery burden, perceived loss of a ‘natural’ birth experience, and reduced early mobility and infant contact associated with surgical delivery [17,27,31]. That these associations did not reach significance in our adjusted model, in contrast to earlier work from this same district that identified caesarean delivery as a significant independent predictor, illustrates how sensitive risk-factor conclusions can be to sample composition, model specification, and, as discussed above, correct outcome-scale coding; we present our adjusted estimates for these variables transparently, as suggestive rather than confirmed associations meriting testing in a larger, adequately powered sample.

Contrary to our a priori hypothesis and to some earlier regional evidence, intimate partner violence and internal displacement status were not independently associated with PPD in this corrected analysis (partner violence: AOR not retained beyond bivariate p = 0.372; internal displacement: bivariate p = 0.543), despite both being biologically and psychosocially plausible risk factors and despite their documented associations with depression in other African and Cameroonian settings [17, 25]. Under-

disclosure of intimate partner violence on a self-administered questionnaire, particularly where a woman's partner or household members were nearby during data collection, is a well-recognized source of non-differential misclassification that would tend to bias any true association towards the null, and may partly explain this null finding rather than indicating a genuine absence of effect. We recommend that future studies in this setting collect partner violence data using private, interviewer-administered methods with established safeguarding protocols, which typically yield higher and more valid disclosure rates than self-administered instruments.

Strengths and limitations

This study's strengths include a sample size exceeding the calculated minimum, a multistage sampling procedure incorporating probability-proportionate-to-size allocation across facilities, the use of a validated screening instrument with a corrected, auditable scoring protocol, and separate multivariable modelling of three distinct outcomes (knowledge, attitude, and PPD) rather than a single composite analysis.

Several limitations should be considered when interpreting these findings. First, the cross-sectional design precludes any causal inference; associations identified, including the education-PPD relationship, describe correlation at a single postpartum time point only. Second, recruitment through vaccination/postnatal clinics means the sample reflects women who returned for facility-based postnatal care; women who delivered at home, did not attend follow-up visits, or were most severely affected by depression (and therefore least likely to attend routine appointments) may be under-represented, which could bias prevalence in either direction. Third, self-administration of sensitive items, particularly intimate partner violence, smoking, and psychosocial adversity, is susceptible to social desirability and recall bias, likely leading to underestimation of these exposures. Fourth, several subgroup analyses (for example, women with primary-only education, or of minority religious affiliation) involved small cell counts and correspondingly wide confidence intervals, limiting the precision and generalizability of those specific estimates. Finally, although we have corrected and audited the EPDS scoring for this analysis, the instrument was not validated against a structured clinical diagnostic interview in this population, so the 37.8% figure should be interpreted as the prevalence of a positive depression screen rather than a confirmed clinical diagnosis.

Conclusion

More than one in three postnatal women attending postnatal and vaccination clinics in the Buea Health District screened positive for probable postpartum depression, a higher burden than several previously reported regional estimates and one that was substantially under-stated in an earlier, uncorrected scoring of the same dataset. Knowledge of PPD was comparatively good, but nearly half of women still held an unfavourable attitude towards the condition, and religious-minority women were independently disadvantaged in knowledge. After adjustment, educational attainment, rather than obstetric complications, partner violence, or displacement status, emerged as the principal independent correlate of both PPD and knowledge, while caesarean delivery, non-attendance at antenatal care, and pregnancy

complications showed persistent, though not statistically significant, trends towards association that merit confirmation in larger studies. These findings support integrating routine, correctly-scored EPDS screening into postnatal and vaccination clinic visits in this and comparable districts, coupled with psychoeducation and stigma-reduction activities targeted at women with limited formal education and religious-minority communities, as a feasible entry point for closing the maternal mental health detection gap.

Recommendations

1. Health facilities in the Buea Health District should integrate routine EPDS-based screening for postpartum depression into postnatal and infant vaccination visits, using a scoring protocol that has been audited against the validated instrument.
2. Psychoeducation and stigma-reduction interventions addressing the specific misconception that PPD reflects personal weakness should be prioritized, given that this belief persisted among more than half of an otherwise reasonably well-informed sample.
3. Culturally tailored maternal mental health outreach should be extended to religious-minority communities, who showed significantly lower odds of good knowledge in this study.
4. Women with lower educational attainment should be prioritized for targeted psychosocial support and follow-up, given their consistently elevated odds of PPD across the analyses presented here.
5. Future studies should collect intimate partner violence data through private, interviewer-administered approaches with appropriate safeguarding protocols to reduce under-disclosure, and should consider community-based sampling to capture women who do not return for facility-based postnatal follow-up.

Declarations

Ethical clearance was obtained from the Institutional Review Board (IRB) of the Faculty of Health Sciences (FHS), University of Buea, administrative authorization from the Regional Delegation of Public Health for the SWR, approvals from chiefs of the different health areas, quarter heads, principals of the selected schools, consent and assent obtained for data collection. All procedures were conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to data collection.

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Data Management

To ensure data quality and accuracy, questionnaires with 20% or above missing information were discarded. Those below 20% were coded as “Missing” and analysed. To ensure confidentiality, all participants’ information were coded and questionnaires checked on daily basis to ensure correct entry of information. Data was entered in to Microsoft excel and secured by a password known only to the principal investigator and saved into Google drive and external flash.

Collaborative group

Publish & Thrive Network

Authors' contributions

BMN conceived and designed the study, collected and analyzed the data, and drafted the manuscript. S.N, M.T.A, JNP, S.F.N and ETO supervised the study design, data analysis, and manuscript preparation, and critically revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

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Data availability

The datasets generated and analyzed in this study are not publicly available due to institutional regulations but can be obtained from the corresponding author upon reasonable request. All data access requests will be subject to review by the Ethics Committee of the Cameroonian Ministry of and the Regional Ethics Committee for Human Health Research for the South west Region, Institutional Review Board of the Faculty of Health Science, University of Buea, to ensure adherence to ethical and legal requirement.

Competing interest

The authors declare no competing interests.

Clinical trial number

Not applicable.

Consent for publication

Not applicable.

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Figures

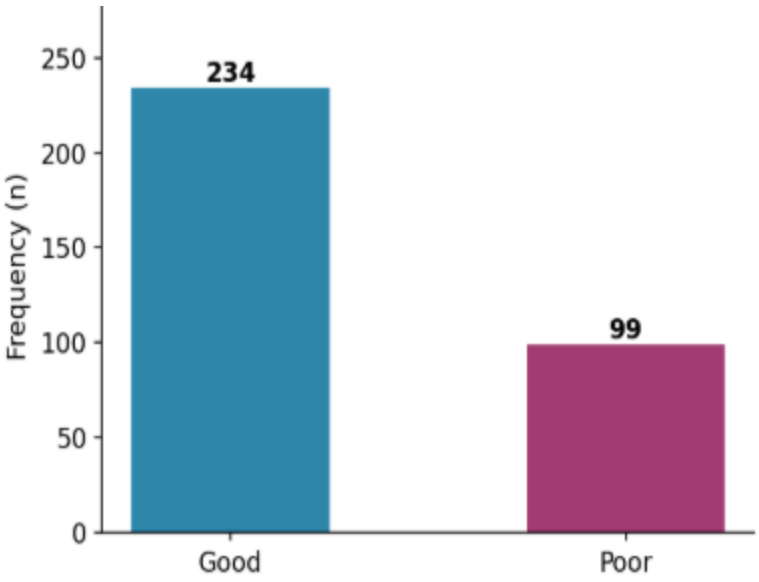


Figure 1

Overall knowledge of participants on postpartum depression

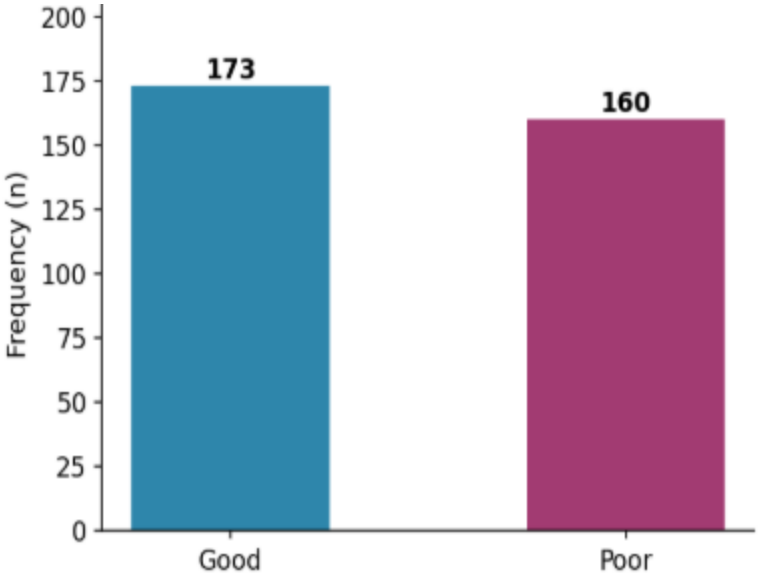


Figure 2

Overall attitude of women towards postpartum depression

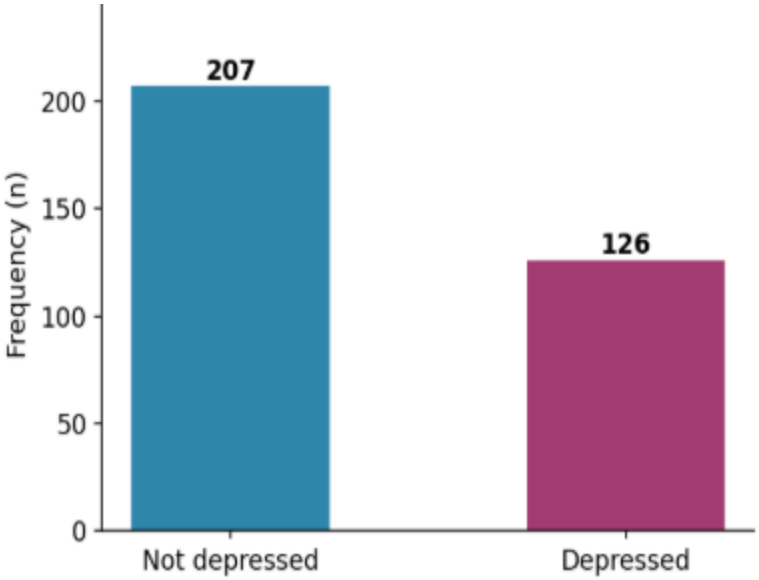


Figure 3

Prevalence of postpartum depression among postnatal women (EPDS ≥13)