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Postpartum depression in mothers of infants under 12 months at Hai Duong Pediatric Hospital and its association on infant health

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Abstract

Introduction: Postpartum depression (PPD) is one of the current priorities in the national program on maternal and child health. The study aims to provide a comprehensive database on the prevalence of PPD among mothers in 12 months of post-delivery and to examine its relationship with the health status of their offspring in the first 12 months.

Methods: This hospital-based cross-sectional study involved 180 mothers whose children were admitted at Hai Duong Pediatric Hospital in September 2022. The mothers in the study were classified by the PPD, which was determined using the Edinburgh Postnatal Depression Scale (EPDS) with the cut-off score of 12/13. Infant health indicators include the gestational age at birth, birthweight, congenital abnormality at birth, infant illness within the first 12 months, hospitalization frequency, crying behavior, and the mother's concerns regarding the infant's health status.

Results: PPD is significantly associated with the frequency of infants admitted for inpatient treatment (p=0.038) and the occurrence of prolonged infant crying episodes exceeding 15 minutes per day (p=0.004). Additionally, frequent maternal worry about the infant's health also showed a strong relationship with PPD status (p<0.001).

Conclusions: Strengthening targeted strategies to screen for and reduce the rate of PPD, especially among mothers who are often in a state of concern for their offspring's health, should be prioritized.

Keywords: depression, postpartum; mothers; infant health; Vietnam

1. INTRODUCTION

Postpartum depression (PPD) represents a pressing global concern in a changing sociocultural environment. The surge in PPD prevalence aligns with the increased empowerment and societal roles adopted by women, which results in increased pressures and responsibilities, especially for postpartum women [1]. Projections by the World Health Organization (WHO) portend that depression will ascend to preeminence as the foremost contributor to the global disease burden by 2030 [2]. Furthermore, depression in women is expected to occur at a rate almost twice as high as in men

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[3]. When PPD remains undiagnosed and untreated, it can exacerbate a mother's overall health and increase her susceptibility to severe mental illnesses. Additionally, the impact extends beyond the mother and may affect the child's physical and psychological development. This underscores the critical roles of society and familial structures [4,5].

Globally, the prevalence of PPD in women varies between 15% and 25% [6–8]. PPD can manifest either immediately after childbirth or persisting up to 12 months postpartum, making it a significant public health concern. The risk of developing PPD is notably three times higher during the initial 5 weeks postpartum and peaks at 12 weeks postpartum. Moreover, women have a significant risk of recurring PPD, with rates ranging from 25% to 68% [9]. Research on PPD in Vietnam reveals a prevalence ranging from 11.6% to 33.0% [10–12].

Maternal PPD has been linked to the health of infants from delivery and during the first year of life. It has been objectively shown that psychological abnormalities that are thought to be antecedents to depression are typically caused by preterm, congenital illnesses, malnutrition, or immediate postnatal death in infants [13]. PPD is a recognized priority within the national maternal and child health program, underscoring the essential need for continuously updated data on PPD status to formulate effective strategies. However, in Vietnam, there is currently no systematic screening or ongoing monitoring system for PPD, with reliance primarily on individual scientific studies. However, the impact of the COVID-19 pandemic has resulted in a limited number of scientific studies on PPD during this period. Aiming to contribute to the current understanding of PPD, this research was conducted to provide updated data on the prevalence of PPD in mothers within a year of giving birth and to investigate its relationship with infant health status, a recognized risk factor for maternal PPD.

2. METHODS

2.1. Study design

The PPD status of mothers having infants under 12 months and its association with the infants' health status were examined by the hospital-based cross-sectional study.

2.2. Study population

Mothers with infants under 12 months of age attending outpatient visits and receiving inpatient treatment at Hai Duong Provincial Pediatric Hospital.

2.2.1. Inclusion criteria

Women with infants under 12 months of age attending outpatient visits and receiving inpatient treatment in all departments of Hai Duong Provincial Pediatric Hospital during the data collection period from September 12th to 23rd, 2022, who consented to participate in the study.

2.2.2. Exclusion criteria

Mothers without the ability to respond to questions (due to deafness, speech disorders, or communication impairments).

Mothers used to participate in the study in the previous hospital visits of their infants.

2.3. Study site and duration

Hai Duong Pediatric Hospital was chosen as the focal point of this study due to its representation as a prototypical pediatric hospital of the Northern region with a stable patient flow of approximately 300 outpatients daily and more than 20,000 inpatients annually.

The research was conducted at Hai Duong Provincial Pediatric Hospital during the period from September 12th to 23rd, 2022.

Sample size:

The study to examine the prevalence of PPD, thus the sample size calculation follows the formula for determining a proportion:

$$n = Z^2_{1-\alpha/2}\frac{p(1-p)}{d^2}$$

In which, $Z^2_{\left(1-\frac{\alpha}{2}\right)} = 1.96^2$ denotes the statistical significance level (α=0.05), p represents the estimated PPD in mothers based on Fisher et al.'s study in Ha Nam (p=0.13) [14], d=0.05 represents the desired precision, and an additional 5% is added to account for potential dropouts. The calculated sample size is n=180, ensuring a robust statistical foundation

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for the investigation.

2.4. Sampling technique

A convenience sampling method was employed. Any mothers who met the inclusion criteria in the study duration when seeking health services for their infants in the hospital and concurred to participate in the study were recruited until the sample size was obtained.

2.5. Bias

The study's participants are selected from Hai Duong Pediatric Hospital, which may introduce selection bias. Mothers who visit the hospital more frequently might be overrepresented in the sample. To address this bias, the data collectors were trained to screen inclusion and exclusion criteria when recruiting the participants to avoid duplicate responses.

2.6. Variables and data collection instruments

The study encompassed the following index variables:

Demographic factors includes age, occupation, household economic status, and educational level.

Infants' health status pertains premature birth, birth weight, abnormalities at birth, health issues within the first 12 months of life, frequency of hospitalization, frequency of infant crying for more than 15 minutes per day, maternal concern frequency regarding child health.

Maternal PPD status was screened by utilizing the standardized Edinburgh Postnatal Depression Scale (EPDS) validated for Vietnam by Giang et al. [15], given its specificity for pregnant and postpartum women. The EPDS includes 10 questions, each consisting of 4 answer choices, scored on a scale from 0 to 3. Specifically, questions 1, 2, and 4: the scoring assigns points incrementally from 0 to 3; questions 3, 5–10 are scored conversely from 3 to 0. The total score ranges from 0 to 30 points. The cut-off threshold for PPD classification in this study was set at 12/13, a clinically diagnosed standard with high specificity [16,17]. The study participants with a total EPDS score of 13 or higher were categorized as having PPD status. The reliability of the EPDS scale was internally tested to ensure its appropriateness for measurement in the study population before conducting further analyses on the association between risk factors and PDD. The Cronbach's Alpha value of 0.855 indicated a high level of reliability, ensuring the EPDS' validity and reliability in screening PPD status within the target population.

2.7. Data collection method

The information about relevant factors within the 12-month postpartum period and indicators of PPD, as measured by the EPDS over the previous seven days, was obtained through structured and questionnaire-based interviews with mothers.

Before the data collection process began, the investigators, who were highly skilled, received training on how to use the research instrument.

2.8. Data processing

EpiData 3.1 was used for data entry. The data was then extracted and cleaned up in IBM SPSS 26.0 (Armonk, NY, USA).

Descriptive statistical analysis was employed to delineate an overview of the study population, the infants' health status, and maternal PPD status. Univariate analysis with Chi-square test was utilized to determine the association between PPD status and factors related to the infant's health status with a significance level of $p<0.05$.

3. RESULT

3.1. Description of study sample characteristics

A comprehensive summary of the study participants' demographic details is given in Table 1. The average age of the 180 individuals involved in the study is 27 years, women occupying the largest percentage of the population with 60.0%—fall within the 25–34 age range. Seventy-two percent of the female participants come from rural areas, accounting for over three quarters of the total. Most study participants have completed their higher education beyond high school. Workers and housewives constituted the largest occupational group, representing 37.9% and 20.3%, respectively. The majority of research samples (97.9%) are married and live with their partners. More than half of the

Table 1. Descriptive characteristics of the study population (n=180)

Demographic factors	Frequency (n)	Percentage (%)
Age group		
<25	42	23.3
25–34	108	60.0
≥34	30	16.7
Living area		
Rural	131	72.8
Urban	49	27.2
Education of mothers		
Primary school	2	1.1
Secondary school	38	21.1
High school	72	40.0
University/college/vocational training	64	35.6
Post-graduate	4	2.2
Occupation		
Civil service employees/officials	22	12.2
Laborers	67	37.2
Freelance workers	34	18.9
Business	15	8.3
Housewives and farmers	42	23.3
Marriage status		
Married cohabitation	176	97.8
Married but living separately	0	0
Divorced	0	0
Unmarried cohabitation	4	2.2
Living arrangements		
Living with husband only	64	35.6
Cohabitating with the biological parents	20	11.1
Cohabitating with the husband's parents	96	53.3

women participating in the study reside with their mothers-in-law (53.3%), while the remaining women either living independently (35.6%) or living with their biological parents (11.1%). These demographic insights provide a foundation for understanding the sociodemographic composition of the study cohort, contributing to the contextualization and interpretation of research findings.

3.2. Postpartum depression status

Based on the EPDS, each individual within the study cohort obtained her total EPDS score. The PPD status was categorized by the classification cut-off point, the threshold at 12/13 on the EPDS score. A notable 32.8% of individuals within the study cohort surpassed the classification cut-off point. This outcome underscores a significant prevalence of PPD within the examined population (Fig. 1).

3.3. Relationship between prevalence of postpartum depression (PPD) and infant health status

The findings in Table 2 regarding the relationship between PDD in mothers and factors associated with the child's health status. Specifically, the frequency of infants admitted for inpatient treatment two or more times in the first year of life is associated with PDD in mothers (p=0.038). The prevalence of maternal PPD is almost twice as high in the group of mothers with children admitted for inpatient treatment more than twice compared to those whose children have never been admitted for inpatient care, with respective prevalences of 48.5% and 25.0%. Moreover, the children that daily cry for longer than fifteen minutes per time are a substantial risk factor for PPD in mothers. The prevalence of PPD is four times larger in mothers whose children cry for longer than fifteen minutes at a time daily comared tothose whose children cry for shorter periods (62.3% versus 15.4%, respectively). Frequent maternal anxiety for the child's health is another factor strongly associated with PPD. Mothers who are often in this psychological state have a far greater prevalence of PPD (57.4%) than mothers who show little to no care for their child's health (22.7%).

These complex associations highlight the diverse range of factors that impact PPD status in women, offering important new perspectives on the screening and management initiatives of mental health issues in postpartum mothers.

4. DISCUSSION

4.1. Postpartum depression situation of the study cohort

With a cut-off point of 12/13 on the EPDS score, the PPD prevalence found in the study is 32.8%. According to a thorough systematic review on PPD rates in the Asian region conducted by Klainin and Arthur in 2009, this rate is within the range of 3.5% to 63.3% [18]. Nonetheless, the prevalence of PPD in the study is higher than the typical rates reported

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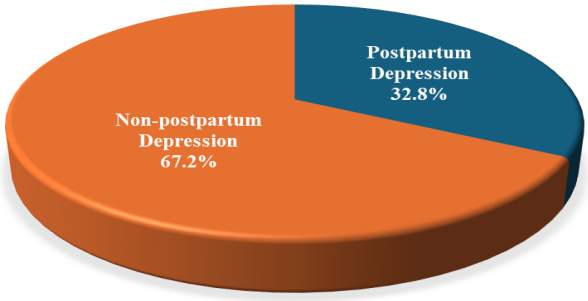

Fig. 1. Prevalence of postpartum depression (PPD) based on Edinburgh Postnatal Depression Scale (EPDS) classification in the study cohort.

Table 2. Relationship between prevalence of postpartum depression (PPD) and infant health status

Infant health status	Postpartum depression				p-value
	Yes		No		
	n	(%)	n	(%)	
Pregnancy term					
Full-term	52	33.3	104	66.7	0.686
Pre-term	7	29.2	17	70.8	
Birth weight					
Normal (≥2,500 g)	50	32.5	104	67.5	0.829
Underweight (<2,500 g)	9	34.6	17	65.4	
Infant abnormality at birth					
No	55	32.9	112	67.1	0.873
Yes	4	30.8	9	69.2	
Infant illness during the first 12 months					
Febricity (yes/no)	19	34.5	36	65.5	0.738
Respiratory illness (yes/no)	23	29.9	54	70.1	0.473
Gastrointestinal infection (yes/no)	13	39.4	20	60.6	0.372
Hospitalization frequency					
Never	23	25.0	69	75.0	0.038*
Once	20	36.4	35	63.6	
≥Twice	16	48.5	17	51.5	
Daily prolonged infant crying (over 15 minutes per time) frequency					
Sorely	8	15.4	44	84.6	0.004*
Occasionally	11	50.0	11	50.0	
Regularly	66	62.3	40	60.3	
Maternal worries regarding infant health					
Sorely	15	22.7	51	77.3	<0.001*
Occasionally	13	21.7	47	78.3	
Regularly	31	57.4	23	42.6	

p-value obtained from Chi-square tests.
* p-value <0.05.

in Vietnamese studies, when compared to research conducted in Vietnam. Noticeably, it is higher than the rates reported in the research conducted by Do Van Tam et al in Binh Dinh (12.1%) and the research conducted by Luong Bach Lan and

collaborators in Ho Chi Minh City (11.6%), even though all of these studies used the same classification threshold as the present study. The inconsistence in PPD rates in Vietnamese studies can be attributed to the diverse socioeconomic, cultural, and societal characteristics of the studied cohorts, along with variations in the timing of PPD assessments.

A equivalent result was found using the same 12/13 criterion in the study carried out by Fisher et al. in Ho Chi Minh City. This study found that 33.0% of women have PDD. The analogy between the two studies—that is, their focus on a research population made up primarily of mothers whose children are hospitalized for treatment or examination—may help to explain this observation. The act of bringing children to hospitals for check-ups or inpatient care is acknowledged as a stress-inducing factor, causing substantial anxiety for mothers and exacerbating pre-existing depressive symptoms. The findings of this study and Fisher's research are similar, which emphasizes the possible influence of stressors connected to child health conditions on mothers' mental health in comparable situations [19]. This alignment strengthens the robustness of the findings and contributes to the broader understanding of PPD within specific demographic groups.

4.2. Exploring the interplay between prevalence of postpartum depression (PPD) and infant health factors

Our investigation sheds light on the complex dynamics between PPD and infant health, underlining the imperative of early identification of PPD risk factors for comprehensive mental health interventions. Remarkably, the findings we found highlight a strong association between the number of hospital admissions in the first year of the infant and the development of PPD in mothers. This is consistent with other studies, such the one conducted in 2004 that found different depression rates in mothers of healthy children versus mothers of infants receiving inpatient care ($p<0.001$) [20]. These findings are further supported by a 2017 study conducted at Nam Dinh Pediatric Hospital in Vietnam, which explains that childrens who are hospitalized frequently increase the risk of PPD in mothers by 5.3 times [13]. The complex association between hospitalization of infants and PPD in mothers is explained by the increased maternal caregiving demand from the child, as well as the stress and anxiety resulting from the medical procedures and the inadequate living conditions in hospitals. These factors collectively contribute to the manifestation of PPD in mothers [20].

Our research also reveals a strong correlation between PPD in mothers and their infants' continuous crying behavior. This is in line with worldwide research trends, as demonstrated by the 2013 study by Radesky et al., which found that women who had infants cry for longer than 20 minutes a day had a fourfold increased risk of PPD [21]. In the Vietnamese context, persistent and intense infant crying, also known as "khóc dạ đề," has been associated with PPD in studies like the one conducted in 2023 at Central Obstetrics Hospital by Nguyen Quang Bac et al., which highlighted that mothers were 4.42 times more likely to experience PPD if their infants cried nonstop at night [22]. The persistent crying behavior that infants display is frequently linked to particular health problems in young children, like stomach discomfort or malnutrition. Determining the exact reason for an infant's protracted crying is still difficult and elusive. When mothers struggle with uncertainty about their child's health status, this exacerbate their stress and anxiety levels [23]. Moreover, the crying patterns of infants have a negative effect on postpartum women's sleep quality, aggravating pre-existing stress and acting as a trigger for PPD [13].

The current investigation further underscores that mothers who consistently express heightened concern regarding their child's health face an increased risk of PDD, with an odds ratio of 4.58 compared to mothers whose children are in good health and do not harbor excessive worry in this regard. This result is consistent with earlier research, including a 2013 study by Radesky that found women whose infants have health-related problems are twice as likely to experience anxiety and despair. In particular, mothers whose infants have digestive issues are more likely to experience PDD (OR=4.0; 95% CI: 2.0–8.1) [21]. Parallel to these results, a longitudinal study that followed 132 mother-child pairs in 2012 explains that problems related to a child's restricted weight gain and persistent maternal anxiety and stress about the child's weight and health are contributing factors that increase the risk of PPD [24]. Similar results on PPD have

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been frequently obtained in Vietnamese research. Mothers of children receiving medical treatment had a 4.2-fold higher risk of PPD than mothers of children in good health, according to a 2017 study conducted in Nam Dinh. This was mainly due to the ongoing worry for their child's well-being [13]. For postpartum mothers, the already challenging and stressful task of caring for a infant becomes further exacerbated when the child's health is compromised, leading to frequent illnesses and discomfort. This not only exacerbates the mothers' mental well-being but also heightens anxiety and stress levels, impacting the physical condition of mothers who must stay awake at night attending to their sick child and experience irregular eating habits while caring for an unhealthy infant.

Valuable insights into PPD among mothers with children receiving healthcare services have been provided by this exploratory investigation. The study highlights the relationship between a mother's PPD and her children's health. This preliminary research lays foundation for future PPD screening and intervention programs is laid by this preliminary research, which aims to address the complex relationship between mothers' mental health and their infants' wellbeing.

The study's cross-sectional design, which provides a snapshot of PPD status and infant health at a specific point in time, may not fully capture the dynamic nature of these conditions. The hospital-based methods potentially lead to the limitations in generalizability due to predominant representation of mothers with infants experiencing health issues requiring hospitalization, resulting in overemphasis on depression status.

5. CONCLUSION

PPD among mothers with infants is found to be 32.8% based on the assessment of 180 women with infants under 12 months who sought medical care at Hai Duong Pediatric Hospital. The research investigated PPD-related factors, with a primary focus on markers of the child's health. Significant associations between maternal PPD and the child's frequency of inpatient admissions, the frequency of daily extended crying episodes longer than 15 minutes, and frequent maternal anxiety about the child's health were discovered.

These findings underscore the intricate interplay between maternal mental health and child well-being, emphasizing the need for targeted interventions and PPD risk screening. Strategies aimed at preventing and addressing postpartum PPD should prioritize mothers with children currently under medical care. This insight contributes to the broader understanding of the nuanced dynamics influencing maternal mental health, offering valuable implications for healthcare policies and practices concerning maternal and child well-being. Further research and comprehensive interventions are crucial to mitigate the impact of PPD on both mothers and their children.

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Conflict of interest

No potential conflict of interest relevant to this article was reported.

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Writing - review & editing: HTM Nguyen, DP Luu, TN Quyet, H Hoang, MNP Tran, MTP Le.

Availability of data and material

Upon reasonable request, the datasets of this study can be available from the corresponding author.

Ethics approval

All procedures in this study were approved by the Institutional Review Board (IRB) of the National Institute of Hygiene and Epidemiology, Vietnam (IRB-VN01057/IORG 0008555) under approval no. HĐĐĐ–13/2022 dated 31st August 2022.

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