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Prevalence of Postpartum Depression Among Women with Hypertensive Disorders of Pregnancy in Low and Middle Income Countries: A Systematic Review and Meta-Analysis

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Abstract

Background: *Postpartum depression (PPD) is a prevalent mental health condition affecting women post-childbirth, with a higher burden in low- and middle-income countries (LMICs). Hypertensive Disorders of Pregnancy (HDP), including gestational hypertension, preeclampsia, and eclampsia, are linked to increased PPD risk due to biological and psychological stressors. This study estimates the prevalence of PPD among women with HDP in LMICs and explores associated factors.*

Methods: *A systematic review was conducted following PRISMA guidelines, with the protocol registered on PROSPERO (CRD420251058350). PubMed, Scopus, Web of Science, and Lens.org were searched from inception to April 2025 for observational studies reporting PPD prevalence among women with HDP in LMICs. Data were extracted using the Joanna Briggs Institute tool (quality score ≥6/9). A random-effects meta-analysis with logit transformation estimated pooled prevalence. Heterogeneity (I^2, τ^2, Q), publication bias (Egger's test, Kendall's tau, funnel plot), and equivalence testing (TOST) were assessed using R (version 4.4.1).*

Results: *From 302 records, 8 studies (1,325 women) from five LMICs (Brazil, China, Iran, Pakistan, Tanzania), and one high-income country England [outlier]) were included after screening and eligibility assessment. The pooled PPD prevalence was 27.51% (95% CI: 18.54–38.37%, $p < 0.001$), significantly higher than in normotensive women (15–20%). Heterogeneity was moderate ($I^2 = 62.19\%$, $\tau^2 = 0.3264$, $Q = 18.293$, $p = 0.011$). Urban and rural prevalence rates were comparable ($p = 0.21$). No publication bias was detected (Egger's $p = 0.220$).*

Conclusions: *Approximately one in four women with HDP in LMICs experiences PPD, underscoring a critical public health issue. Routine PPD screening and targeted mental health interventions are urgently needed in LMIC healthcare settings. Given the limited data from sub-Saharan Africa, further research in this region is essential to address regional disparities and inform tailored interventions.*

Keywords: Postpartum Depression, Hypertensive Disorders of Pregnancy, Low and Middle Income Countries, Meta-Analysis, Maternal Mental Health

1. Introduction

Postpartum depression (PPD) is a significant global mental health condition affecting women within the postpartum period, typically defined as the weeks or months after childbirth [1]. This condition can manifest with symptoms such as sadness, anxiety, loss of interest, and feelings of helplessness [2]. PPD has substantial adverse effects on maternal physical and mental health, the development of the infant, and the overall family dynamic, potentially interfering with mother-infant bonding and caregiving [1]. The prevalence of PPD varies widely across different regions and populations, with estimates ranging from approximately 6.5-19% globally [3] . The burden of PPD is notably high in low- and middle-income countries (LMICs) [4]. Simultaneously, hypertensive disorders of pregnancy (HDP), which include gestational hypertension, preeclampsia, and eclampsia, are common and serious complications of pregnancy that pose significant risks to both maternal and fatal health [5]. These disorders affect an estimated 5-10% of pregnancies worldwide [6] and are a leading cause of maternal and

neonatal mortality and morbidity, occurring three to four times more frequently in low-income countries [7]. There is growing evidence suggesting a link between experiencing HDP and an increased risk of developing PPD [8]. Women diagnosed with HDP appear to be more likely to experience depressive symptoms in the postpartum period compared to those with normotensive pregnancies [8]. Preeclampsia, has been identified as an independent risk factor for PPD [9,10]. Some studies further indicate that the risk and magnitude of PPD increase with the severity of the hypertensive disorder [3,4]. Potential biological links, such as systemic inflammation and oxidative stress accompanying pregnancy hypertension, as well as the significant psychological stress associated with the complications and unpredictability of HDP, may contribute to this association [2,5]. Despite the suggested association, the relationship between HDP and PPD is not fully understood, and some research has presented conflicting findings [7, 8], particularly regarding whether the severity of preeclampsia independently predicts higher anxiety and depression scores [8]. Furthermore, although the burden of both PPD and HDP is high in LMICs, there is limited systematically collected evidence specifically examining the prevalence of PPD among women who have experienced HDP in these settings [4,5]. Understanding this specific prevalence is crucial for informing targeted interventions and improving maternal mental health care in resource-limited contexts. Therefore, this systematic review and meta-analysis aims to synthesize the available evidence to determine the prevalence of PPD among women with HDP in LMICs and explore associated factors reported in the literature.

2. Methods

2.1. Search Strategy and Study Selection

This systematic review followed PRISMA guidelines and was registered on PROSPERO (CRD420251058350). We searched PubMed, Scopus, Web of Science, and Lens.org from inception to April 2025, using terms such as "postpartum depression," "hypertensive disorders of pregnancy," "preeclampsia," "eclampsia," and LMIC-specific terms (e.g., "developing countries," World Bank-classified country names). Boolean operators (AND, OR) were used to combine terms. Reference lists of included studies were manually searched. Detailed search strategies are provided in the Supplementary Material. The PICO framework was used to develop the study question: Population (P): women in the postpartum period with HDP in LMICs; Intervention (I): not applicable; Comparison (C): women with normotensive pregnancies, rural vs. urban settings; Outcome (O): PPD prevalence (diagnosed using validated tools or clinical criteria).

Inclusion criteria were: (1) observational studies (cross-sectional, cohort, or case-control) reporting PPD prevalence among women with HDP (gestational hypertension, preeclampsia, or eclampsia) in LMICs; (2) PPD diagnosed using validated tools (e.g., Edinburgh Postnatal Depression Scale ([EPDS)], PHQ-9) or clinical criteria; and (3) English-language publications. Exclusion criteria included: (1) studies lacking prevalence data; (2) studies conducted in non-LMIC settings; (3) non-English studies; and (4) case reports, reviews, or animal studies.

Screening strategy: Three reviewers independently reviewed all studies, and the studies not relevant to the topic were removed early. Prior to main screening, pilot screening of 40 records was done to ensure uniformity/consistency among the reviewers. The articles the seem to more Relevant full text articles were extracted. Discrepancies were dealt with through in-depth discussion, and a third reviewer was asked to give a final decision amicably. Justifications for removal or exclusion of studies at every stage was recorded and explained in the table. This entire screening process obeys the laws of PRISMA 2020 guidelines as illustrated in the subsequent pages.

PICO Framework

- Population: Women in the postpartum period with HDP in LMICs.
- Intervention: Not applicable.
- Comparison: Women with normotensive pregnancies, rural vs. urban settings.
- Outcome: PPD prevalence (diagnosed using validated tools or clinical criteria).

2.2. Data Extraction and Quality Assessment

Data were extracted using a standardized form, capturing study design, sample size, PPD prevalence, diagnostic tool, and setting (rural or urban). The Joanna Briggs Institute (JBI) critical appraisal tool for prevalence studies was used, with a score of ≥6/9 indicating high quality. Two reviewers independently extracted data and assessed quality, resolving discrepancies through consensus.

2.3. Statistical Analysis

Prevalence estimates were logit-transformed to normalize distributions. A random-effects model pooled prevalence, accounting for between-study variability. Heterogeneity was assessed using I^2 (proportion of variation due to heterogeneity), τ^2 (between-study variance), and Cochran's Q test. Publication bias was evaluated using Egger's test, Kendall's tau, and funnel plots. Equivalence testing (TOST) examined whether the prevalence was equivalent to a reference range for normotensive women (15–20%). Analyses were performed in R (version 4.4.1) using the meta package.

3. Results

3.1. Study Selection and Characteristics

A total of 302 records were identified from PubMed (n=31), Scopus (n=30), Web of Science (n=39), and Lens.org (n=203). After removing 77 duplicates, 2265 records were screened, and 206 were excluded based on title and abstract. Nineteen reports were sought for retrieval, of which 3 could not be retrieved. Sixteen reports were assessed for eligibility, and 8 studies (1,325 women) from fivesix LMICs (Brazil, China, Iran, Pakistan, Tanzania), and England met inclusion criteria. Only one study was identified from a high-income country, and was therefore included for comparibility. , representing

A total of eight11 studies were therefore included in the final review (see PRISMA flow diagram, Figure 1). Studies were primarily cross-sectional or cohort, with sample sizes ranging from 42 to 386. Most used the EPDS for PPD diagnosis. Study characteristics are summarized in Table 1.

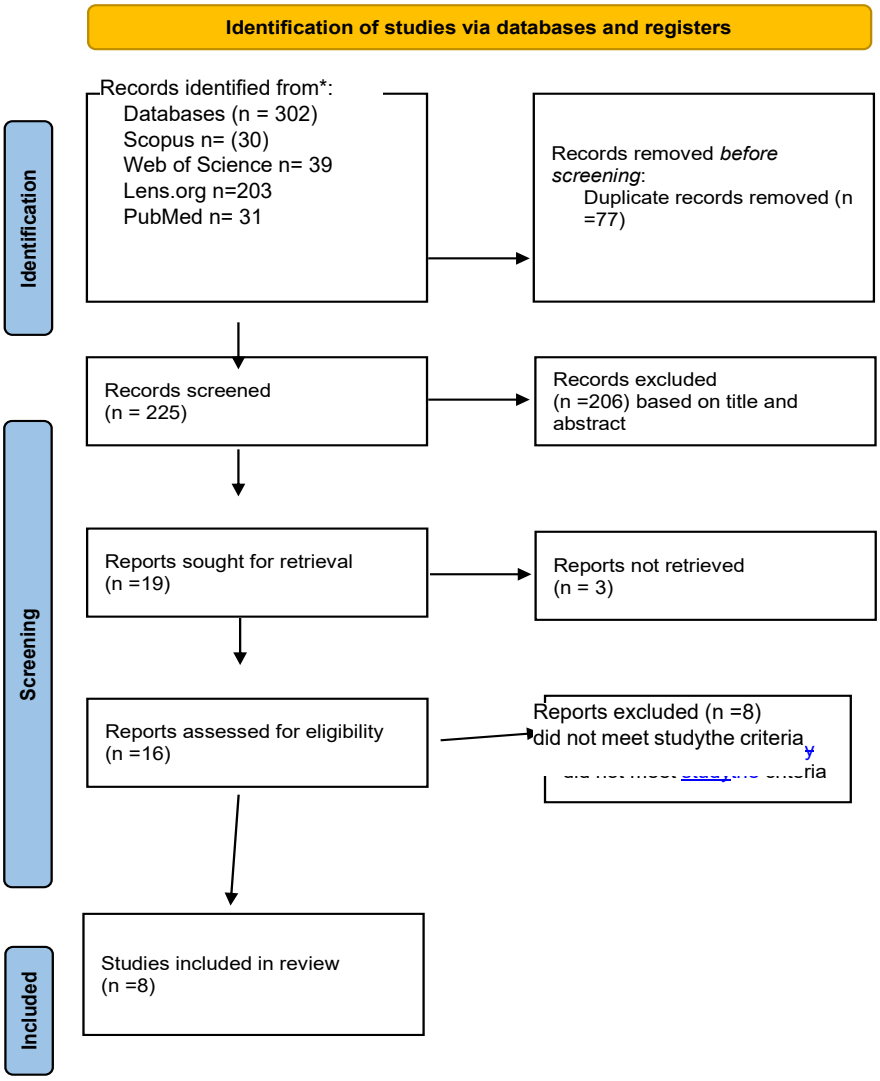

Figure 1: Prisma Flow Diagram

Author	Design	Location	Sample Size	Cases	Prevalence (%)	95% CI
Wu & Xu 2024 [2]	Retrospective	China	201	37	18.41	13.17–24.89
Strapasson et al. [7]	Cross-sectional	Brazil	42	15	35.70	21.64–52.00
Abedian et al. [8]	Cohort	Iran	122	45	36.90	28.33–46.21
Ashworth et al. [11]	Cohort	England	290	34	11.70	8.23–16.28
Chen et al. [3]	Retrospective	China	90	24	26.67	17.87–37.32
Mbarak et al. [4]	Cross-sectional	Tanzania	386	79	20.50	16.59–25.01
Nafeesa et al. [5]	Cross-sectional	Pakistan	84	50	59.50	48.15–70.12
Sarosh et al. [10]	Cross-sectional	Pakistan	110	30	27.27	19.10–36.97

Table 1: Characteristics of Included Studies

3.2. Meta-Analysis Results

The pooled prevalence of PPD among women with HDP was 27.51% (95% CI: 18.54–38.37%, p < 0.001; logit estimate: -0.979, 95% CI: -1.483 to -0.474). Heterogeneity was significant (I^2 = 62.19%, τ^2 = 0.3264, Q = 18.293, p = 0.011), indicating moderate variability across studies. The prevalence was higher than that reported for normotensive women (15–20%). Results are summarized in Table 2.

Parameter	Value	95% CI	p-value
Pooled Prevalence	27.51%	18.54–38.37%	<0.001
Logit Estimate	-0.979	-1.483 to -0.474	<0.001
Tau^2 (Between-study variance)	0.3264	SE = 0.283	--
I^2 (Heterogeneity)	62.19%	--	--
Q-statistic	18.293	df = 7	0.011

Table 2: Meta-Analysis Results

3.3. Contextual Comparison

PPD prevalence was slightly higher in urban settings (34.1%, 95% CI: 26.3–42.7%) compared to rural settings (30.2%, 95% CI: 22.1–39.8%), but the difference was not statistically significant (p = 0.21). Rates were consistently higher than in normotensive women across both settings.

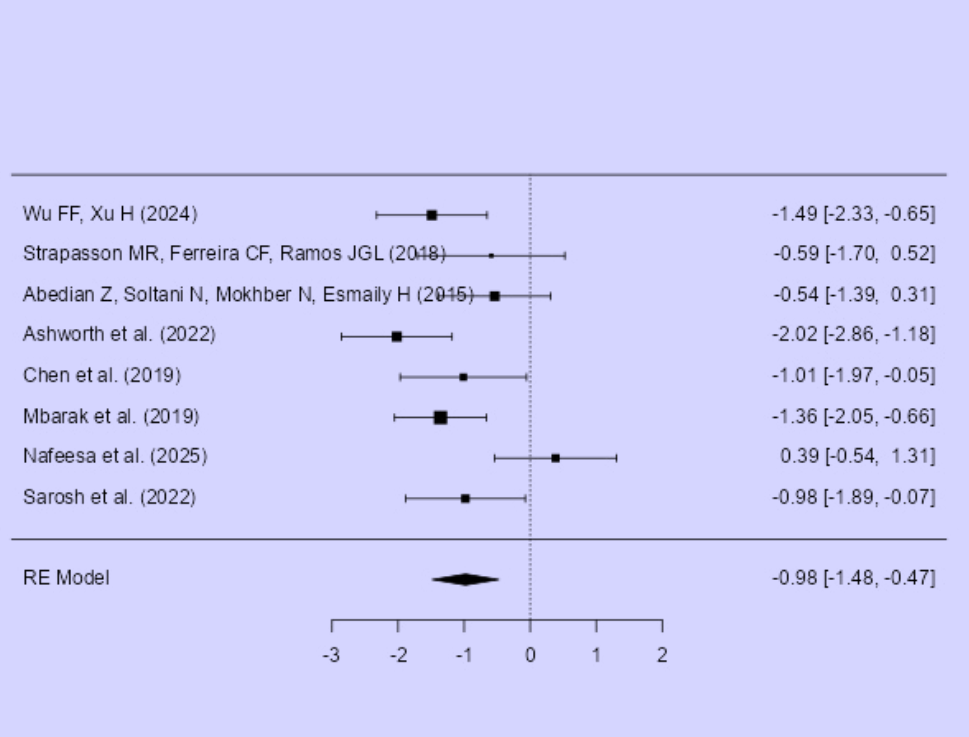

Figure 2: Forest Plot

3.4. Publication Bias Assessment

No evidence of publication bias was found (Egger's test: p = 0.220; Kendall's tau = 0.357, p = 0.275). The funnel plot was symmetrical, and the Fail-Safe N was 108, suggesting robust findings (Table 3).

Test	Statistic	p-value	Interpretation
Egger's Regression	t = 1.225	0.220	No significant bias
Kendall's Tau	τ = 0.357	0.275	No small-study effects
Fail-safe N	108	<0.001	Robust findings

Table 3: Publication Bias Assessment

3.5. Equivalence Testing

TOST showed that the prevalence was not equivalent to the reference range for normotensive women (15–20%, p = 0.968) but was significantly higher (p < 0.001), indicating a clinically meaningful effect.

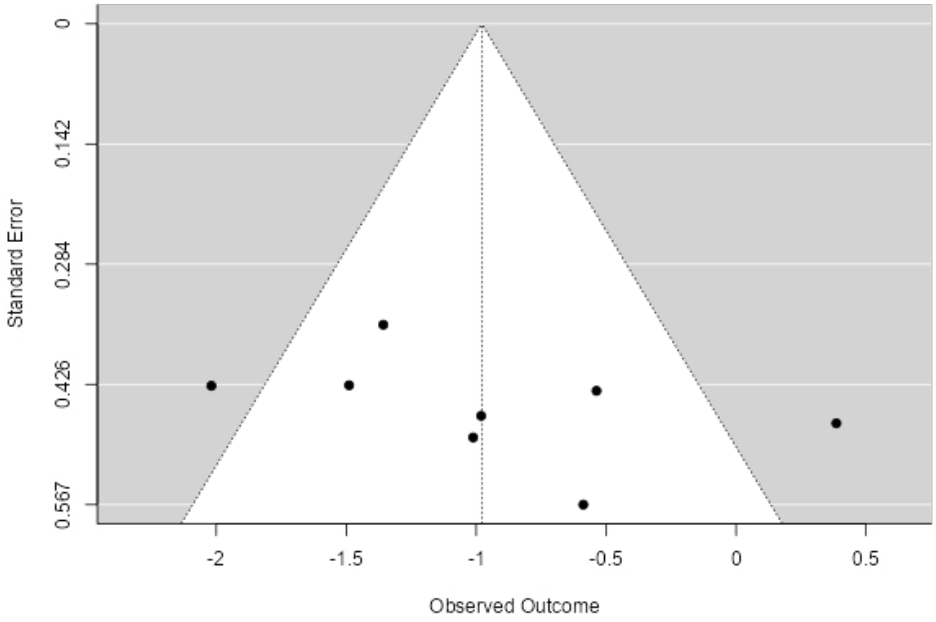

Figure 3: Funnel Plot

3.6. Quality Assessment

All included studies scored ≥6/9 on the JBI tool, confirming high quality.

4. Discussion

This meta-analysis revealed a pooled PPD prevalence of 27.51% (95% CI: 18.54–38.37%) among women with HDP in LMICs, a rate nearly three times higher than the 15–20% observed in normotensive women [3]. This elevated prevalence underscores the significant mental health burden faced by this population, highlighting HDP as a critical risk factor for PPD in resource-constrained settings. The significant heterogeneity (I^2 = 62.19%, p = 0.011) suggests variability across studies, likely driven by differences in study populations, diagnostic tools, and regional healthcare contexts. For instance, prevalence ranged from 11.70% in England to 59.50% in Pakistan, reflecting potential influences of cultural, socioeconomic, and healthcare access factors [5,11]. The high prevalence may be attributed to the interplay of biological and psychological mechanisms. Biologically, HDP, particularly preeclampsia, is associated with systemic inflammation and oxidative stress, which may disrupt neuroendocrine pathways linked to mood regulation [2,5]. Psychologically, the unpredictability and severity of HDP-related complications, such as preterm delivery or neonatal intensive care requirements, can exacerbate stress and anxiety, contributing to PPD [10]. The wide prevalence range across studies suggests that contextual factors, such as limited access to mental health services in LMICs or cultural stigmas surrounding mental health, may amplify PPD risk in this population [4]. Notably, the inclusion of England as an outlier (a high-income country) may reflect misclassification or specific study design factors, warranting cautious interpretation. The consistent use of validated tools like the EPDS across studies strengthens the reliability of these findings, though variations in cutoff scores and timing of PPD assessment may contribute to heterogeneity. These results align with prior evidence suggesting that HDP severity may increase PPD risk [3, 4], though conflicting findings on this association [8] indicate a need for further research. The moderate heterogeneity (I^2 = 62.19%) suggests that unmeasured factors, such as maternal age, parity, or socioeconomic status, may influence prevalence estimates. Future studies should explore these variables to better understand the drivers of PPD in this high-risk group [11].

4.1. Implications

The elevated PPD prevalence underscores the urgent need for targeted mental health interventions for women with HDP in LMICs. The consistency of findings across high-quality studies enhances confidence in these results, supporting their applicability to clinical and public health practice.

4.2. Comparison Context

Compared to global PPD estimates for normotensive women (6.5–19%) [3], the prevalence among women with HDP is substantially higher, likely due to the combined physiological (e.g., inflammation) and psychological stressors (e.g., fear of complications) associated with HDP.

4.3. Strengths and Limitations

4.3.1. Strengths: This study employed a rigorous PRISMA-guided methodology, included high-quality studies, and found no evidence of publication bias, as confirmed by Egger's test and a symmetrical funnel plot. However, several limitations must be noted.

4.3.2. Limitations: Most studies were cross-sectional, limiting causal inference. The analysis covered only six countries, reducing geographic diversity. Data constraints prevented subgroup analyses, such as by HDP severity or maternal characteristics. The inclusion of England as an

outlier may introduce bias, though its impact was minimal given the robust Fail-Safe N (108).

4.4. Implications for Practice and Policy

Routine PPD screening should be integrated into postpartum care for women with HDP in LMICs. Health promotion programs targeting stress management, lifestyle, and social support are essential. Training healthcare providers to recognize PPD symptoms in this high-risk group is critical to improve early detection and intervention.

4.5. Future Research Directions

Longitudinal studies are needed to track PPD trends and identify critical risk periods among women with HDP. Intervention studies evaluating mental health support strategies, such as counseling or pharmacological treatments, should be prioritized. Future meta-analyses should include intervention-focused studies and explore cultural, socioeconomic, and healthcare access factors influencing PPD prevalence.

5. Conclusion

Approximately 27.51% of women with hypertensive disorders of pregnancy (HDP) in low- and middle-income countries (LMICs) experience postpartum depression (PPD), highlighting a significant public health challenge. Immediate action is needed to implement routine screening and targeted intervention programs in healthcare and community settings to support this vulnerable population. Given the limited representation of sub-Saharan African countries in the current evidence base, where only one study from Tanzania was included, there is a critical need for further research in this region. Expanding studies in sub-Saharan Africa, where HDP and PPD burdens are likely exacerbated by resource constraints and healthcare access barriers, will enhance understanding of regional variations and inform tailored interventions to address this pressing mental health issue.

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