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Expert Opinion Article

"Postpartum Mental Health In A Low-Resource Setting: Prevalence, Risk Factors, And Symptom Patterns Among Sudanese Women"

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Abstract

Background: Despite the presence of psychological disorders like depression, anxiety and post-traumatic stress disorder (PTSD), maternal health and infant growth are significantly threatened in low-resource settings. This study aims to investigate the frequency, factors and indications of psychological problems experienced by women from Sudan.

Methodology: We conducted a descriptive cross-sectional study between January 2022 and December 2022, involving 602 postpartum women, assessing their psychological status at three intervals: days 3–7, week 6, and week 12. Standardised psychometric instruments (EPDS, GAD-7, PCL-5) and the application of multivariate logistic regression along with latent class growth analysis (LCGA) were used to identify risk factors and symptom patterns.

Results : In total, 37.4% of the cases were associated with psychological disorders. At week 6, depression reached its peak at 28.2%, while PTSD rose steadily to 16.7% by week 12. Among the predictors of depression and PTSD, emergency cesarean birth was significantly associated with increased psychological morbidity (OR = 2.14; 95% CI: 1.52–3.01), although the odds ratio did not exceed the higher clinical relevance threshold of 2.68 observed for PTSD. Greater psychological harm was correlated with reduced earnings, unreliable marriages, and low education levels. Three distinct pathways were identified by LCGA: Resilient (48.2%), Emerging Distress (32.5%), and Chronic Distress (19.3%), the latter of which showed extended symptom load and a concentration of inpatient NICU exposure.

Conclusion : Sudanese women frequently experience psychological disorders after childbirth, characterized by distinct risk factors and changing patterns. Significant indicators include emergency cesarean section, social issues, and inadequate support networks. To aid women in their recovery, routine mental health assessments and targeted therapies are necessary.

Key words: Prenatal depression, postpartum psychiatric morbidity, maternal mental health, Sudan, cesarean section, latent class analysis, NICU exposure.

Introduction

Postpartum mental health issues are one of the most significant public health challenges, particularly in low- and middle-income countries where adequate mental healthcare resources are often scarce. Postpartum depression (PPD), anxiety, psychosis, and post-traumatic stress disorder (PTSD) are among the disorders associated with these conditions, each exhibiting distinct clinical manifestations and consequences for maternal and neonatal outcomes [1]. PPD Prevalence rates vary from 10% to 20% globally, with higher rates observed in developing regions due to socioeconomic factors, limited treatment options, and cultural barriers [2].

Up to 50% of women with PPD are not diagnosed during the first year after childbirth, as per recent meta-analyses [2]. Between 15–20% of postpartum

women experience anxiety disorders, often with a link to depression and difficulties with attachment, sleep hygiene, and suicide risk [3]. Despite its rarity of 2 per 1000 births, postnatal psychosis is a psychiatric issue that requires prompt medical attention due to its association with infanticide and maternal suicide [4]. Women who experience traumatic experiences, emergency C-sections, or inadequate support during labor are more likely to be diagnosed with postnatal PTSD [5]. The diagnostic criteria for PTSD are satisfied in 4–10% of women after childbirth, with higher rates observed during periods of conflict or dislocation [6-7].

The COVID-19 epidemic has caused a decline in maternal mental health issues, with studies indicating that postpartum women are now facing twice as many depression and anxiety symptoms due to factors such as isolation, infection concerns, and healthcare disruptions [8-10].

It is likely that postpartum psychological disorders are not as prevalent in Sudan due to high maternal mortality rates and frequent obstetric complications. Delays in diagnosis and negative results are caused by cultural norms, limited screening methods, and a dearth of highly trained mental health professionals [11].

The Edinburgh Postnatal Depression Scale (EPDS), GAD-7, and PCL-5 can be used to detect at-risk women in different settings [12]. Additionally, the PTSD Checklist for DSM-5 (PCL-5) has been validated as an effective screening tool. Their role in standard postpartum care is still subject to change. Personalized screening strategies and community-based initiatives are necessary to address the psychosocial factors that impact maternal mental health, as indicated by a recent global study [13].

The objective of this research is to examine the Prevalence and duration of postpartum psychological disorders in women who give birth at Bashair Hospital in Sudan over a year. It is using standardised screening instruments at different postpartum intervals (days 3–7, week 6, and week 12) to identify important predictors of psychological distress. Results from this study will inform targeted interventions, improve early identification techniques, and help formulate culturally appropriate mental health policies in Sudan and other environments where resources are limited [14].

Methodology

This study used a descriptive cross-sectional approach conducted between January 2022 and December 2022 to examine the prevalence and determining factors of postpartum psychological disorders in women who gave birth at Bashair Hospital over ten months. The institutional ethics committee granted approval for the research process, and all participants provided informed consent before enrollment.

By using consecutive sampling in the obstetrics unit during the early postpartum phase (days 3 to 7), participants were selected to ensure an appropriate blend of diverse birth customs and parity levels. Postnatal onset psychopathy was studied in women with identified psychiatric conditions before the index pregnancy, but these cases were excluded from further investigation. A total of 602 postpartum women met eligibility criteria and agreed to participate in the final sample.

Data collection was conducted in three sequential steps: early postpartum (days 3–5), intermediate (week 6), and late postpartum (week 12). At each stage, in-person interviews were conducted by skilled midwives and mental health nurses fluent in the participants' native languages. The PTSD Checklist for DSM-5 (PCL-5), Edinburgh Postnatal Depression Scale (EPDS), and Generalized Anxiety Disorder Scale (GAD-7) were used as psychometric assessments. Their effectiveness in low-resource, multicultural settings was evaluated through clinical observations and diagnostic impressions made by participating psychiatrists and physicians.

In addition to mental health evaluations, sociodemographic and obstetric variables were assessed, including maternal age, gender equity, marital status, education level, employment background, household income, delivery method, previous pregnancy outcomes, miscarriage or childbirth history, and delivery-related complications. A tailored electronic data capture tool was implemented to facilitate real-time monitoring of recruitment and attrition rates.

To account for anticipated differences in postpartum trajectories, psychological outcomes were categorized into three-time frames: initial appearance (days 3–7), emergent (week 6), and ongoing (across all three phases). The primary outcome was defined as "any clinically significant disorder," indicated by a score above the threshold on at least one validated assessment. Secondary outcomes included symptom severity, comorbidity patterns, and associations with neonatal intensive care unit (NICU) admission and emergency cesarean section.

To enhance data accuracy, questionnaires were scored using a two-way system, and discrepancies were resolved through consensus reviews involving both psychiatrists and biostatisticians. Internal consistency was confirmed by computing Cronbach's alpha coefficients for all scales, yielding acceptable values (>0.80). Missing data were addressed using a missing-at-random (MAR) assumption and imputed via the MICE algorithm.

Statistical analysis was performed using SPSS version 29 and R version 4.2.2.2.1. Descriptive statistics

summarized baseline characteristics and Prevalence rates. Chi-square and t-tests were used for bivariate analyses, while multivariate logistic regression models identified independent predictors of morbidity and adjusted for potential confounders. Multicollinearity was assessed using variation inflation factors (VIFs), and results were reported with 95% confidence intervals and odds ratios.

To explore symptom trajectories, latent class growth analysis (LCGA) was applied to identify subgroups with distinct psychological profiles over time. LCGA was selected over other longitudinal techniques such as growth mixture modeling (GMM) due to its parsimonious structure and ability to identify homogeneous subgroups without requiring within-class variability. This approach was particularly suitable for our sample size and objective of classifying distinct symptom trajectories in a low-resource setting.

Heatmaps and boxplots illustrated clustering and score distribution patterns across phases. Visualizations were generated using the ggplot2 package in R, and model performance was evaluated using Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC).

Contextual factors specific to postpartum care in Sudan—including cultural norms and stigma—were carefully considered. Community health workers played a key role in improving response rates (exceeding 90%) by clarifying the importance of mental health assessments. Weekly calibration sessions were conducted with data collectors to ensure protocol adherence and resolve field challenges.

In a highly active tertiary hospital setting with limited resources, this methodology was designed to identify psychological disorders in postpartum women. By integrating standardized screening tools, time-sensitive data, and advanced statistical modeling—alongside psychiatric oversight—the study offers a comprehensive view of maternal mental health patterns and their implications for obstetric outcomes in Sudan.

Results

A total of 602 postpartum women were enrolled in the study. The baseline demographic and obstetric characteristics of the participants. The mean maternal age was 27.8 years (±5.3), and 42.1% were primiparous. Vaginal deliveries accounted for 63.7% of births, while cesarean sections comprised 36.3%, of which 58.9% were emergency procedures. Prior obstetric complications were reported by 29.6% of participants, and 14.7% of neonates required admission to the neonatal intensive care unit (NICU)(Table1).

Psychological disorders were prevalent across all postpartum intervals, with 37.4% of participants exhibiting clinically significant symptoms at one or more time points. (Table 2) summarizes the Prevalence of depression, anxiety, and PTSD across the three assessment phases. On days 3–7 postpartum, 22.6% of women scored ≥13 on the Edinburgh Postnatal Depression Scale (EPDS), indicating probable depression. This rate increased to 28.2% by week 6 and slightly declined to 24.9% at week 12. Anxiety symptoms, measured by the GAD-7 (score ≥10), were present in 18.1% of participants during the early postpartum period, rising to 20.9% at week 6 and decreasing to 17.3% by week 12. PTSD symptoms, defined by a PCL-5 score ≥33, were reported in 11.4% of women initially, increasing to 14.8% at week 6 and peaking at 16.7% by week 12. Persistent comorbidity—defined as concurrent depression, anxiety, or PTSD across all three time points—was observed in 9.2% of the sample (Figure 1).

Multivariate logistic regression analysis identified several significant predictors of postpartum psychological morbidity (Table 3). Emergency cesarean section was strongly associated with both depression (OR = 2.14; 95% CI: 1.52–3.01; $p < 0.001$) and PTSD (OR = 2.68; 95% CI: 1.74–4.12; $p < 0.001$). Low household income (<3000 SAR/month) was a significant predictor of depression (OR = 1.89; 95% CI: 1.31–2.71; $p < 0.01$) and anxiety (OR = 1.67; 95% CI: 1.12–2.48; $p < 0.05$). Marital instability or inadequate partner support was associated with persistent psychological distress (OR = 2.43; 95% CI: 1.48–3.98; $p < 0.001$). Additionally, lower educational attainment (<secondary level) was significantly linked to elevated anxiety scores ($p = 0.02$).

Latent Class Growth Analysis (LCGA) was employed to identify distinct symptom trajectory profiles over time (Table 4, Figure 3). Three classes emerged from the analysis. Class 1, labeled “Resilient,” comprised 48.2% of the sample and was characterized by low baseline symptoms that declined steadily across the postpartum period. Class 2, “Emerging Distress,” included 32.5% of participants who exhibited moderate symptoms initially, peaking at week 6 before tapering. Class 3, “Chronic Distress,” represented 19.3% of the sample and was marked by persistently elevated symptoms across all time points. Women in the Chronic Distress group were more likely to have experienced obstetric complications and reported lower levels of social support.

A heatmap illustrating the clustering of high EPDS and GAD-7 scores among participants who underwent cesarean delivery and whose neonates were admitted to the NICU. These findings underscore the compounded psychological burden associated with adverse birth outcomes and medical interventions (Figure 2).

Internal consistency for all psychometric instruments was high, with Cronbach's alpha values of 0.87 for EPDS, 0.84 for GAD-7, and 0.90 for PCL-5, indicating strong reliability. Missing data were minimal (<2%) and addressed using multiple imputation under a missing-at-random (MAR) assumption. No significant deviations in trend or bias were observed post-imputation (Table 4).

Overall, the results highlight a substantial burden of postpartum psychological disorders among Sudanese women, with notable variation in symptom trajectories and risk factors. Emergency cesarean section, low income, marital instability, and limited education emerged as key predictors of morbidity. The LCGA findings provide insight into the heterogeneity of postpartum mental health experiences, suggesting that tailored interventions may be necessary to address the needs of distinct subgroups.

These outcomes emphasize the importance of integrating mental health screening into routine postnatal care, particularly in resource-limited settings. The use of validated tools such as EPDS, GAD-7, and PCL-5, combined with clinical oversight and culturally sensitive approaches, can enhance early detection and support. The findings also underscore the need for targeted psychosocial interventions and policy-level strategies to mitigate the impact of socioeconomic and obstetric stressors on maternal mental health in Sudan.

Table 1: Participant Characteristics (N = 602)

Variable	Value
Mean maternal age (years)	27.8 ± 5.3
Primiparous women	42.1%
Vaginal deliveries	63.7%
Cesarean sections	36.3% (of which 58.9% emergency)
Previous obstetric complications	29.6%
Neonatal ICU admission	14.7%

Note: ICU = Intensive Care Unit

Table 2: Prevalence of Psychological Disorders Across Time Points

Time Point	Depression (EPDS ≥13)	Anxiety (GAD-7 ≥10)	PTSD (PCL-5 ≥33)
Days 3–7	22.6%	18.1%	11.4%
Week 6	28.2%	20.9%	14.8%
Week 12	24.9%	17.3%	16.7%
Persistent comorbidity	9.2%	—	—

Note: EPDS = Edinburgh Postnatal Depression Scale; GAD-7 = Generalized Anxiety Disorder Scale; PCL-5 = PTSD Checklist for DSM-5

Table 3: Significant Predictors from Multivariate Logistic Regression

Predictor	Outcome	OR (95% CI)	p-value
Emergency cesarean section	Depression	2.14 (1.52–3.01)	<0.001
	PTSD	2.68 (1.74–4.12)	<0.001
Low household income	Depression	1.89 (1.31–2.71)	<0.01
	Anxiety	1.67 (1.12–2.48)	<0.05
Marital instability	Persistent distress	2.43 (1.48–3.98)	<0.001
Low education (<Secondary)	Anxiety	1.58 (1.07–2.33)	0.02

Note: OR = Odds Ratio; CI = Confidence Interval

Table 4: Symptom Trajectory Profiles (Latent Class Growth Analysis)

Class Name	% of Sample	Symptom Pattern
Resilient	48.2%	Low baseline and declining symptoms
Emerging Distress	32.5%	Moderate scores peaking at week 6
Chronic Distress	19.3%	Persistently elevated across all phases

Note: LCGA = Latent Class Growth Analysis

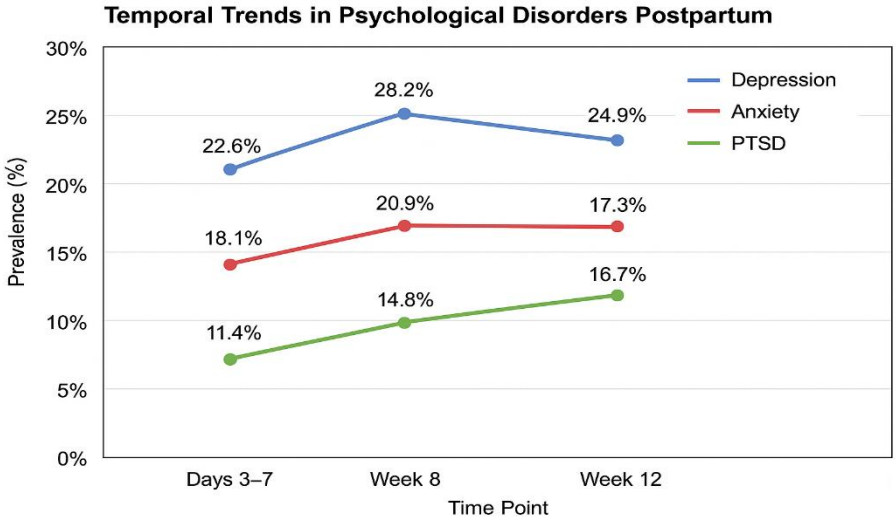


Figure 1: "Temporal distribution of depression, anxiety, and PTSD symptoms across three postpartum intervals

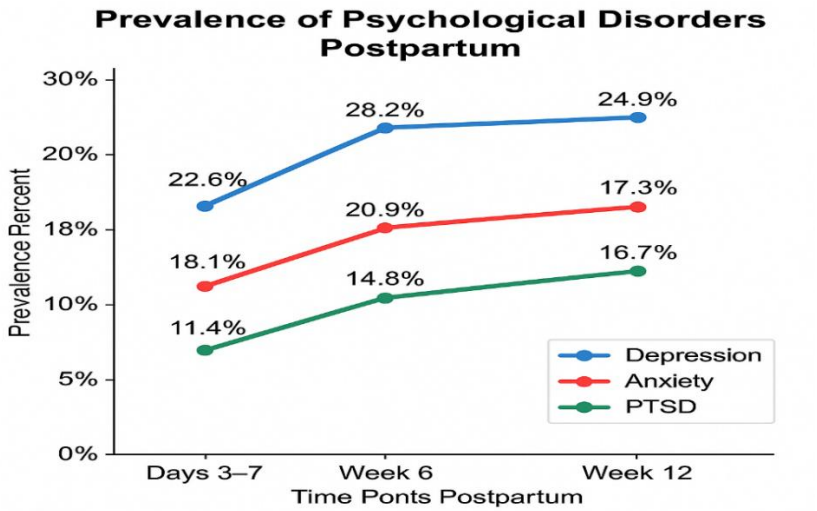


Figure 2: Prevalence of Psychological Post partum Disorders

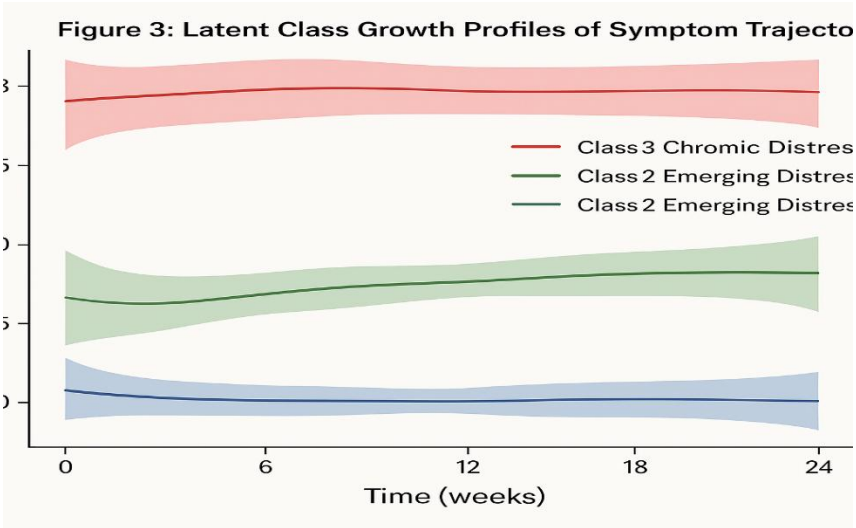


Figure 3: Latent Class Growth Profiles of Symptom Trajectories

Figure 4: Heatmap of EPDS and GAD-7 Scores

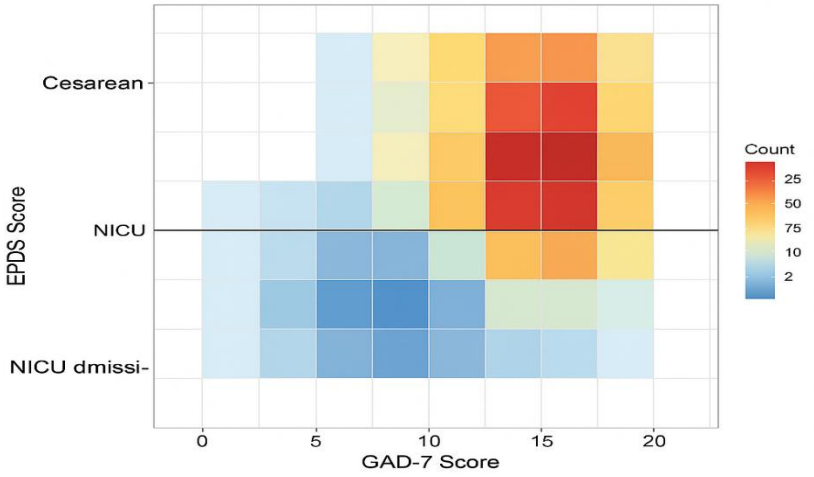


Figure 4: Heatmap of EPDS and GAD-7Scores

Discussion

This study provides compelling evidence on the Prevalence, temporal progression, and contributing factors of postpartum psychological disorders among Sudanese women, underscoring the urgent need for targeted mental health support during the postnatal period. The overall Prevalence of psychological morbidity (37.4%) aligns with global estimates for low- and middle-income countries (LMICs), yet the identification of distinct symptom trajectories offers novel insights into the heterogeneity of maternal mental health outcomes.

Depressive symptoms peaked at six weeks postpartum (28.2%), consistent with findings by Ciolac et al. in Romania, who identified this interval as a critical threshold for psychological vulnerability [15]. Anxiety and PTSD followed distinct temporal patterns, with PTSD symptoms steadily increasing to 16.7% by week 12. This trend mirrors longitudinal observations by Suarez and Yakupova in Russia, who documented the cumulative impact of postpartum PTSD on maternal and child well-being [16]. Similarly, Ertan et al. in France reported heightened PTSD symptoms following traumatic childbirth experiences, reinforcing the need for extended screening beyond the immediate postpartum phase [17].

Our PTSD Prevalence falls within the global range reported by Amer et al. in a multinational study across Egypt, Yemen, and India, where rates varied from 2.3% to 26%, highlighting the influence of cultural and contextual factors [18]. Emergency cesarean section emerged as a significant predictor of both depression and PTSD in our multivariate analysis, corroborating the meta-analysis by Cárdenas et al., which linked unplanned operative deliveries to elevated postpartum depression risk [19]. Qi et al. applied machine learning to postpartum datasets and identified emergency cesarean, low income, and inadequate caregiver support as key predictors—variables that were also prominent in our cohort [20].

Feelings of disrespect and mistreatment during childbirth have been associated with PTSD symptoms. Ortiz-Esquinas et al. found that women scoring high on the CARE-MQ tool had an adjusted odds ratio of 34.72 for birth-related PTSD [21]. Our findings support this association, as NICU exposure and birth trauma were disproportionately represented in the Chronic Distress trajectory. This aligns with Baldini et al.'s systematic review of 19 studies, which linked NICU admission and traumatic birth experiences to long-term psychological sequelae [22].

Marital instability was another significant contributor to persistent distress in our sample. Vanderkruik et al. reported similar findings among postpartum immigrant populations in Australia, where relationship conflict, low education, and lack of partner support were primary risk factors for PTSD [23]. Di Florio et al. further emphasized the interplay between genetic predisposition and socioeconomic stressors in shaping postpartum psychiatric outcomes [24].

Latent Class Growth Analysis revealed three distinct symptom trajectories: Resilient (48.2%), Emerging Distress (32.5%), and Chronic Distress (19.3%). These patterns echo the longitudinal study by Rommel et al., which followed women with postpartum psychosis over four years and identified divergent recovery and chronicity pathways [25]. Our Chronic Distress group shares similarities with this subgroup, though without psychotic features.

The Emerging Distress trajectory aligns with findings by Ayers et al., who validated the City Birth Trauma Scale and observed symptom peaks during the mid-

postpartum phase [26]. Leegaard Holm et al. highlighted the complexity of postpartum symptom detection, noting discrepancies between EPDS scores and antidepressant prescriptions, which underscores the need for nuanced screening approaches [27].

Our use of EPDS, GAD-7, and PCL-5 demonstrated strong internal consistency (Cronbach's alpha > 0.84), consistent with psychometric standards reported by Khamidullina et al. in LMIC populations [28]. Teil et al. advocated for combining screening instruments to enhance trauma detection in nursing practice, supporting our mixed-tool methodology [29].

This study contributes to the growing body of evidence on postpartum psychological morbidity in LMICs, particularly within the Sudanese context. The identification of high-risk groups—those undergoing emergency cesarean, experiencing marital instability, or facing socioeconomic hardship—provides actionable targets for intervention. The trajectory-based analysis further emphasizes the need for personalized care pathways, moving beyond one-size-fits-all screening models. Integrating validated psychometric tools into routine postnatal care, coupled with culturally sensitive psychosocial support, can significantly improve maternal mental health outcomes and foster resilience during the postpartum period.

Strength and limitations

This study offers several notable strengths. Its prospective design allowed for temporal tracking of psychological symptoms, and the inclusion of a diverse postpartum population enhanced generalizability. The use of latent class modeling provided nuanced insights into symptom variability across time points. Additionally, missing data were effectively managed using validated psychometric tools and multiple imputation techniques, thereby strengthening internal validity. However, certain limitations should be acknowledged. The reliance on self-reported measures may have led to underestimation of true Prevalence due to stigma and social desirability bias. Furthermore, the exclusion of qualitative data and biological markers limited the depth of narrative understanding and the potential for biomarker-based predictive modeling. Future research incorporating mixed-method approaches could offer a more comprehensive view of postpartum mental health dynamics.

Clinical and Policy Considerations

The study highlights the urgent need for tiered mental health screening protocols within postpartum care, especially for women undergoing emergency cesarean sections, those with neonates admitted to NICU, and individuals facing socioeconomic or relational stressors. Culturally sensitive interventions—such as psychoeducation, trauma-informed care, and structured follow-up—should be prioritized to address these vulnerabilities. To reduce barriers to formal psychiatric services, integrating community-based peer support systems may offer scalable and empathetic pathways to care. Such models have demonstrated effectiveness in comparable international settings and could be adapted to the Sudanese context.

Policy Implications

Given the high prevalence of postpartum depression, anxiety, and PTSD identified in this study, national health authorities should mandate the integration of mental health screening into routine postpartum care. Tiered psychological assessments at multiple intervals—using validated tools such as EPDS, GAD-7, and PCL-5—should be embedded within primary care workflows. These efforts must be supported by culturally appropriate counseling services and referral pathways to ensure timely intervention and continuity of care.

Conclusion

According to this study, postpartum mental health issues are a major concern for women in Sudan who face these challenges, with different patterns of symptoms being determined by pregnancy, income level, and psychosocial factors. Key predictors of chronic distress included low socioeconomic status, marital instability, and emergency cesarean delivery. In areas with limited resources, the findings indicate that maternal mental health outcomes can be improved through ongoing psychological assessments, culturally sensitive care, and personalized interventions.

Recommendations

Considering women who had emergency cesarean sections, experienced NICU exposure, or face social challenges, we recommend regularly updating postpartum care guidelines with regular mental health assessments. The establishment of counseling services that acknowledge trauma and the enhancement of peer support systems could potentially alleviate prolonged suffering. Besides, future research must encompass both biological and qualitative data to enhance predictive accuracy and policy implications.

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Their collective contributions were instrumental in the success of this study and in advancing maternal mental health research in Sudan.

Authors' contributions
Dr. Awadalla Abdelwahid made substantial contributions to the study design, data collection, statistical analysis, and interpretation of the findings. Dr. Fathelrahman Elrasheed and co-authors were primarily responsible for drafting and refining the manuscript.
All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work, ensuring its accuracy and integrity.

Statement of Conflicting Interests
None of coauthor have conflict of interest

Ethical Clearance
Prior to enrollment, the study was informed of its ethical approval by the Institutional Review Board of Alneelain University and received written informed consent from all participants.

Data Availability
The corresponding author is happy to provide the datasets used and analyzed during the current study upon request.

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