



WEBSITE-BASSED EARLY DETECTION TO PREVENT POSTPARTUM DEPRESSION

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ABSTRACT

Postpartum depression is a serious mental health disorder that affects the well-being of both mother and baby, with a global prevalence of 10–20%. In South Tangerang, 32.5% of mothers experience baby blues, which carries a risk of developing into depression. Early detection is still hindered by inefficient manual screening, social stigma, and a lack of privacy. This research emphasizes the need for a digital screening system that facilitates early intervention. The study was a Research and Development (R&D) approach with the ADDIE model and an explanatory sequential mixed methods design. Quantitative data were collected through a one-group pretest-posttest design involving 136 postpartum mothers at three Community Health Centers in South Tangerang using purposive sampling. The EPDS and TAM instruments were used, while qualitative data were obtained through in-depth interviews. Data were processed and analyzed using SPSS through editing, coding, data entry, and cleaning stages. Quantitative analysis included descriptive, bivariate, and multivariate analysis, while qualitative data were analyzed using thematic analysis. The NABILAH website was rated “Very Feasible” by experts (100%), media experts (98.91%), and accepted by users (88.84%). Depression scores decreased significantly from week 1 to week 4 after the intervention ($p = 0.000$). Lack of physical activity was identified as the dominant factor (OR 14.357). Qualitative analysis showed that the system effectively addressed privacy and time efficiency constraints and provided a sense of security for mothers. The NABILAH model has been proven effective and feasible as a digital screening solution in primary care services.

Keywords: digital screening; EPDS; mental health of mother; nabilah web posrpartum

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INTRODUCTION

Postpartum depression (PPD) is a serious mental disorder after childbirth, marked by prolonged sadness, anxiety, fatigue, sleep problems, and even thoughts of self-harm or harming the baby, and requires medical treatment rather than being considered a normal adjustment (Sadock, 2017; Beck, 2020). Globally, PPD affects 10–15% of mothers in developed countries and up to 20–40% in developing countries, while in Indonesia the incidence is estimated higher due to low detection, including in Banten where postpartum emotional problems continue to increase (WHO, 2023; Ministry of Health RI, 2023). The main issue lies in limited early detection, low mental health literacy, stigma, and manual screening that is restricted to health facilities, which delays identification and intervention even though PPD has significant impacts on mothers, infants, and family functioning (O’Hara & McCabe, 2020; Rachmawati, 2022). Along with digital health development, web-based screening offers a more accessible and flexible solution, yet its implementation in Indonesia remains limited and not fully integrated with education and referral systems. Therefore, this study develops a web-based screening system to enable early detection, provide psychological education, and facilitate referral to health services, aiming to improve timely identification and prevention of postpartum depression in a more accessible, integrated, and sustainable way.

Until now, postpartum depression (PPD) screening efforts in Indonesia have not been optimally implemented. Although some primary healthcare centers use conventional methods such as interviews and the Edinburgh Postnatal Depression Scale (EPDS), these approaches remain manual, are not integrated into digital systems, and generally lack follow-up or referral mechanisms. In addition, technology-based interventions for early PPD detection in Indonesia are still limited, particularly those combining screening and psychological education through a community-based approach. To address this gap, a web-based screening platform was developed to provide early detection of PPD risk, psychological education, and referral to appropriate mental health services. This innovation was designed to suit the characteristics of South Tangerang, an urban area with high internet penetration but without a structured digital PPD prevention system. The platform is expected to create a more accessible, measurable, and responsive postpartum mental health prevention system at both the individual and primary healthcare levels.

METHOD

This study employed a Research and Development (R&D) design using the ADDIE model to develop and evaluate the effectiveness of a website-based postpartum depression prevention program through the NABILAH application. The quantitative approach was conducted using a pre-experimental One Group Pretest-Posttest Design ($O1 \rightarrow X \rightarrow O2$), utilizing the EPDS instrument along with risk factor and Technology Acceptance Model (TAM) questionnaires. The study population consisted of 1,080 postpartum mothers (days 1 to 28) across three community health centers in South Tangerang City (Pamulang, Kampung Sawah, and Pondok Aren), with a sample of 136 respondents selected through purposive sampling and determined using the Slovin formula. The intervention, delivered through the NABILAH platform over four weeks, included pretest and posttest measurements. Quantitative data were analyzed using univariate, bivariate (Paired T-Test or Wilcoxon, and correlation tests), and multivariate analysis with multiple linear regression at a significance level of $\alpha = 0.05$. The qualitative approach involved in-depth interviews with at-risk postpartum mothers ($EPDS \geq 10$), family members, healthcare providers, heads of community health centers, and health office officials using a snowball sampling technique. Data were analyzed using a thematic approach to explore experiences, perceptions, and acceptance of the NABILAH system, with validity ensured through triangulation of sources, techniques, and time. The study applied an explanatory sequential mixed methods design, in which quantitative data were collected first and subsequently enriched with qualitative findings. This study received ethical approval from the Health Research Ethics Committee of the Faculty of Health Sciences, National University (No. 103/e-KEPK/FIKES/X/2025).

RESULT

Respondent Characteristic

Table 1.
Respondent characteristics (n=136)

Responden Characteristic	f	%
Age		
Not at Risk	123	90,4
At Risk	13	9,6
Education		
High	76	55,9
Low	60	44,1
Occupation		
Unemployed	104	76,5
Employed	32	23,5
Income		
At/Above Minimum Wage	78	57,4
Below Minimum Wage	58	42,6

Table 1, it can be seen that among 136 responden, the majority of postpartum mothers were of a non-risk age (90.4%), highly educated (55.9%), and unemployed (76.5%). In terms of income, the majority earned an income equivalent to the regional minimum wage (UMR) (57.4%). In general, the respondents were dominated by mothers of a non-risk age, relatively highly educated, unemployed, and with a family income equivalent to the regional minimum wage.

Respondent Characteristic of Dependent and Independent Variables

Table 2.

Respondent Characteristic of Dependent and Independent Variables (n=136)

Respondent Characteristic	Weeks 1 (Pre-test)		Weeks 2		Weeks 4 (Post-test)	
	f	%	f	%	f	%
History of Mental Disorders						
None	120	88,2	-	-	-	-
Present	16	11,8	-	-	-	-
Infant Condition						
Healthy Infant	117	86,0	-	-	-	-
Premature	7	5,1	-	-	-	-
Low Birth Weight (LBW)	7	5,1	-	-	-	-
NICU Care	5	3,7	-	-	-	-
Pregnancy Complication						
None	88	64,7	-	-	-	-
Present	48	35,3	-	-	-	-
Postpartum Depression						
Low Risk	102	75,0	116	85,3	124	91,2
Moderate Risk	25	18,4	15	11,0	10	7,4
High Risk	9	6,6	5	3,7	2	1,5
Family Support						
Good Function	45	33,1	46	33,8	46	33,8
Moderate Function /At Risk	44	32,4	45	33,1	45	33,1
Family Dysfunction	47	34,6	45	33,1	45	33,1

Table 2, most respondents had no history of mental disorders, delivered healthy babies, and did not experience pregnancy complications. The risk of postpartum depression improved from Week 1 to Week 4, shown by an increase in the low-risk category and a decrease in moderate and high-risk categories. Family support and breastfeeding problems remained relatively stable, while physical activity improved over time. In contrast, sleep quality tended to decline, with most respondents reporting poor sleep quality in Weeks 2 and 4.

System Development and Qualification (NABILAH Web)

The NABILAH (Happy and Healthy Mother Navigation) system was designed as a web-based platform that integrates early detection of postpartum depression using the EPDS instrument with flexible mental health education. The design includes a simplified interface for easy access by postpartum mothers, the development of educational materials based on literature reviews (sleep management, nutrition, breastfeeding techniques, and social support) in the form of animated videos and the e-book "Recovering Happily," as well as key features such as automatic score calculation and access to consultations via WhatsApp. The interface design includes a WhatsApp number-based login and registration page, profile filling and informed consent, a questionnaire category dashboard (EPDS, physical activity, family support, sleep quality, and breastfeeding problems), interactive questionnaire completion, and the display of screening results accompanied by recommendations and educational materials. In addition, the system is equipped with regular monitoring features through questionnaire history and direct access to midwives, thus functioning as a support and liaison between postpartum mothers and health workers.

The development of the NABILAH Web was based on the need for a more efficient postpartum depression screening system, considering that conventional methods are still manual, less than optimal, and hampered by stigma. This system is designed as a web-based platform that integrates screening using the EPDS with mental health education through videos and e-books, equipped with automatic scoring features and referrals to health professionals. The results of the feasibility test showed that the NABILAH Web was considered very feasible by media experts (98.91%) and material experts (100%), and obtained a user acceptance rate of 88.84% with positive responses in aspects of usability, ease of use, attitudes, and interest in use. Overall, this system was declared feasible and can be used as a screening and education medium in the prevention of postpartum depression.



Figure 1. Nabilah Web Account Login and Registration Page Display

Analysis Qualitative

Theme 1: The Reality of Depression Symptoms and the Strong Stigma in Society

This theme demonstrates that postpartum depression symptoms in postpartum mothers often go undetected due to the ambiguity of symptoms and strong internal and socio-cultural stigma. Mothers experience confusion in recognizing their emotional state, coupled with limited access to valid information. Furthermore, self-stigma, including shame and fear of being perceived as ungrateful, tends to isolate mothers and makes them reluctant to seek help. These barriers are further reinforced by family and cultural environments that still view mental health issues as myths or trivial matters. Overall, this situation reflects the low level of early detection of postpartum depression due to the interaction of psychological, social, and cultural factors. Therefore, an approach that guarantees privacy, provides objective validation, and involves the family as the primary support system is needed.

Theme 2 : Ineffectiveness of Manual Screening System

This theme demonstrates that the manual postpartum depression screening system is ineffective in supporting optimal early detection. The main obstacles stem from the high workload of health workers and time constraints, often neglecting mental health screening and focusing on physical aspects of care. Furthermore, the paper-based documentation system is considered inefficient due to the risk of loss and lack of support for ongoing monitoring. From a user perspective, limited access and impracticality of face-to-face services, such as long queues and difficulty transporting infants, contribute to lower maternal participation in screening. Overall, the ineffectiveness of this conventional system reflects operational, systemic, and accessibility barriers that hinder early detection of postpartum depression, necessitating a transformation to a more efficient, integrated, and accessible digital system.

Theme 3 : Need for Web-Based System Development (Web NABILAH)

This theme demonstrates the urgent need for the development of a web-based system as a solution to the privacy barriers, service inefficiencies, and limited access to information identified in the previous theme. The Web NABILAH system is seen as capable of providing a "safe space" for postpartum mothers to honestly express their emotional states, while also providing easy, flexible access via mobile devices. From the perspective of healthcare workers, the need for efficiency

arises through automation features such as auto-scoring, which can reduce administrative burdens and increase focus on clinical care. Furthermore, the system also functions as an integrated educational tool for families, especially husbands, in understanding the psychological condition of postpartum mothers. Overall, the development of Web NABILAH reflects the need for a system that is not only efficient and accessible but also able to bridge the clinical, psychological, and social aspects in efforts to detect postpartum depression early.

Bivariate Analysis

Chi-Square Analysis

Tabel 3.
Association Between Independent Variables and Depression Postpartum

Association Between Independent Variables and Depression Postpartum							
Variable	Depression Postpartum						P Value
	Low Risk		Moderate Risk		High Risk		
	f	%	f	%	f	%	
History of Mental Disorders							
None	104	86,7	12	10,0	4	3,3	0,465
Present	12	75,0	3	18,8	1	6,3	
Infant Condition							
Health Baby	99	84,6	13	11,1	5	4,3	0,602
Preterm	7	100,0	0	0,0	0	0,0	
Low Birth Weight (LBW)	5	71,4	2	28,6	0	0,0	
NICU Care	5	100,0	0	0,0	0	0,0	
Pregnancy Complication							
None	72	81,8	12	13,6	4	4,5	0,301
Present	44	91,7	3	6,3	1	2,1	
Family Support							
Good Functioning	46	100,0	0	0,0	0	0,0	0,000
Moderate / At-Risk Functioning	45	100,0	0	0,0	0	0,0	
Family Dysfunction	25	55,6	15	33,3	5	11,1	
Breastfeeding Problems							
None	46	100,0	0	0,0	0	0,0	0,000
Mild	43	95,6	2	4,4	0	0,0	
Severe	27	60,0	13	28,9	5	11,1	
Low Physical Activity							
Good Activity	68	100,0	0	0,0	0	0,0	0,000
Moderate Activity	48	70,6	15	22,1	5	7,4	
Sleep Quality							
Good Sleep Quality	68	100,0	0	0,0	0	0,0	0,000
Poor Sleep Quality	48	70,6	15	22,1	5	7,4	

Based on the results of the chi-square test on several variables, the majority of respondents were in the low-risk category of postpartum depression, namely 116 respondents (85.3%), followed by 15 respondents (11.0%) with moderate risk and 5 respondents (3.7%) with high risk. The analysis showed that a history of mental disorders ($p = 0.465$), baby's condition ($p = 0.602$), pregnancy complications ($p = 0.301$), and sleep quality ($p = 0.279$) did not have a significant relationship with the incidence of postpartum depression although there were variations in the proportion at each risk level. In contrast, family support ($p = 0.000$), breastfeeding problems ($p = 0.000$), and physical activity ($p = 0.000$) showed a significant relationship with postpartum depression, where respondents with good family support and no breastfeeding problems and good physical activity tended to be all at low risk, while in conditions of family dysfunction, severe breastfeeding problems, and lack of physical activity, an increase in the proportion of medium and high risks was found.

Friedman Test

Tabel 4.

Friedman Test Measuring the effectiveness of a web-based system on changes in postpartum depression scores.

Measuring Time	Mean Rank	df	Asymp. Sig. (p)
Postpartum Depression (Week 1)	2.17	2	0,000
Postpartum Depression (Week 2)	1.97		
Postpartum Depression (Week 4)	1.85		

The Friedman test showed a significant decrease in postpartum depression scores over time ($p = 0.000$), from week 1 to week 4.

Wilcoxon Test

Tabel 5.

Post Hoc Wilcoxon Test Results Summary

Comparison of Measurement Time	Z	Asymp. Sig. (2-tailed)
Week 2 – Week 1 (Pre-test)	-4,243	0,000
Week 4 – Week 2	-3,051	0,002
Week 4 (Post-test) – Week 1 (Pre-test)	-5,385	0,000

The Wilcoxon test confirmed significant differences between all measurement periods ($p < 0.05$), indicating a continuous reduction in scores.

Spearman Test

Tabel 6.

Correlation Between Video and Ebook Media Use and Reduction in Depression Level

Independent Variable	Dependent Variable	Spearman's rho	Sig. (2-tailed)
Video	Depression reduction (pre-post difference)	0.903	0.000
Ebook	Depression reduction (pre-post difference)	0.876	0.000

There is a very strong and significant positive correlation between learning media and reduction in postpartum depression scores ($p = 0.000$). Video shows a slightly stronger correlation than ebook.

Tabel 7.

Correlation Between Video and Ebook Media Use and Reduction in Depression

Variable Pair	Spearman's rho	Sig. (2-tailed)
PEOU – PU	0.732	0.000
PEOU – System Acceptance	0.881	0.000
PU – System Acceptance	0.747	0.000

All variables show significant positive correlations ($p = 0.000$). PEOU and PU are strongly related and both are significantly associated with system acceptance, with PEOU showing the strongest relationship.

Multivariate Analysis

Tabel 8.

Correlation Between Video and Ebook Media Use and Reduction in Depression

Variable	B (Coefficient)	SE	Wald	df	Sig (p)	Odds Ratio (Exp B)	95% CI for Exp(B)
Low Physical Activity	2.664	1.056	6.360	1	0.012	14.357	1.811 – 113.850
Constant	-6.869	2.040	11.339	1	0.001	0.001	-

Low physical activity was significantly associated with postpartum depression ($p = 0.012$). Mothers with low physical activity had about 14 times higher risk of experiencing postpartum depression compared to those with adequate activity. The positive B value indicates a direct relationship, meaning lower physical activity increases the likelihood of postpartum depression.

DISCUSSION

Characteristics of Postpartum Depression Prevention System Users in South Tangerang

The characteristics of respondents in this study were dominated by protective factors against postpartum depression, as most were of healthy reproductive age (Shorey et al., 2021; Wang et al., 2022; Sari & Astuti, 2021), had higher education supporting health literacy and digital system use (Ng et al., 2021; Okano et al., 2022; Lestari & Dewi, 2021), and had relatively stable family economic conditions despite most being unemployed (Wu et al., 2021; Dagher et al., 2020; Veri & Lestari, 2024; Nguyen & Chen, 2022). In addition, the majority had no history of mental disorders, which are key risk factors for postpartum depression (Silverman et al., 2020; Putnam et al., 2021; Meltzer-Brody & Howard, 2022), and most gave birth to healthy babies that supported maternal psychological well-being (O'Brien et al., 2023; Provenzi et al., 2025; Permatasari & Hidayah, 2022). However, family support varied and remained an important external factor in preventing postpartum depression, where adequate support can significantly reduce the risk (Xu, 2022; Putri & Juwita, 2025; Ibtihal et al., 2025).

Design of a Web-Based Screening System (Web NABILAH)

NABILAH Web is a user-driven digital health system that integrates ease of access, automated EPDS screening, CBT-based education, and social support for postpartum depression prevention. Ease of use (PEOU) is supported by a simple interface and WhatsApp access (Davis, 1989; Alzahrani et al., 2021; Ray, 2021), while system benefits (PU) are seen in rapid and accurate screening that improves early detection (Venkatesh, 2022; Nicholson et al., 2021; Ministry of Health of the Republic of Indonesia, 2023). Educational videos and e-books are effective in increasing maternal understanding and self-efficacy (Fonseca et al., 2020; WHO, 2013; Lawrence et al., 2024). The system also implements data protection and digital ethics to increase user trust (PP No. 17 of 2025; Bit-Avrágim, 2024), and provides direct access to midwives for social support and isolation prevention (Lailiyana & Permata Sari, 2021; Oyetunji & Chandra, 2021). Overall, the NABILAH website effectively supports early detection and comprehensive prevention of postpartum depression.

Needs, Perceptions, and Barriers to System Utilization.

Qualitative analysis reveals a gap between the high psychological burden of postpartum mothers and the limited healthcare system, exacerbated by stigma and limited services, resulting in many cases of postpartum depression going undetected (O'Mahen, Lawson, & Taylor, 2021; Shorey, Chee, & Ng, 2022; Lestari & Putri, 2021; Akalin, 2025; Zhou, Wang, & Li, 2021; Fitriani & Pratiwi, 2021). The NABILAH website was developed as a technology-based solution to bridge this gap through safe and private self-screening to reduce stigma barriers and increase maternal openness (Nurbaeti et al., 2021; Rahmatina et al., 2025). This system also improves service efficiency through an auto-scoring feature that accelerates detection and supports healthcare workers' focus on intervention, in line with the Technology Acceptance Model's concept of perceived usefulness (Davis, 1989; Venkatesh, 2022; Eisner, 2022). Furthermore, providing education for mothers and families through videos and e-books strengthens social support and reduces stigma within families, which act as important protective factors (Shorey & Chee, 2021; Mangngi et al., 2024). Overall, the NABILAH website functions as a digital ecosystem that integrates screening, education, and referrals to support comprehensive and holistic postpartum depression prevention.

Web-Based Screening System Development (NABILAH Web)

The development of the NABILAH Web demonstrated very high feasibility based on validation by media experts (98.91%), content experts (100%), and user testing (88.84%), confirming that the system is technically feasible, content-wise, and user-acceptable. From a media perspective, the interface was rated excellent in terms of usability and visual communication (100%), and the

system's functions, including the automatic EPDS feature, performed optimally (96.8%), in line with the Diffusion of Innovations principle, which emphasizes ease and technological suitability (Rogers, 2003). Excellent material validation (100%) ensures that the video-based and e-book-based educational content has a strong medical basis and is effective in supporting postpartum mothers' understanding. User testing showed a “very feasible” category with a score of 88.84%, with Perceived Usefulness (88.4%) and Perceived Ease of Use (87.8%) supporting system acceptance according to the Technology Acceptance Model (Davis, 1989; Alzahrani et al., 2021), as well as positive user attitudes (90%) and continued use intentions (89.6%). Overall, the integration of technical quality and user acceptance indicates that the NABILAH Web is an effective, easy-to-use innovation with strong potential to support early detection and sustainable prevention of postpartum depression.

Analysis of Risk Determinants and Effectiveness of the NABILAH Website in Preventing Postpartum Depression

Research results indicate that psychosocial and physiological factors are significantly associated with postpartum depression, particularly family support ($p=0.000$) and breastfeeding problems ($p=0.000$), confirming the important role of the social environment and lactation conditions in maternal mental health (Shorey & Chee, 2021; Xu, 2022; Hassan, 2024; Ibtihal et al., 2025; Indrianita et al., 2022; Figueiredo, Canário, & Field, 2022; Izzati et al., 2025). Multivariate analysis showed that physical inactivity was the most dominant factor ($p=0.012$), which is associated with neurochemical changes, oxidative stress, and decreased psychosocial functioning (Ko, Lee, & Kim, 2021; Veri & Lajuna, 2024). In addition, the NABILAH website has been shown to significantly reduce postpartum depression scores ($p=0.000$) through early detection, digital education, and self-monitoring, in line with technology-based mental health literacy (Lawrence 2024; Franco et al. 2024; Rahmatina et al. 2025; Nicholson et al. 2021; Nurbaeti et al. 2021; Eisner 2022). The effectiveness of the intervention is also supported by the use of video media ($r=0.903$) and e-books ($r=0.876$) which improve maternal understanding and coping (Fonseca 2020; Suryawan 2023; Mangngi et al. 2024). Furthermore, system acceptance was proven strong based on the Technology Acceptance Model, indicated by the relationship between ease of use ($r=0.881$) and system usefulness ($r=0.747$) with user acceptance (Davis, 1989; Dwivedi, 2020; Venkatesh, 2022; Alzahrani et al., 2021; Zhang & Yu, 2023; Farooq, 2023). Overall, the NABILAH Web is effective as a digital intervention that integrates risk factors, education, and technology acceptance in comprehensively preventing postpartum depression.

CONCLUSION

This study indicates that postpartum depression is mainly influenced by psychosocial factors such as family support, breastfeeding problems, and physical activity. The NABILAH website is feasible, well accepted, and effective in reducing depression scores through EPDS screening, auto-scoring, digital education, and rapid referral features. It also supports healthcare workers and provides a safe space for early self-detection.

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