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The Prevalence and Associated Factors for Postpartum Depression Among Women in Samarinda, Indonesia

Nik Nairan Abdullah [1,*], Ridha Wahyuni [2], Akmal Hisyam Arsyad [1]

[1] University Tekhnology Mara Malaysia, Shah Alam, Malaysia
[2] Institute Heath and Sains Wiyata Husada Samarinda, Kalimantan Timur 75243, Indonesia

[*] ***Corresponding Author:*** University Tekhnology Mara Malaysia, Shah Alam, Malaysia. Email: niknairan@gmail.com

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Abstract

Background: Postpartum depression (PPD) is a serious mood disorder that is often underdiagnosed in postpartum women and is exacerbated by women's biological conditions, especially Body Mass Index (BMI), energy intake, and physical activities. There is limited literature on PPD relating to nutritional status and physical activity.

Objectives: This study aimed to detect the prevalence of PPD and the factors associated with postpartum women in Samarinda, Indonesia, from February 2023 to July 2023.

Methods: A cross-sectional study encompassing 387 women from four to 24 weeks postpartum was performed. We used stratified random sampling to select respondents from six clinics. Respondents fulfilled the inclusion and exclusion criteria. Data were collected via interviews using validated tools in the national language. The independent variables were socio-demography, BMI, energy intake, and physical activity. After adjusting for confounders, multivariate logistic regression analysis determined whether the factors were significantly associated with PPD.

Results: From 387 correspondents, this study showed that the prevalence of PPD was 11%. The significant factors of PPD were obesity in the 3rd trimester of pregnancy versus overweight BMI, AOR 4.066, 95% CI (1.297 - 12.745), P = 0.016; having an underweight BMI in postpartum versus overweight BMI, AOR 4.509, 95% CI (1.486 - 13.676), P = 0.008; and having a lower Recommended Dietary Allowances (RDA) versus high RDA for energy intake in the postpartum period, AOR 2.325, 95% CI (1.091 - 4.956), P = 0.029.

Conclusions: The prevalence of PPD was higher in Samarinda than recorded in national data. Obesity in the 3rd trimester of pregnancy, being underweight in postpartum, and lower RDA in postpartum increased the risk of PPD.

Keywords: Body Mass Index, Calorie, Intake, Physical Activities, Postpartum Depression

1. Background

Postpartum depression (PPD) is a serious mood disorder that has been a significant public health issue in the last decade (1). It is often underdiagnosed, with the prevalence of probable depression being highest at two months postpartum and that of major depression at one year postpartum (2). According to a systematic review of 565 studies from 80 different countries, the global PPD prevalence varies from 6.24% in Denmark to 60.98% in Afghanistan (3). In Asia, PPD had the lowest prevalence in Malaysia (4.4%) and the highest prevalence in Thailand (57.7%). Based on data from Basic Health Research 2018, the prevalence of PPD in Indonesia was 5.4% (4).

The American Psychological Association defines PPD as a major depressive disorder (MDD) (5). Severe depression begins within four weeks after giving birth and most commonly occurs in women with an underlying or preexisting mood or other psychological illness. Suicide is one of the symptoms, along with severe sleeplessness, emotional lability, and exhaustion. There may be homicidal and delusional thoughts concerning the infant. It may be a mental health crisis that puts the mother and child in danger (6). Early identification of PPD is important because it affects not

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just the woman who is in distress but also her baby and other relatives, contributing to the degradation of family and marriage relationships (2).

In Indonesia, PPD is related to socio-demographic factors such as maternal age, maternal education, maternal occupation, unwanted pregnancy, pregnancy complications, childbirth complications, and postpartum complications (4). Postpartum women also endure significant physical and mental changes (1). Women in the postpartum phase experience major physiological changes from 2 weeks to 6 - 8 weeks, such as metabolism, hemodynamics, genitourinary recovery, and emotional status, then recover gradually up to 6 months (7). The postpartum phase requires more energy from food intake to produce milk and for tissue function (8). Energy expenditure indicates food substances metabolized for development, body maintenance, physical activity, pregnancy, lactation, and many other functions (9).

Although the link between depression in women and extremes of Body Mass Index (BMI) has been established, nothing is known regarding the relationship between obesity and PPD. The PPD is associated with the first trimester of pregnancy, and women without a history of depression who are overweight have an increased risk of PPD (10). Another study also showed a strong association between BMI in pre-pregnancy and self-reported postpartum depressive symptoms (11). Postpartum women reduced their carbohydrate intake and increased their physical activity, while pregnant women consumed more fat and exercised less (12). There is evidence that physical activity during postpartum may be associated with the promotion of a healthy weight. A scoping review described nutrition or physical activity interventions as probably improving PPD (13). However, published data on the relationship between PPD and energy intake are lacking. In Samarinda, BMI is measured during antenatal care check-ups. However, no energy intake was recorded. Routine screening for PPD was also not conducted. Therefore, baseline data on PPD is much needed for policymakers.

2. Objectives

This study aimed to determine the prevalence of PPD in Samarinda and the association of PPD with socio-demographic factors, nutritional factors (BMI, energy intake), and physical activities.

3. Methods

3.1. Study Design

This cross-sectional study was conducted on postpartum women over a six-month duration in 2023.

3.2. Study Setting

The location of the study was Samarinda, East Kalimantan, Indonesia.

3.3. Study Population

The population in this study consisted of postpartum women from six clinics (n = 570). The sample size was calculated using the Lemeshow formula, with an additional 20%, resulting in a requirement of 387 respondents. We used stratified random sampling to select respondents from these clinics. The number of respondents chosen was proportional to the clinic's postpartum population. The inclusion criteria for this study were Indonesian citizens, women between four to 24 weeks postpartum, who agreed to participate as respondents, and who had been living in Samarinda for the past 6 months. The exclusion criteria were women with physical disabilities and/or those receiving psychological/psychiatric treatment.

3.4. Study Variable

3.4.1. Dependent Variable

The dependent variable was PPD. The instrument used to determine PPD was the Edinburgh Postnatal Depression Scale (EPDS) Indonesian version. The classification is depressed (score ≥ 10), not depressed (score < 10) (14). The Cronbach's alpha validity and composite reliability of the EPDS are 0.80 and 0.83 for the Indonesian version (15).

3.4.2. Independent Variable

The independent variables were socio-demographic factors, nutritional factors, and physical activities. The data collected on socio-demographics included age, education level, religion, work, family income, parity, and ethnicity. The participants were grouped according to the Indonesian Ministry of Health for the age variable. The education levels are elementary school, middle school, and high school. Religions are categorized as Muslim and Non-Muslim. Work is categorized into three categories: Housewife, work at home, and work outside of home. Family income was categorized into low (< IDR 2,000,000), middle (IDR 2,000,000 - IDR 3,999,999), high (IDR 4,000,000 - IDR 6,000,000), and very high income (> IDR 6,000,000) (16). The BMIs was assessed and classified according to

the World Health Organization (WHO): Underweight < 18.5 kg/m^2, normal 18.5 - 24.5, overweight 25 - 29.9, and obesity ≥ 30.

Physical activity was measured using the physical activity level (PAL). Respondents were asked to document their activities over 3 days, detailing what was done during a 24-hour period on the activity recall sheet (17). The PAL levels were categorized into active (1.70 - 1.99) and low activity (1.40 - 1.69) (18, 19).

Energy intake data were obtained by interviewing and recording respondents' answers regarding their daily intake of food and drink consumption in the household using a 24-hour recall questionnaire. The recorded food ingredients were analyzed using the NutriSurvey 2007 application. They were classified based on the Recommended Dietary Allowances (RDA) for postpartum mothers. Energy intake was grouped into higher (RDA ≥ 2700) and lower (RDA < 2700). The Cronbach's alpha validity and composite reliability of the questionnaire are 1.00 and 1.00 for the Indonesian version (20).

Data collection was conducted among women who visited the clinic for postpartum check-ups. The questionnaire used was in Indonesian. The researcher conducted interviews to fill out the questionnaire in the clinic consultation room. Respondents were required to complete a consent form before answering the questionnaire.

3.5. Statistical Analysis

Data analysis was conducted using the Statistical Program for Social Science Software version 25. A descriptive analysis was performed to detect the prevalence. Univariate and multivariate logistic regression analyses were conducted to identify significant factors for PPD. Any factors with a P-value < 0.05 were considered significant in the multivariate analysis. Confounding factors were controlled by applying multivariate logistic regression analysis. After adjusting for confounders in the study, we reported only the final adjusted odds ratio (Table 1).

3.6. Ethics Statement

The study received ethics approval from the Indonesian Ethical Committee. The Ethics Committee issued a research ethics letter with letter number LB.01.01/7.1/00152/2022. All experiments complied with the relevant laws and institutional guidelines, and the Institutional Committee approved the experiments.

4. Results

4.1. Overview of Study Respondents

The majority of respondents were aged 26 - 35 years (n = 220, 56.6%), most attained middle school education (n = 266, 68.7%), were Muslim (n = 365, 94.3%), worked as homemakers (n = 228, 58.9%), had middle-range family income (n = 134, 34.6%), had parity > 1 (n = 209, 54%), and were of non-native ethnicity (n = 194, 50.1%). Four hundred sixty-seven respondents had a normal BMI in the preconception period (68%). Almost half of the participants were overweight when pregnant (n = 188, 48.6%), while most had a normal BMI in the postpartum period (n = 215, 55.5%). Most of the respondents had lower energy intake (RDA < 2700) (n = 235, 60.7%), and their physical activities were low (n = 211, 55.8%).

4.2. Descriptive and Logistic Regression Analysis

The prevalence of PPD in Samarinda among 387 women was 11.9% (n = 46). Refer to Table 2. Table 1 displays the univariate analysis, which shows that four independent variables had a significance value of < 0.25. Postpartum women working at home reported higher odds of PPD; OR 1.938; 95% CI, (0.759 - 4.949), than homemaker women, P = 0.227. Obesity in the 3rd trimester of pregnancy reported higher odds of PPD; OR 3.522; 95% CI, (0.883 - 14.054), than overweight BMI, P = 0.075. The BMI underweight in postpartum admission reported higher odds of PPD; OR 6.042; 95% CI (1.631 - 22.378), than overweight BMI, P = 0.007. The BMI normal in postpartum reported higher odds of PPD; OR 8.171; 95% CI (0.552 - 137.684), than overweight BMI, P = 0.124. Postpartum women with lower energy intake reported higher odds of PPD; OR 2.183; 95% CI (0.990 - 4.810), than higher energy intake, P = 0.053.

The multivariate analysis identified three significant independent variables associated with PPD. Women who were obese in the 3rd trimester of pregnancy had higher odds of PPD; AOR 4.509; 95% CI (1.486 - 13.676), compared to women who were overweight, P = 0.016. Women who were underweight in the postpartum period had higher odds of PPD; AOR 4.509; 95% CI (1.486 - 13.676), compared to women who were overweight in the postpartum period, P = 0.008. Postpartum women with lower energy intake reported higher odds of PPD; AOR 2.325; 95% CI (1.091 - 4.956), compared to women with higher energy intake, P = 0.029.

5. Discussion

5.1. Prevalence of Postpartum Depression

Table 1. Univariate and Multivariate Analysis for Factors Associated with Postpartum Depression

Variables	Univariate			Multivariate		
	P-Value	B	OR (95% CI)	P-Value	B	AOR (95% CI)
Age						
17 - 25	0.426	0.339	1.403 (0.610 - 3.230)	-	-	-
26 - 35 (reference)	0.515	-	-	-	-	-
36 - 45	0.339	0.477	1.611 (0.606 - 4.281)	-	-	-
Women education level						
Elementary school	0.827	-	-	-	-	-
Middle school	0.540	- 0.275	0.761 (0.174 - 3.315)	-	-	-
High school (reference)	0.716	- 0.274	1.334 (0.306 - 3.315)	-	-	-
Religion						
Muslim (reference)						
Non-Muslim	0.716	0.289	1.334 (0.306 - 5.225)	-	-	-
Work						
Homemaker (reference)	0.434	-	-	0.330	-	-
Work at home	0.227 [a]	0.631	1.879 (0.676 - 5.225)	0.167	0.661	1.938 (0.759 - 4.949)
Work out home	0.395	0.389	1.476 (0.602 - 3.618)	0.349	0.341	1.407 (0.689 - 2.873)
Family income						
Low	0.536	-0.302	0.739 (0.264 - 2.073)	-	-	-
Middle	0.566	0.433	1.542 (0.601 - 3.954)	-	-	-
High	0.368	0.179	1.196 (0.355 - 4.035)	-	-	-
Very high (reference)	0.773	-	-	-	-	-
Parity						
Primiparity	0.817	0.094	1.098 (0.496 - 2.434)	-	-	-
Multiparity						
Ethnic						
Native (reference)						
Non-native	0.615	-0.176	1.097 (0.593 - 2.032)	-	-	-
BMI preconception						
Underweight	0.536	- 1.247	0.287 (0.033 - 2.493)	-	-	-
Normal (reference)	0.258	-	-	-		
Overweight	0.540	0.467	1.596 (0.358 - 7.105)	-	-	-
Obesity	0.342	1.064	2.899 (0.323 - 26.018)	-	-	-
BMI 3rd trimester pregnancy						
Normal	0.931	0.038	1.039 (0.438 - 2.466)	0.773	- 0.05	0.886 (0.389 - 2.019)
Overweight (reference)	0.204			0.045		
Obesity	0.075 [a]	1.259	3.522 (0.883 - 14.054)	0.016 [b]	1.403	4.066 (1.297 - 12.745)
BMI postpartum						
Underweight	0.007 [a]	0.1799	6.042 (1.631 - 22.378)	0.008 [b]	1.506	4.509 (1.486 - 13.676)
Normal	0.124 [a]	2.165	8.171 (0.552 - 137.684)	0.210	1.579	4.850 (0.410 - 57.426)
Overweight (reference)	0.059	-	-	0.053	-	-
Obesity	0.674	0.343	1.410 (0.285 - 6.981)	0.189	0.750	2.117 (0.692 - 6.483)
Energy intake						
Higher (RDA ≥ 2700) (reference)						
Lower (RDA < 2700)	0.053 [a]	0.781	2.183 (0.990 - 4.810)	0.029 [b]	0.844	2.325 (1.091 - 4.956)
Physical activities						
Active (reference)						
Low activity	0.361	0.329	1.405 (0.744 - 2.652)	-	-	

Abbreviations: BMI, Body Mass Index; RDA, recommended dietary allowances.

[a] $P < 0.25$

[b] $P < 0.05$

Table 2. Prevalence of Postpartum Depression

PPD	No. (%)
No depression (EPDS < 10)	341 (88.1)
Depression (EPDS Score ≥ 10)	46 (11.9)

Abbreviations: PPD, postpartum depression; EPDS, Edinburgh Postnatal Depression Scale.

The study found the prevalence of PPD was 11.9% for the duration of postpartum from two to 24 weeks. This rate was higher than data from Indonesian basic health research in 2018, which recorded a prevalence of 5.4%. The data collection was conducted during the COVID-19 pandemic. This condition may explain our findings. The WHO also reported that during the pandemic, there was an increase in anxiety and depression worldwide of more than 25%. In addition, the global prevalence of PPD was 34%, much higher than the incidence before the pandemic (1). On the other hand, there are limitations to postpartum maternal health services, and increased stress and anxiety. The postpartum women could not access midwives for counseling, education, and care.

Maternal and child health programs in developing countries have been focusing on improving nutritional status and addressing malnutrition, rather than on women's emotional and mental health during and after pregnancy. However, in Indonesian postpartum health services, PPD conditions are often underdiagnosed. Women are diagnosed with PPD if they are aware of the symptoms and report them to their midwife or other health worker. This process is subjective because the experience and knowledge of health workers may vary in recognizing the signs of PPD. Therefore, several studies in various countries, including Indonesia, have identified the EPDS as the best tool for the early detection of PPD. The EPDS assesses emotional distress, anxiety, and depression. Women, midwives, and nurses can complete the EPDS in no more than 5 minutes. When all postpartum women complete the EPDS, PPD can be detected more quickly, allowing health workers to intervene with those who suffer from it.

5.2. The Association Between Nutritional Status (Body Mass Index) and Postpartum Depression

First, we found that obesity in the third trimester of pregnancy is associated with PPD. Obesity is linked to the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis in both pregnant and general populations. Dysregulation of the HPA axis can trigger a series of systemic reactions, including inflammation, which can result in depression, exhaustion, and trouble sleeping (21). In contrast, another study reported that obesity in the preconception period is associated with PPD (11). Preconception obesity was associated with an increased probability of gestational and PPD (22). During pregnancy, serum proinflammatory mediators change. Women with obesity show elevations in serum proinflammatory markers compared to pregnant women with normal weight (23). Unlike Japanese women, weight-loss methods before conception are associated with PPD (24).

Second, we found that an underweight BMI in the postpartum period is associated with PPD. Regardless of a history of depression, women in the lowest BMI category had a 50% higher chance of developing PPD than those in higher BMI categories; however, a history of depression alters this risk for women in the lowest BMI category (10). Reports of postpartum weight loss suggest a significant degree of fluctuation in overall weight shift. Previous studies have reported a relationship between the duration and exclusivity of breastfeeding and postpartum weight loss at 6 - 12 months of age. Breastfeeding aids weight loss by mobilizing fat stores and increasing energy expenditure (25).

Besides focusing on weight during the first trimester of pregnancy, it is very important to identify abnormal BMI during the postpartum period. This allows health workers to provide education on appropriate weight gain for pregnant women throughout their pregnancy. Recommendations for weight gain are based on preconception BMI: Underweight individuals should increase their weight by 12.5 - 18 kg, normal-weight individuals should increase their weight by 11.5 - 16 kg, overweight individuals should increase their weight by 6.8 - 11.3 kg, and obese individuals should increase their weight by 5 - 9 kg during pregnancy.

5.3. Energy Intake Associated with Postpartum Depression

Third, we found that lower energy intake is associated with PPD. Cohen et al. (2002) documented that energy intake may impact the onset of mood disorders, depression, or depressive symptoms (26). The same study found that consuming hydrolyzed protein high in tryptophan led to an elevation in good mood and a reduction in the cortisol response to sudden stress (27). Fowles and Walker found that more than half of women after giving birth have diets that are not ideal, as indicated by the low proportion of women who satisfy the requirements of the food guide pyramid (12). Postpartum women need a RDA of 2700 kcal, but a study found that the median energy intake was below the RDA at 2,148 kcal (28). Postpartum women need more energy to recover after delivery and for breastfeeding.

Postpartum women should consume more calories and macronutrients (protein, fat, saturated fat, monounsaturated fat, polyunsaturated fat, and fiber) compared to women who gave birth more than a year prior, particularly in terms of micronutrients such as iron, folate, sodium, zinc, magnesium, phosphorus, potassium, niacin, retinol, riboflavin, thiamine, and vitamin E (29). The body undergoes recuperation during the postpartum period; aside from breastfeeding, these circumstances necessitate sufficient calorie consumption (30).

5.4. Limitations

Limitations of this study include that the food intake data collection did not encompass nutritional components such as protein, carbohydrates, and others. A source of bias is the self-reported food intake and PPD symptoms, which may compromise validity. The results have limited generalizability as the study population is confined to women in Samarinda, who may have

different cultures and traditions from other populations. It is suggested that intervention studies be conducted in the future. From the study findings, it is recommended that a standardized screening tool be used for the early detection of PPD, and proper weight management should be executed for those at risk of PPD.

Footnotes

Authors' Contribution: Conceptualization, methodology, formal analysis, writing original draft, writing review and editing, and supervision: R. W.; Methodology, data curation, writing original draft, and visualization: N. N. A.; Formal analysis, and writing review and editing: A. H. A.

Conflict of Interests Statement: The authors declare no conflict of interest.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after its publication. The data are not publicly available due to.

Ethical Approval: Ethical consideration approval was obtained from The Health Polytechnic of the Ministry of Health of East Kalimantan, with letter number LB.01.01/7.1/00152/2022, granted permission for the study. In addition, permission was requested from the Kartika Jaya Maternity Clinic, Ramlah Parjib 2, Hasanah, Kesuma, Ayu Husada, and the Islamic Center for Patient Data Collection.

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Informed Consent: All respondents were informed about the purpose and significance of the study before giving consent. The responses of the research participants were kept confidential.

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