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Original Research

Smart Diagnosing System Design To Accelerating Early Detection Of Postpartum Blues

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ABSTRACT

Background: *Untreated mothers with postpartum blues are at greater risk of severe mental health disorders. At the same time, early detection tools are manually provided and paper-based, and they cannot offer accessible access to center-compiled data despite their lack of priority in mental health services.*

Methods: *Using a mixed-methods study design, the researcher used semi-structured interviews, while the quantitative approach was conducted using demographic questionnaires and a survey resulting from the interviews. A total of 16 participants were chosen for the qualitative study, and 60 respondents participated in the quantitative study. The sample for the study was screened by using the Edinburgh Postnatal Depression Scale (EPDS) within the area of Sibela Healthcare Center in Surakarta. Data collection used instrument tests and observation sheets and was analyzed by the Chi-Square statistical test.*

Results: *Quantitative data analyses identified a relationship between age and the incidence of postpartum blues in mothers (p-value of 0.004; OR 0.053). This study showed that mothers aged < 21 and > 35 years old have a 0.067 times higher development of postpartum blues than mothers aged 21-35.*

Conclusion: *Both qualitative and quantitative data suggest that postpartum mothers need support from husbands in overcoming the blues. Mothers and husbands need a comprehensive digital mobile phone service that involves professional health workers, health service providers, and referral systems.*

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INTRODUCTION

In the first few weeks after delivery, postpartum blues often occur in 50% or more of women with app (Howard et al., 2014). Symptoms of the blues develop within two to three days postpartum and resolve within two weeks (Balaran & Raman, 2021). Postpartum blues symptoms are mild, temporary, and can heal independently. The impact of the postpartum blues can cause mothers to feel reluctant to take care of the

health of themselves and their babies and be unwilling to breastfeed (Admon et al., 2021). 30-50% of blues symptoms that lead to depression and are not treated can increase the risk of recurrence in subsequent pregnancies and childbirth Brummelte & Galea, (2016), where 24,000 mothers are at risk for suicide (Admon et al., 2021).

Indonesia has not considered the incidence of postpartum blues. This concern is due to the public perception that postpartum mothers' postpartum blues are common. This problem is in line with the absence of prenatal mental statistical data displayed in the 2020 Indonesian Health Profile (Ministry of Health Republic Indonesia, 2020).

Although the Maternal Mortality Rate (AKI) decreased in 2018–2019 from 4,226 to 4,221, maternal mortality indicators still focus on physical problems. In the city of Surakarta, the health service target still focuses on biological monitoring and physical care, providing communication, information, and education (KIE) on the health of postpartum mothers and newborns and family planning services. The providers at the Sibela Public Health Center in Surakarta are unable to precisely identify the incidence of postpartum blues and depression because they did not conduct comprehensive postpartum blues examinations and instead focused on physical recovery in postpartum mothers (BBC News, 2021).

Healthcare providers should carefully evaluate postpartum blues mothers to meet the diagnostic criteria for depression. Since the release of the 2016 US Preventive Service Task Force (USPFTF) recommendation for screening and staff to ensure accurate diagnosis, a follow-up of treatment and support beyond screening has demonstrated an absolute risk reduction in depression prevalence of as much as 9% (O'Connor, Rossom, Henninger, Groom, & Burda, 2016). A useful clinical tool for identifying depression in postpartum mothers is the Edinburgh Postnatal Depression Scale (EPDS) (Balaran & Raman, 2021).

EPDS is the first step in meeting the need for identifying postpartum blues. Validation of postpartum blues events helps produce a fast, accurate, and comfortable postpartum recovery. Although they do not require treatment, postpartum blues mothers need partner support, information, care, and mental health resources (K. L. Chan, Leung, Tiwari, Or, & Ip, 2019). Treatment is not only centered on the mother but also connects with health workers (doctors, nurses, and psychologists) and family (husband or closest person).

Over the last decade, computer-based technology has effectively supported maternal postpartum recovery (Firth, Torous, Nicholas, Carney, Pratap, et al., 2017) (Firth, Torous, Nicholas, Carney, Rosenbaum, et al., 2017) (Sun et al., 2019). The smartphone is the most effectively used application to disseminate health information, and mobile-based interventions have been shown to reduce depression (Firth, Torous, Nicholas, Carney, Pratap, et al., 2017) (Firth, Torous, Nicholas, Carney, Rosenbaum, et al., 2017) (Sun et al., 2019). Intelligent medical services are needed to create a medical system capable of monitoring, diagnosing, and providing remote care (Balaran & Raman, 2021) (Rhayem, Mhiri, Drira, Tazi, & Gargouri, 2021).

The smart diagnostic system here detects the patient's condition according to his complaint. This system can also recommend interventions according to the patient's condition (Basu, Sinha, Ong, & Basu, 2020) (Gulshan et al., 2016) (Güneş, Yaman, Çekyay, & Verter, 2014). Previous research has shown that the EPDSAp prototype in Android OS has been tested for validity and reliability using a sensitivity test of 83%, and a specificity test of 77.78% (Novinaldi, Edwardi, Gunawan, & Sarli, 2020).

The results of the positive predictive value (PPV) are lower than the negative predictive value (NPV). In which the study displays results based on a score above 10, so the mother experiences depression or baby blues. In contrast, a score between 5 and 9 requires the supervision of the mother and re-evaluation using the EPDS application. That is why this study considered that the smart diagnostic system can connect postpartum mothers with health workers (doctors, nurses, and psychologists) and their husbands or significant others as the closest people who can monitor the recovery of postpartum mothers.

The study's goal is to investigate qualitatively related people's perceptions of postpartum blues and their expectations of its application design. This research expects to produce an application design that is fast, precise, and responsive in anticipating maternal psychiatric emergencies at Sibela Health Center Surakarta to support the acceleration of early detection of postpartum blues mothers.

MATERIALS AND METHOD

This mixed methods study investigated the perception of related people in the incident of postpartum blues and their expectations of its application design. The study combined qualitative research with a focus group discussion (FGD) and in-depth interviews. The authors conducted in-depth interviews with an obstetrics and gynecology specialist, a psychologist, and five pairs of postpartum mothers and their husbands. The authors also facilitated an FGD with a cadre, a midwife, a general practitioner, and a nurse who coordinated postpartum programs at Sibela Healthcare Center.

Recruitment for healthcare providers and a cadre was based on their contribution to a local healthcare center for postpartum programs. In contrast, the postpartum mothers and husbands were the people who used the local healthcare center's services. On the other hand, as the local health center did not have a mental health program and referred complex maternal patients, the authors recruited experts who were obstetrics and gynecology specialists and a psychologist who works in the central government hospital in Surakarta. The author established a good rapport with potential participants by offering them the opportunity to participate in the study voluntarily.

The data collected in this research involved all areas under the Sibela Health Center. The researcher used Colaizzi data analysis Polit & Beck, (2012) with bracketing, intuiting, analyzing, and describing processes. The authors collected data through a structured in-depth interview and FGD and conducted the research from July to October 2022. The Committee on Ethics at Universitas Kusuma Husada Surakarta approved this research with ID number 741.a/UKH.L.01/EC/VII/2022.

This study reached data validity through credibility, dependability, confirmability, and transferability processes. The first author confirmed to participants the suitability of the data based on the transcript. A member check was achieved by clarifying the conclusion to the participants, who agreed with the findings. The second and third authors were independent auditors who examined the overall activities of the first author. The study met the auditability principle, with the audit process involving consultation with independent auditors for data validity.

The findings reached confirmability and referred precisely to the recorded informants' answers and field notes, which guaranteed this study's objectivity. Last, a thick description was achieved as the transferability criteria. The informants' words were discussed under the "emerging themes" section so that readers could compare

other studies' results. Other studies also support the themes generated in this study according to the transferability criteria. A complete and transparent report on findings was presented to research examiners at the Center of Research and Engagement Service (LPPM) at Universitas Kusuma Husada Surakarta.

Each participant gave consent before each interview. The authors were informed of the sensitive nature of the interview guide content, and they were given the freedom to withdraw at any stage of the study. The authors conducted interviews with maximum privacy and strictly maintained data confidentiality.

An interview guide focused on how participants viewed the postpartum blues and the expectation of an application that can link mothers to related people. The authors carried out all interviews in Bahasa Indonesia with a Javanese dialect, which lasted from 30 minutes to 60 minutes. The data gathered reached the level of saturation (Corbin & Strauss, 2008).

For the quantitative data, an analytic-descriptive research design with a cross-sectional approach was used. The sample of the study screened 60 postpartum mothers using the *Edinburgh Postnatal Depression Scale* (EPDS) Cox, Holden, & Sagovsky, (1987) within the area of Sibela Healthcare Center in Surakarta. The research was conducted at the Sibela Surakarta Health Center from June to September 2022. Data collection used instrument tests and observation sheets and analyzed by the Chi-Square statistical test. This research presented a cash token range of Rp 50.000 to Rp 500.0000.

RESULTS

Qualitative Data

Eight themes were derived form the interviews, which were:

The vulnerability of postpartum mothers to manage self-change causes the occurrence of blues, as stated by the following participants:

"They usually come with symptoms of post-traumatic stress … such as panic, anxiety, restlessness, being unable to sleep, being sad, and so forth." (P3)

"… feel more sensitive, when my baby cries, I will cry instantly …" (P1)

"...stressed… tired…"(P4)

Untreated postpartum blues events could cause severe mental disorders, as stated by the following participants:

"Harm the child" (P1)

"…there was a patient who came for counseling after giving birth, and later the baby blues developed into depression …" (P3)

"Even more extreme, the mother committed suicide" (P6)

The lack of priority for postpartum mental health services influences the mother's efforts to overcome the blues, as stated by the following participants:

"Only examined for physical complaints" (P1).

"Mental health services already existed but not specifically for postpartum" (P10).

"General practitioners are available in local health centers, but psychological services are not covered there" (P3).

"Talk to husband..." (P7).

Digital services bridge the postpartum blues manual service, as stated in the following participants:
"Usually, when the patient comes, we provide manual education to explain more about what they are experiencing and its symptoms. Later, there will be a further referral to the psychologist" (P3).
"if I feel unease coming to the hospital, digital service is way more comfortable through chat or video" (P5).
"It is possible to do counseling via chat."Voice and video calls can also be suitable for patients who have problems coming directly due to physical limitations or distance" (P8).

Consultation is postpartum mothers' hope to overcome the blues by involving husbands as the primary support system, as stated by the following participants:
"*The service should be a place where mothers can share their feelings and what they have been through" (P7).*
"Both husband and wife must be involved…" (P5).
"… the husband's role is very important" (P13).

Comprehensive postpartum blues services involve professional health workers, health service providers, and referral systems, as stated by the following participants:
"In the local health centers, we didn't get screened, but later, when they have standards, they should cooperate and collaborate with the posyandu or other healthcare providers and clinics." (P11)
"Consultation with a psychologist is a must" (P7).
"Indeed, if the mother needs further assistance, they should be immediately referred to anticipate a severe disorder" (P9).

Postpartum blues digital services from mobile phones facilitate mothers to access comprehensive mental health service features, as stated by the following participants:
"The items should be screened in digital form as local healthcare centers have none of it." (P9).
"We need more health education on blues, also when their result show postpartum blues, they can use simple therapy feature and get referred if in more severe cases" (P3).
"For Moslems, they can have murottal of Quran, while for Christians, they can have a worship song" (P6).

Postpartum blues applications' obstacles do not hinder the benefits of the application, as stated in the following participants:
"Most of it would be capacity. Because not all phone capacity is big" (P15).
"10 out of 10 … I feel sorry for the mothers" (P1).

Quantitative Data
Table 1 shows that most postpartum mothers were aged 21–35 (32 respondents, or 67%). Most respondents were multiparous (55%), had normal delivery status (61%), and had high-level education (58%). On average, 46% of mothers were housewives, lived with husbands in the same household (46%), and had in-home childcare (67%), assisted by husbands and parents.

Table 1. Respondents Characteristics

Risk Factos	Frequency	
	n	%
Age		
20-35 years old	32	67
< 20 years old or < 35 years old	18	33
Parity		
Primipara	33	55
Multipara	27	45
Delivery status		
Normal	37	61
Sectio Caesaria	23	49
Place of delivery		
Hospital	35	58
Clinic or midwife clinic	25	42
Education		
High-level	35	58
Low-level	25	42
Occupation		
Working	28	47
Housewife/unemployed	32	53
Residential status		
Living with husband	55	91
Living apart from husband	5	9
Care of the baby		
In-home help	40	67
Self-care	20	33

Table 2 shows a relationship between age and the incidence of postpartum blues in mothers (p-value of 0.004; OR 0.053). This study showed that mothers aged < 21 and > 35 years old have a 0.067 times higher development of postpartum blues than mothers aged 21-35. In addition, there were significant results between parity status and the incidence of postpartum blues. Primipara mothers had 1.6 times higher risk of postpartum blues than multiparous mothers.

Housewife mothers had 0.98 times higher developing postpartum blues than multiparous mothers. Meanwhile, mothers who do not have assistance in childcare (self-care) have a 1.2 times greater risk of developing postpartum blues than mothers whose husbands or other family members help them.

Table 2. Data Analysis with Postpartum Blues Incident

Risk Factor	Postpartum Blues				Frequency		P-value	OR value
	No		Yes					
	n	%	n	%	n	%		
Age								
20-35 years old	30	50	2	3	32	67	0,004	(CI 95%) 0,067 (0,006-0,512)
< 20 years old or < 35	8	13	10	17	18	33		

Risk Factor	Postpartum Blues				Frequency		P-value	OR value
	No		Yes					
	n	%	n	%	n	%		
years old*								
Parity								
Primipara*	29	48	4	7	33	55	0,000	1,639
Multipara	19	32	8	13	27	45		(0,213-8,328)
Delivery status								
Normal	33	55	4	6	37	61	1,000	0,739
Sectio Caesaria*	15	25	8	14	23	49		(0,139-7,518)
Place of delivery								
Hospital	31	73	4	8	35	58	0,216	0,78
Clinic or midwife clinic*	20	7	5	12	25	42		(0,152-5,566)
Education								
High-level	25	44	10	13	35	58	0,430	0,688
Low-level*	22	36	2	7	25	42		(0,660-0,940)
Occupation								
Working	20	34	8	13	28	47	0,000	0,98
Housewife/unemploye*	28	46	4	7	32	53		(0,152-5,566)
Residential status								
Living with husband	46	76	9	15	55	91	0,205	0, 539
Living apart from husband*	2	4	3	5	5	9		(0,115-6,528)
Care of the baby								
In-home help	36	60	4	8	40	67	0,000	1,239
Self-care*	12	20	8	3	20	33		(0,228-8,426)

= *Referred

Table 3. Expected Service Feature

Expected Service Feature	n	%
Platform		
Mobile phone	56	93,3
Website	4	6,7
Digital form of service		
Consultation	7	11,7
Online referral	2	3,3
News	2	3,3
Consultation and social networing of pregnant mothers	3	5,0
Early detection of blues, consultation, news, social networking forum, online referral	46	76,7
Parties involved in application		
Husband	18	30,0
Husband and friend	4	6,7
Husband, nurse, and obstetrician	15	25,0
Husband, cadre, midwife, and obstetrician	19	31,7
Husband, parents, cadre, midwife, nurse and obstetrician	4	6,7
Early detection feature		
Result	13	21,7

Expected Service Feature	n	%
Interpretation	4	6,7
Result, interpretation, follow-up	43	71,7
Consultation feature		
Chat, Voice call, Video call	12	20,0
Chat Video Call	7	11,7
Chat	40	66,7
Chat Voice call	1	1,7
News feature		
Video	7	11,7
Health news, video	29	48,3
Health news	24	40,0
Therapy feature		
Game	5	8,3
Music, funny video, yoga/meditation	32	53,3
Murottal/worship, music, funny video, yoga/meditation	15	25,0
Music	8	13,3
Discussion forum feature		
Send message	13	21,7
Create status	12	20,0
Create status, give like, comment, send message, react with emoticon	35	58,3
Online referral feature		
Connected to government health center	5	8,3
Connected to local health center or clinics,	10	16,7
Connected to local health center or clinics, cadre, midwife, psychologist, government health center, hosptal and pharmacy	45	75,0

Table 3 shows that most respondents (63%) chose the mobile service feature as the expected form of the postpartum blues application. 76.7% of mothers chose early detection of postpartum blues, consultation, related health education materials, social networking sites of groups of pregnant women, and online referrals as a comprehensive form of digital service. A total of 48% of respondents chose health news and videos. 53% of mothers choose music therapy, funny videos, and meditation or yoga as therapy when the mother is feeling anxious and tired while caring for the baby. 58% of mothers choose discussion forum features compatible with social media, which can create status updates, give likes and comments, send messages, and have emoticons.

DISCUSSION

The first theme was the vulnerability of postpartum mothers to manage self-change, which causes the occurrence of the blues. Postpartum mothers experience significant hormonal changes from pregnancy to delivery (Dalfen, 2008). Their estrogen and progesterone levels rise steadily through pregnancy and drop dramatically during delivery. As progesterone and estrogen control moods by interacting with serotonin, this fluctuation during the postpartum period is the first layer of risk. During the postpartum period, the hormones, behavior, and moods cause blues to manifest (Dalfen, 2008).

The study found that participants' blues is the psychological response when mothers cannot adjust to enormous and rapid change during the postpartum period. Not

only did all five participants felt stressed, tired, sad, afraid, confused, and more sensitive, but they also showed anger and refused to interact with family members. Some of them also mentioned that they received no support from family members and did not know what to do and think when they needed to adjust to their physical and emotional changes.

Asadi, Noroozi, & Alavi, (2022) stated that the motherhood transition is associated with stress and difficulties as they cannot find appropriate resources. Such stress occurs in various physical, psychological, social, economic, and family dimensions Johansson, Benderix, & Svensson, (2020) and is sourced from internal and external factors (Putriarsih, Budihastuti, & Murti, 2017). Internal factors include psychological conditions such as worries, fears, and anxieties about themselves and their children, financial problems, and prohibitions or myths that mothers must obey after giving birth.

External factors include the absence of adequate support from husband and family, and the hormonal changes mothers feel (Oktaputrining, C., & Suroso, 2018). Also, those who experienced physical fatigue experienced postpartum blues. As mothers adjust to an additional role and new responsibilities in newborn care, some of them also experience a history of prolonged labor and a lack of rest and sleep, all of which can cause physical fatigue.

Not only that, but their physical fatigue is also caused by babysitting, changing diapers, nursing, bathing, and petting babies all day. Thus, those activities drain their energy and cause prolonged fatigue in the mother, especially without the help of her husband or other family members (Kumalasari & Hendawati, 2019). In the quantitative data, age is one of the risk factors influencing the incidence of postpartum blues.

Mothers aged <20 years or >35 years are at 3.5 times greater risk of developing the blues than those aged 20 to 35 (Yuniwati, Fithriany, & Fahriany, 2016). Primipara mothers aged <20 or > 35 are at a higher risk of pregnancy-related complications, while women under 20 whose bodies are not mature enough to absorb iron need large quantities. These young mothers are more likely to have an abortion and have their membranes rupture prematurely.

On the other hand, women over 35 might get too tired during childbirth. These events will make the mother’s condition psychologically unstable, leading to postpartum blues (Marwiyah et al., 2022). This study aligns with Salat & Suprayitno, (2022) finding that postpartum mothers aged less than 20 and over 35 years experience severe anxiety during the third trimester.

This is due to the lack of mental readiness in pregnant women at a young age, while mothers over 35 have anxiety during childbirth. From the data above, pregnancy at a risky age will undoubtedly affect mothers’ psychological condition after childbirth, resulting in postpartum blues. Pregnancy is one of the crucial factors that play a role in the incidence of postpartum blues. Mothers who give birth for the first time will adjust to role changes they have never experienced (Filaili, 2020).

The experience of giving birth for the first time is a stressful one that affects the adaptation process, which primiparous mothers experience more often than postpartum blues (Kusuma, 2019). Maternal anxiety starts from delivery until after childbirth. Some stressful events originate from postpartum pain, the newborn's condition, the safety of mothers and babies, newborn care, and the breastfeeding process (Solama & Handayani, 2022).

Mothers who do not have experience caring for babies will be exposed to worry, fear, and anxiety if they make mistakes. Primiparous mothers often feel confused about their new role, feel the maternal burden, and think they have no freedom after childbirth (Fatmawati, 2015). The existence of parties involved in newborn care is a factor that influences the incidence of postpartum blues. The existence of family support during postpartum makes mothers feel comfortable and emotionally relieved because they feel cared for and exposed to more information.

According to Taylor, social support can effectively reduce conditions that can be psychologically harmful in times of stress, resulting in a decline in postpartum blues incidents. The study showed that 20% of postpartum mothers who did not receive in-home childcare support had a 1.2 times greater risk of developing postpartum blues. Mothers with no support in caring for their babies will be at risk of having more burdens and experiencing prolonged fatigue that will cause postpartum blues.

The second theme was that untreated postpartum blues could cause severe mental disorders. The study found that participants mentioned how mothers refuse to take care of the baby and leave their husbands and house and harm the baby as depression may happen. Participants also mentioned that untreated blues lead to depression, and mothers may risk hurting themselves by suicide.

In Indonesia, people often seem less concerned about the incidence of postpartum blues due to the term's misunderstanding. Some people believe that postpartum blues are a natural side effect of fatigue after childbirth. Mothers who experience postpartum blues experience severe symptoms for an extended period, such as feelings of deep sadness and worthlessness, causing disturbances in daily activities. 15% of them experience postpartum depression, a continuation of the postpartum blues that are not appropriately handled.

The impact of untreated postpartum depression will cause the mother to experience prolonged and severe depression, to the point of wanting to hurt the baby or herself (Purwati & Noviyana, 2020). Another impact on an ongoing basis can cause the mother to become disinterested in the baby, unable to recognize the role and needs of the baby, so the breast milk is not flowing well and influences the baby's growth and development (Ambarwati & Wulandari, 2009). The third theme was that the lack of priority for postpartum mental health services influences the mother's efforts to overcome the blues.

This study found that participants' efforts to overcome the blues include support-seeking behavior from significant others such as husbands, parents, and cadres. They also sought advice from healthcare professionals and went to local healthcare facilities. As mentioned by all participants, specific mental health services for postpartum blues mothers were not available, as local health centers only provide physical treatment and general mental health services.

Salleh, Nor, & Mokhtar, (2022) mentioned that partners, parents, and families were a group of people that were close to them, and mothers were likely to seek support from them. Specifically, in marriage, a good relationship between couples helps their emotions as they are a reliable source of support. Chan, Levy, Chung, & Lee, (2002) stated that mothers were more comfortable asking for help from family members, especially biological mothers, and mothers-in-law, whose support was important to support their emotions.

Postpartum mothers feel that during challenging times such as the blues, their family's existence brings comfort and trust (Salleh et al., 2022). On the other side,

mothers who sought professional service tended to feel more overburdened, as being a new mom has more childcare responsibilities. They must adjust their normal daily tasks to the new baby's arrival. Not only is the mother overwhelmed with her new role, but they feel weak and tired, contributing to why they need help (Corrigan, Kwasky, & Groh, 2015).

This study also supports the findings of Azale, Fekadu, and Hanlon, (2016) who found that the lack of accessible maternal health services was very high and that the mother's help-seeking behavior toward professional support reflects proximity, autonomy, and awareness of treatment benefits. The fourth theme was that digital services help to alleviate the postpartum blues associated with manual service. This study found that participants mentioned that digital services helped lessen discomfort when sharing their feelings.

Although there are no current specific programs for mothers with postpartum blues, some also expressed that digital services help them get healthcare professionals' services remotely. This finding is consistent with the quantitative data in Table 1.3, which shows that most respondents (63%) chose the mobile service feature as the expected form of postpartum blues application. Participants chose this mobile platform because mobile phones are more practical than others.

According to Tang et al., (2022) digital health transforms the healthcare delivery system by involving patients and providers. Patients are more empowered to use technology to seek service, understand their health better, and have the autonomy to decide their condition with providers. The digital service also bridges unmet needs in care plans as a treatment for blue-only anticipatory guidelines and screening. Such unmet needs lack proper diagnosis, clinical screening guidelines adherence, limited access to behavioral health services, a lack of training in mental health management conditions, and personal stigma.

The fifth theme was that consultation is postpartum mothers' hope to overcome the blues by involving husbands as the primary support system. This study found that participants expect to share mental health concerns after childbirth. Some mentioned they wanted to share their feelings and exchange more about their peers' life adjustments. They also wished for local healthcare centers to provide a mental health corner so mothers could visit it.

Participants hoped that the consultation provided to talk about mental health experiences after childbirth would bring some ease to what they experience in the postpartum period. This study is consistent with Dagher, Pérez-Stable, & James, (2021) which showed that depressive symptoms are common in women after childbirth and that few mothers sought mental health consultation. On the other hand, the study mentioned that 62% of mothers met the cutoff for significant depressive symptoms, but only 19% consulted mental health professionals.

This is concerned about the possibility that no screening occurred during an obstetric office visit or that women did not seek consultation due to barriers to seeking mental healthcare or a lack of concern about the symptoms. Engqvist & Nilsson, (2011) also found that partners of women with mental health concerns, such as postpartum depression, were also affected. That is why expectant couples need to be provided with prenatal classes so that they can overcome them.

The researchers also stated that understanding the experiences of mothers' partners is critical for primary healthcare staff when caring for women with postpartum depression. By this means, consultation between healthcare providers and both mothers

and partners can ease mothers' adjustment after birth and help the partner's perspective on how this postpartum period might influence their lives altogether. Moreover, couples can anticipate the conflict and work together to overcome the postpartum blues.

The sixth theme was that comprehensive postpartum blues services involve professional health workers, health service providers, and referral systems. Participants mentioned that healthcare providers such as psychologists, obstetricians, and nurses are pivotal in postpartum blues service. Mothers also noted that the service should align with the local health center to track its members for needed referrals.

Meanwhile, according to the survey, 43 respondents chose the early detection feature. During the screening, mothers expected the application to include results, interpretation, and follow-up. The clearer the results and follow-up plan, the easier it is for mothers to predict blues incidents. Besides, most mothers (66%) postpartum chose the chat for the consultation feature because it was considered easier for mothers to express their feelings after giving birth.

This study result is consistent with McKinney, James, Murray, Nelson, & Ashwill, (2021) who stated that the American College of Obstetricians and Gynecologists recommended mothers have an initial assessment visit 3 weeks after delivery, follow-up ongoing care, and a comprehensive postpartum visit no later than 12 weeks after giving birth. The seventh theme was that digital postpartum blues services on mobile phones make it easier for mothers to access comprehensive mental health service features. Participants mentioned that future applications would be easier if accessed from a mobile phone, as most people own one and use it every day.

Comprehensive features such as virtual consultation through chat options, health education and related information, screening for early detection of postpartum blues, and simple therapies for overcoming the blues would be great sources for mothers. Mothers anticipated that extensive features would fully support future early detection applications. The qualitative data is consistent with the quantitative survey results. Table 1.3 showed that 76.7% of mothers chose early detection of postpartum blues, consultation, related health education materials, social networking sites of groups of pregnant women, and online referrals as a comprehensive form of digital service.

A total of 48% of respondents chose health news and videos. These types of information were thought to be more appealing than other types of material. Short and clear messages can also help mothers understand what is going on in the world. 53% of mothers choose music therapy, funny videos, and meditation or yoga as therapy when the mother is feeling anxious and tired while caring for the baby.

Funny videos have been deemed a form of healing for postpartum mothers when they suddenly feel sad. 58% of mothers choose discussion forum features compatible with social media, which can create status updates, give likes and comments, send messages, and have emoticons. It is becoming more interesting for postpartum mothers today with applications such as social media. Online referral features include psychologists, health centers, hospitals, and pharmacies. Local service and professional health workers are thought to be more effective and efficient in anticipating postpartum blues.

The eighth theme was that postpartum blues applications' obstacles do not hinder the benefits of the application. All participants voted from 8 to 10 out of 10 on the benefits of the future application. Although they also mentioned some future obstacles that might happen, participants thought the application was helpful for mothers, partners, healthcare providers, cadres, and health centers. Future obstacles mentioned

would be limited internet quotas, limited RAM and phone capacity, poor signal, an unhandy interface, and a paid subscription.

CONCLUSION

The study's goal is to investigate qualitatively related people's perceptions of postpartum blues and their expectations of its application design. Regardless of the research result, generalizing is difficult as the small number of participants cannot represent similar situations. However, the data portrayed can be used for future studies of postpartum blues.

The study obtained has provided significant information on the future application of smart diagnostic system design to accelerate the early detection of postpartum blues. Both qualitative and quantitative data suggest that postpartum mothers need support from their husbands in overcoming the blues. Mothers and husbands need a comprehensive digital mobile phone service that involves professional health workers, health service providers, and referral systems. Its use of the application is user-friendly and affordable to access.

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