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Early Detection of Postpartum Blues with a Technological Approach Method

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A R T I C L E I N F O

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A B S T R A C T

Background: Baby blues, also referred to as postpartum blues or postpartum distress syndrome, is an emotional state experienced by mothers following the birth of their first child. This condition can adversely affect both the mother and the infant. Multiple factors, such as insufficient family support, are believed to contribute to the rising incidence of baby blues. Given the prevalence of these cases, disseminating information through expert systems is essential. The Certainty Factor (CF) method is commonly employed in expert systems to address the uncertainty inherent in expert assessments. This study seeks to facilitate early diagnosis of psychological disorders in postpartum mothers by calculating a weighted symptom score, which produces a CF score to guide diagnosis and intervention. Data were collected through interviews, observations, and a review of relevant literature on postpartum blues. The research methodology follows the waterfall model, encompassing needs analysis, system design, system implementation, and system testing. The expert system application utilizes the Certainty Factor method. This system is anticipated to support the community by enabling early detection of psychological disorders in postpartum mothers.

INTRODUCTION

The postpartum period is a crucial transitional period for a mother after giving birth (1). During this time, various physical, hormonal, psychological, and social changes occur that can impact a mother's mental health. Having a baby is an incredible experience, but many mothers experience challenges in the early stages of labor (2). One of the most common psychological disorders in the postpartum period is postpartum depression (3). This condition is characterized by persistent feelings of sadness, loss of interest in daily activities, sleep disturbances, fatigue, feelings of worthlessness, and difficulty caring for the baby (4).

If postpartum depression isn't detected and treated early, it can negatively impact the mother's quality of life, the mother-infant relationship, and the child's development. One such issue is known as baby blues. Baby blues, also known as postpartum blues or postpartum distress syndrome, are emotional feelings a mother experiences after giving birth (5). These blues can occur on the first day after delivery or during the "taking in" phase, tend to worsen on the third to fifth day, and last for 14 days (6).

This experience negatively impacts both the mother and the baby. Several factors are thought to contribute to the increased incidence of baby blues, including a lack of strong support from family and the surrounding environment, which can increase the mother's psychological stress. It's therefore not surprising that these feelings of isolation, overwhelm, and anxiety are more common in postpartum mothers who are adapting to their new role as mothers (7).

Overcoming these baby blues is a complex challenge, although many methods are known to help, including adequate rest, a healthy diet, regular exercise, and social support (8). Many mothers still struggle to cope with this condition due to a lack of knowledge about baby blues, coupled with a strong societal stigma surrounding mental health, particularly in rural areas with limited access to mental health services (4). The economic burden on families in lower-middle-class communities can complicate the recovery process (9).

Baby blues syndrome is not just a single problem for postpartum mothers but also a further symptom of baby blues syndrome, which can occur if not properly treated by healthcare professionals (10). The high incidence of postpartum blues among women after childbirth raises concerns for families, as health is crucial for every family. Technological advances in healthcare have made it easier for healthcare professionals to perform various examinations on postpartum mothers (11). Current technology is equipped with various capabilities to recognize

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movement, facial expressions, and even human health. Certainty Factor (CF) is a suitable method used as an alternative solution for users to diagnose symptoms of human disease early, thereby increasing knowledge and understanding of disease management (12)

This research aligns with research conducted by Ulfa et al , which states that the incidence of postpartum depression is 1 to 2 per 1,000 births. Approximately 50 to 60% of mothers experience postpartum depression during their first child, and approximately 50% of mothers who experience postpartum disorders are caused by mood disorders (13). The Certain Factor method has been widely used in various fields to help diagnose diseases, including agriculture. Considering this, the purpose of this study is to apply the Specific Factors (CF) method in its application, specifically in detecting the occurrence of baby blues in postpartum mothers.

The prevalence of postpartum depression remains high in various countries, including Indonesia (14). However, many cases go undetected due to a lack of awareness among mothers and families about the symptoms, limited healthcare professionals, and limited access to mental health services (5), (13). Conventional screening processes often require time, expense, and the involvement of experts, making it difficult to reach all postpartum mothers. Therefore, a method is needed that can facilitate early detection quickly, easily, and widely accessible (15).

Developments in information technology provide opportunities to build decision support systems, or expert systems, that can assist in identifying health problems. Expert systems are a branch of artificial intelligence designed to mimic an expert's ability to solve problems using their knowledge and experience. In the healthcare sector, expert systems have been widely used as diagnostic and screening tools for various diseases because they can provide recommendations based on user-entered symptoms.

One method frequently used in expert systems is the Certainty Factor method. This method is used to accommodate uncertainty in the decision-making process by assigning a confidence value to each symptom. The Certainty Factor approach allows the system to calculate a confidence level for the likelihood that a condition is present, based on the combination of symptoms experienced by the patient. Thus, the results provided are not only conclusions but also confidence levels that can help users understand the risks involved.

The application of the Certainty Factor method in the early detection of postpartum depression is expected to be an innovative solution to increase access to maternal mental health screening. The developed system can be used independently by mothers or as a tool to assist health workers in early identification of the risk of postpartum depression. Through faster and more accurate detection, intervention can be initiated earlier, thereby minimizing the negative impact of postpartum depression on mothers and babies. Based on this description, this study aims to develop and analyze a technology-based early detection system for postpartum depression, using the Certainty Factor method to facilitate initial screening and improve the effectiveness of prevention and management.

METHODS

This research uses an expert system development approach based on the Certainty Factor (CF) method to detect early postpartum blues in mothers. The CF method was chosen because it accommodates uncertainty in the reasoning process and provides confidence in the identification results based on the user's symptoms. The research phase began with the identification and collection of postpartum blues symptom data through literature review and consultations with healthcare professionals competent in maternal and mental health. Next, each symptom was assigned a belief value (a measure of belief) reflecting the degree of association with postpartum blues, based on expert knowledge.

The developed system consists of two main environments: a development environment for building the knowledge base and system rules, and a consultation environment for user-driven early detection. During the consultation phase, the user selects symptoms that align with their perceived condition. The system then calculates the Certainty Factor value for each symptom and combines them using the CF combination formula to produce a final confidence value regarding the likelihood of postpartum blues.

The resulting combined CF value is used to determine the likelihood of postpartum blues. The higher the resulting CF value and the closer it is to 1, the higher the system's confidence in the detection results. The final results are displayed on the application interface as initial screening information to serve as a basis for further consultation with a healthcare professional. This research has been declared ethically sound, clearly and transparently, in this manuscript from the ethics committee/council of Sari Mulia University, Banjarmasin, with number 276/KEP-UNISM/III/2025.

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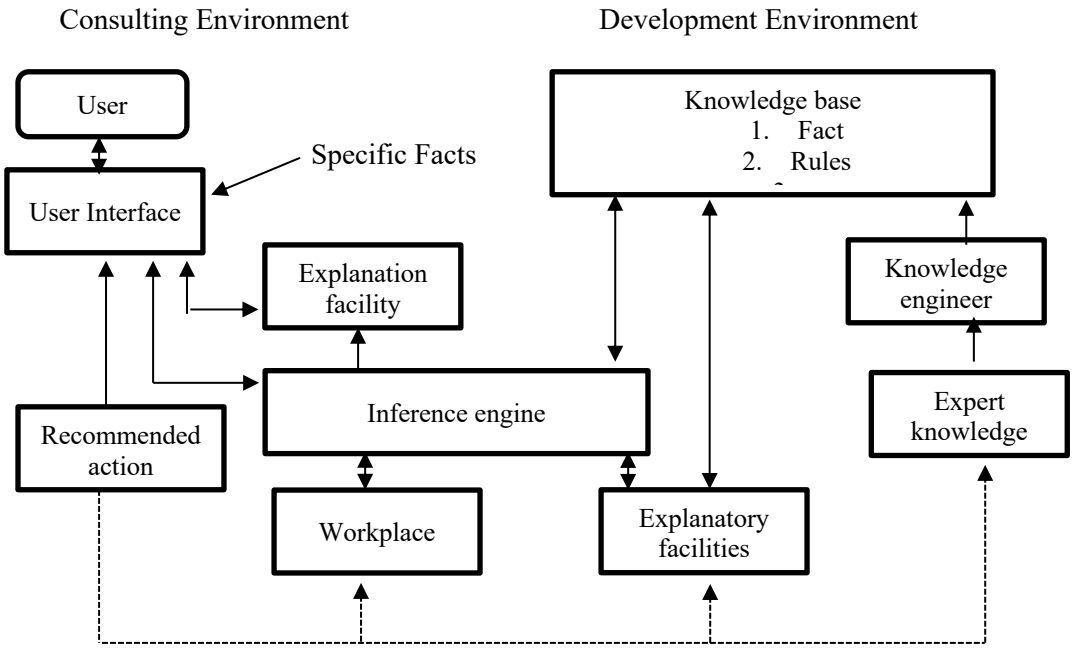


Figure 1. Expert System Architecture

The research process for implementing early detection of postpartum blues utilizes certain factors. The use of expert CF values and user participation in providing CF values will yield more accurate and relevant results for each mother's postpartum condition. (Figure 2)

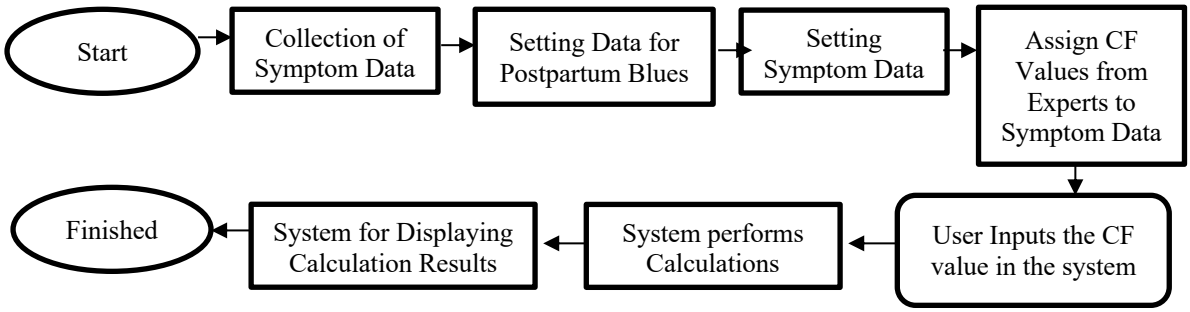


Figure 2. Research Flow

RESULT AND DISCUSSION

RESULT

This research produces an expert system design that can assist postpartum mothers in conducting initial examinations of themselves regarding postpartum psychological disorders. Researchers created a mathematical model to observe calculation results using the Certainty Factor (CF) in an Excel worksheet. The formula used in this study uses the user's CF value, which ranges from 0 to 1. The Combined CF is calculated through the equation:

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Combined CF (CF1. CF2) = CF1 + CF2 - (CF1 * CF2). In addition, the combined CF is determined by multiplying the user-provided CF with the Expert's CF, using the formula: Combined CF = User's CF * Expert's CF. The CF calculation formula assumes that the lists of symptoms and diseases are large. Table 1 illustrates the results of the CF formula for the level of Postpartum Blues depression calculated in Excel. This table describes the CF calculation, which combines user-provided values with values determined by experts. Meanwhile, Table 2 provides an example of calculating the combined CF value for each symptom related to Postpartum Blues depression.

Table 1. Sample Calculation of CF Combination of Post Partum Blues

Symptom Code	Symptom Name	Depression Levels	CF User Value	Expert CF Value	Combination CF
PPB01	Mood changes	Post Partum Blues	0,44	0,25	0,1125
PPB02	Sleep disorder		0,01	0,25	0
PPB03	Weakness		0,46	0,25	0,1175
PPB04	Feeling of uselessness		0,50	0,25	0,125
PPB05	Irritability		0,00	0,25	0
PPB06	Anxiety		0,00	0,25	0
PPB07	Loss of appetite		0,00	0,25	0
PPB08	Stress		0,00	0,25	0
PPB09	Feel hopeless		0,00	0,25	0
PPB10	Low income		0,00	0,25	0
PPB11	Feeling anxious		0,75	0,25	0,2
PPB12	Often feel guilty		0,33	0,25	0,075
PPB13	Sad		0,47	0,25	0,1125
PPB1	Often cry		0,80	0,25	0,1877
PPB2	Decreased confidence level		0,45	0,5	0,22
PPB3	Stress in marriage		0,45	0,5	0,22
PPB4	Don’t care about other people		0,47	0,5	0,23
PPB5	Feeling tired after waking up		0,49	0,5	0,25
PPB6	Decreased Breast Milk Production		0,55	0,76	0,376
PPB7	Fear of Childbirth		0,00	0,76	0
PPB8	Panic Attacks		0,00	0,76	0
PPB9	Excessive Anxiety and Worry		0,00	0,76	0
PPB10	Hyperactivity or Excessive Joy		0,00	0,76	0
PPB11	Excessive Physical Worry		0,00	0,76	0
PPB12	Lack of Knowledge Regarding Newborn Care		0,00	1	0
PPB13	Inadequate Family Support		0,00	1	0
PPB14	Feeling Lonely, Distant from Family		0,00	1	0
PPB15	Difficult Parental Relationship		0,00	1	0
PPB16	Lack of Help with Baby Care		0,75	1	0,72
PPB17	Inability to Care for Baby		0,74	1	0,74

Tabel 2. Post partum Blues combined CF Calculation

Post partum Blues	
CF Combined Post Partum Blues	
CF (PPB01, PPB02)	0,1126
(CF old, PPB03)	0.216882
(CF old, PPB04)	0,314685
(CF old, PPB05)	0,314685
(CF old, PPB06)	0,314685

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(CF old, PPB07)	0,314685
(CF old, PPB08)	0,314685
(CF old, PPB09)	0,314685
(CF old, PPB10)	0,314685
(CF old, PPB11)	0,451748
(CF old, PPB12)	0,492877
(CF old, PPB13)	0,549920
(CF old, PPB14)	0,634310
(CF old, PPB15)	0,711106
(CF old, PPB16)	0,774665
(CF old, PPB17)	0,826490
(CF old, PPB18)	0,868135
(CF old, PPB19)	0,917585
(CF old, PPB20)	0,917585
(CF old, PPB21)	0,917585

DISCUSSION

The research results show that the technology-based early detection system for postpartum blues achieved a very high combined Certainty Factor (CF), with the highest value of 0.993664858 in the postpartum blues category. This value is close to 1, indicating a very strong level of confidence in the system's prediction of the likelihood of postpartum blues based on the symptoms entered by the user. In the Certainty Factor method, the closer the value is to 1, the higher the system's confidence in the resulting conclusions. Therefore, these results indicate that the user-selected symptom combination is highly consistent with the knowledge base built into the system.

The application of technology in the early detection of postpartum blues offers advantages in the initial screening process for postpartum psychological disorders (3). Previously, recognition of postpartum blues was often delayed because the symptoms were considered normal emotional changes after childbirth (16). However, if this condition is not recognized and treated appropriately, postpartum blues can develop into the more serious postpartum depression, impacting maternal health, the mother-infant relationship, and overall family functioning (5). The presence of technology-based applications enables faster, easier, and more accessible identification processes, regardless of time or space (14).

A combined CF value of 0.993664858 indicates that the system effectively integrates various postpartum blues symptoms reported by users. Symptoms such as rapid mood swings, easy crying, feelings of sadness, excessive anxiety, sleep disturbances, emotional exhaustion, and difficulty concentrating are common indicators of postpartum blues in postpartum mothers. When these symptoms are described simultaneously using the Certainty Factor method, the system can generate a high level of confidence in the possible diagnosis, helping users gain an initial understanding of their psychological condition.

This finding aligns with the development of artificial intelligence and expert systems in the healthcare sector, which are increasingly being used as clinical decision-making tools (17). Certainty Factor-based expert systems can accommodate the penetrative elements often found in the medical diagnostic process. Unlike deterministic methods that produce only correct or incorrect decisions, this method allows the system to provide a level of confidence based on the combination of available symptoms (18). This way, the results more closely mimic how an expert thinks when assessing a health condition.

Although the CF score produced is very high, the prediction system cannot be used as a definitive diagnosis (19). The system only functions as an early detection tool to help users recognize the possibility of postpartum emotional disorders. A final diagnosis must still be made by a professional, such as a specialist doctor, clinical psychologist, or midwife who is competent in maternal mental health (20). Therefore, the system's recommendation for a follow-up consultation is an appropriate step to ensure the user's condition is assessed through a more comprehensive examination (21).

From a healthcare perspective, the use of an early postpartum blues detection application has the potential to increase the coverage of postpartum maternal mental health screening (22). This system can be utilized as a supporting tool in antenatal and postnatal care to help healthcare workers identify groups of mothers at risk of experiencing psychological disorders after childbirth (23). With earlier detection, psychological intervention,

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family education, and social support can be provided more quickly, thereby minimizing the risk of postpartum blues developing into postpartum depression (24).

Overall, the high combined CF score for postpartum blues of 0.993664858 indicates that the expert system-based technology approach has good potential as a screening tool and early detection of postpartum psychological disorders (25). These results demonstrate that the system can provide consistent predictions based on user-entered symptoms, while also supporting efforts to improve the quality of maternal healthcare through accessible, efficient digital technology.

CONCLUSION

The successful calculation using this Certainty Factor (CF) in Excel marks a significant achievement in the development of this specially designed system for detecting the early onset of postpartum blues. The user is designed. This aims to empower postpartum mothers to detect their psychological level as early as possible, reducing the potential negative consequences associated with postpartum blues. This research still has many shortcomings, but it is hoped that this research can be a good start to help postpartum mothers to be able to detect the psychological complaints they are experiencing early so that they can get treatment to overcome their complaints.

AUTHOR'S CONTRIBUTION STATEMENT

NWN: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Resources, Validation, Supervision, Project Administration, Writing – Original Draft. MZ: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Visualization, Validation, Supervision, Writing – Original Draft, Writing – Review & Editing.

CONFLICT OF INTEREST

The authors declare no conflict of interest/or conflict

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

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