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COMBINATION OF CASE-BASED REASONING AND CERTAINTY FACTOR FOR DETECTION OF BABY BLUES SYNDROME

[1]HANDRIZAL, [2]DESILIA SELVIDA, [3]SHAFIRA ALFINA
[1,2,3]Department of Computer Science, Faculty of Computer Science and Information Technology, Universitas Sumatera Utara, Jl. University No. 9-A, Medan 20155, Indonesia

E-mail: handrizal@usu.ac.id

ABSTRACT

Baby blues is a mental health disorder that has recently become a public concern. Baby blues is a common emotional condition experienced by most young mothers in the days or weeks after giving birth to a baby. This condition is caused by hormonal changes that occur during pregnancy and after giving birth. To facilitate and reduce or prevent Baby Blues Syndrome, experts created an application program to provide solutions for mothers who experience Baby Blues Syndrome through an early detection process and providing appropriate treatment recommendations. By using the Certainty Factor and Case-Based Reasoning algorithms. Case-based reasoning will find the similarity value of new cases with existing cases, and the Certainty Factor to find the certainty value of the damage experienced by calculating the weight value. Both of the algorithms will result in a system that is more robust and can handle both uncertainty and utilize experience from previous cases. The research was carried out with 30 tests, with 13 questions, and resulted in a research accuracy value is 90%.

Keywords: *Baby Blues Syndrome, Expert System, Case-Based Reasoning, Certainty Factor*

1. INTRODUCTION

The postpartum period most known as Baby Blues Syndrome (BBS) is a period that lasts approximately 6 weeks after a woman gives birth to a baby until when the body returns to its pre-pregnancy state. This period is associated with intense physical and emotional changes leading to anxiety and mood disorders [1].

The cause of BBS is not known with certainty but is thought to be influenced by internal and external factors. This condition often occurs within 14 days postpartum and tends to get worse on days 3 and 4. Mothers with BBS must be identified early and treated adequately. Improper handling of BBS can develop into postpartum depression or even more severe symptoms, namely psychosis. The impact that will be experienced by the mother is that it can interfere with the mother's role, one of which affects the relationship between mother and baby, and mothers tend to be reluctant to give breast milk. That way the baby will be malnourished and the relationship between mother and baby is less established.

Mothers with BBS can affect the baby because the baby is still very dependent on the mother. If postpartum mothers who experience BBS can interfere with milk production because milk production is strongly influenced by psychological factors. Postpartum stress conditions are experienced by 80% of women after giving birth.

Factors that influence the development of Baby Blues Syndrome include social, psychological, and biological factors. Some social factors include lack of social support, financial problems, and stress in relationships. Some psychological factors include excessive anxiety, lack of self-confidence, and significant role changes. Some biological factors include hormonal fluctuations after giving birth, lack of sleep, and physical pain after giving birth [2].

The symptoms and indicators of Baby Blues Syndrome are becoming more well-known because of today's more advanced technology, which can make life easier and lessen the severity of the condition's consequences [3]. Expert is one method. With today's increasingly sophisticated technology. this can certainly make things easier and can help reduce the more severe effects of Baby Blues

It makes it easier for people to know the symptoms or signs of Baby Blues Syndrome,

Syndrome.

This expert system will display a selection of symptoms and the actions or treatments that must be taken [4]. It is hoped that this expert system can help young mothers after giving birth in their efforts to quickly detect Baby Blues Syndrome sothat they can carry out appropriate control or treatment. In this research, the expert system method used is Case Based-Reasoning and Certainty Factor.

One way is to use an Expert System. Expert systems are a subfield of artificial intelligence (AI) that utilizes specialized expertise to solve problems in a broad sense. Expert systems have applications in many domains, including industry, education, and health [5]. An expert system is a computer device created to imitate human capabilities solve problems and make decisions based on available information and data [6]. The combination of CBR and CF can enrich the expert system's ability to solve problems, by utilizing experience from previous cases (CBR) and providing a more measurable confidence assessment (CF) of the resulting solution [7].

The reason behind the usage of the CBR and CF algorithms is that CBR, or case-based reasoning, is concerned with diagnosing new cases by comparing their similarity values to those of prior examples. In the meantime, the obtained weight value is calculated using the CF method to determine the certainty value. It is intended that byemploying the CF approach, users will find it simpler to access specific information.

2. LITERATURE REVIEW

2.1 Expert System

Expert System is a part of Artificial intelligence [8]. Expert systems use the knowledge and experience of experts as the cornerstone or base of a system to solve an issue. Typically, the user enters the information in the form of their early symptoms. Expert systems have applications in many domains, including industry, education, healthcare, and the automobile sector. In its most basic form, an expert system is a computer application that runs on a smartphone or computer to solve problems.

The program that will be created will not only be based on technological knowledge but will also be based on expert knowledge from each field for which the program will be created.

Expert systems can not only get output in theform of right and wrong but can also provide explanations or even solutions to these problems. Expert systems are also one of the fields of human artificial intelligence that is growing rapidly and is very popular [9]. Expert systems can be created in website or mobile form. However, recently expert systems in the form of websites have become more popular because there is no need to download the application you want to use and it saves the user's cellphone memory.

The combination of CBR and CF can enrich the expert system's ability to solve problems, by utilizing experience from previous cases (CBR) and providing a more measurable confidence assessment (CF) of the resulting solution.

An expert system is a computerized report that attempts to replicate the knowledge and reasoning processes of experts in problem-solving [10].

2.2 Baby Blues Syndrome

Baby Blues Syndrome, also known as Maternity Blues, is a minor affective illness syndrome that often manifests in the first week following childbirth, peaks on the third or fifth day, and attacks within 14 days of the birth. In Indonesia, approximately 50–70% of postpartum mothers have baby blues or postpartum blues, but the frequency in Asia is rather high, ranging from 26–85% [11]

Based on the symptoms and how severe the symptoms are for the mother, particularly for new mothers, there are three stages of Baby Blues Syndrome: Postnatal Depression, Puerperal Psychosis, and Baby Blues Syndrome which can be seen from howlong it takes and the diagnosis [12].

It is important to remember that levels of Baby Blues Syndrome are on different spectrums and can change from one level to another. In rare cases, Baby Blues Syndrome can develop into Postnatal

Depression or even Puerperal Psychosis. Therefore, careful monitoring and attention to changes in symptoms and mental well-being of mothers after childbirth is very important to provide timely intervention and treatment appropriate to the severity of the condition.

2.3 Case-Based Reasoning

Case-based reasoning (CBR) is a problem-solving technique that draws on experience from cases that are comparable to its own [13]. By comparing the features of a new problem with examples that have already been solved, this approach seeks to identify solutions for novel problems by selecting the best cases that have the most applicable answers to the novel problem.

This method aims to find solutions to new problems by matching the characteristics of the newproblem with previously existing cases and then extracting solutions from the best cases that are most relevant to the new problem. CBR is used to support disease diagnosis or select appropriate treatment strategies for similar cases. The main advantage of CBR is its ability to handle complex and unstructured problems, as well as being able to extract knowledge from specific existing cases.

Case-Based Reasoning has four steps that are as follows:

1. Retrieve, The procedure of retrieving cases involves looking for those that are most similar to the new case that needs tobe assessed.
2. Reuse, refers to the process of applying knowledge or information that has been saved in a case base to address new issues.
3. Revise is the procedure of reviewing data that will be processed and fixed once more to fix mistakes that arise in brand-new issues.
4. Retaining is the practice of preserving information that will afterward be applied to remedy issues based on currentcases.

Similarity is a step used to recognize similarities between cases stored in the case base and new cases. The case with the greatest similarity value is considered the most similar case. A valueof 0 means not similar and a value of 1 is considered a similar case.

$$\text{Similarity} = \frac{S1\,x\,W1 + S2\,x\,W2 + \cdots + S_n\,x\,W_n}{W1 + W2 + \cdots + W_n}$$

S = Similarity value 1 and 0
W = Weight

2.4 Certainty Factor

A technique for demonstrating whether a fact is certain or uncertain is the Certainty Factor (CF). When diagnosing ambiguous conditions, expert systems find this strategy to be highly appropriate. CF assumes a value's level of confidence in an expert's (inexact reasoning)reasoning about it. This approach divides similarity by preset weights to calculate results. The degree of certainty surrounding a fact or ruleis displayed by the CF technique [14]. The Certainty Factor approach uses expert reasoning to derive trust values [15].

It is important to note that the CF method does not guarantee accuracy, but it provides a way to evaluate the performance of the diagnostic system. The accuracy of the system depends on the quality of the rules used and the data used to train the system. The CF method can be used to identify areas where the system needs improvement and to make changes to improve its accuracy [16].

There are 2 types of certainty factors used, namely the certainty factor entered by the expert along with the rules, and the certainty factor provided by the user. The certainty factor filled in by the expert describes the expert's confidence in the level of confidence in a symptom.

Certainty Factor ranges from -1 to +1, with some values between -1 and 1 having special meaning:

1. If the Certainty Factor = 1, then

the statement or recommendation is true based on existing knowledge.

2. If the Certainty Factor = 0, then the statement or recommendation does not have sufficient influence or evidence to support or oppose it. This can be interpreted as uncertainty.
3. If the Certainty Factor = -1, then the statement orrecommendation Information :
CF[H,E] = Certainty Factor
CF[E] = Certainty Factor of evidence/factsCF[rule] = Certainty Factor of hypothesis

b. If there are rules with similar conclusions (similarity conclusion rules) or more than one symptom, then the CF is calculated using the equation:

CFcombine[CF1,CF2] = CF1+CF2x(1 – CF1)

c. Certainty factor for the final comparisonresult:

Trust Ratio = CFcombine x 100%

3. PROTOCOLS

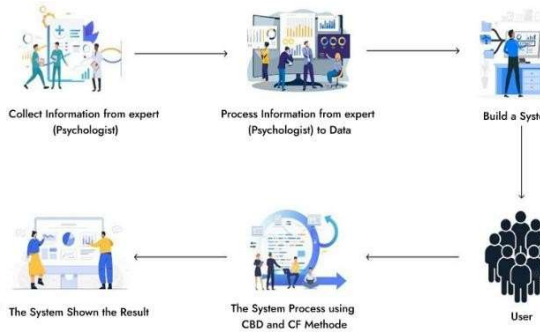


Figure 1: General Architecture

a. Collect data and information related to Baby Blues Syndrome from experts, psychologists,and other trusted sources.
b. Processing data and information that has been obtained from experts and other sources into datasets
c. Design and build a website-based expert system using Certainty factors and Case Based-Reasoning
d. After the expert system has been built, users with the appropriate criteria can use it
e. The system will process user input in the form of symptoms that have been selected using the Certainty factor and case-based-reasoning methods to determine the diagnosis results.
f. The system displays appropriate and accurate diagnosis results and displays appropriate solutions and treatment.

is wrong based on existing knowledge.

In the Certainty Factor, there are several premises or rules used to diagnose, including the following:

a. CF for rules with a single premise or phenomenon (Single premise rules):

CF[H,E] = CF[user] x CF[expert]

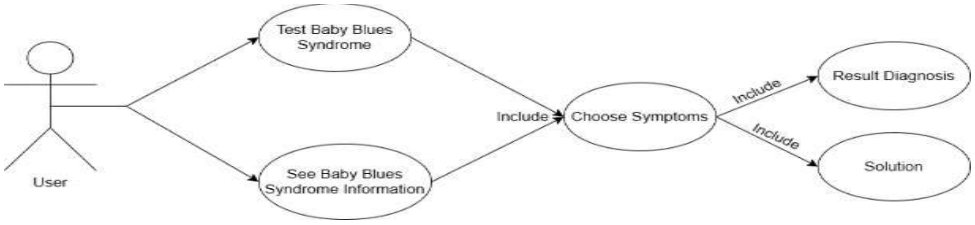


Figure 2: Use Case Diagram

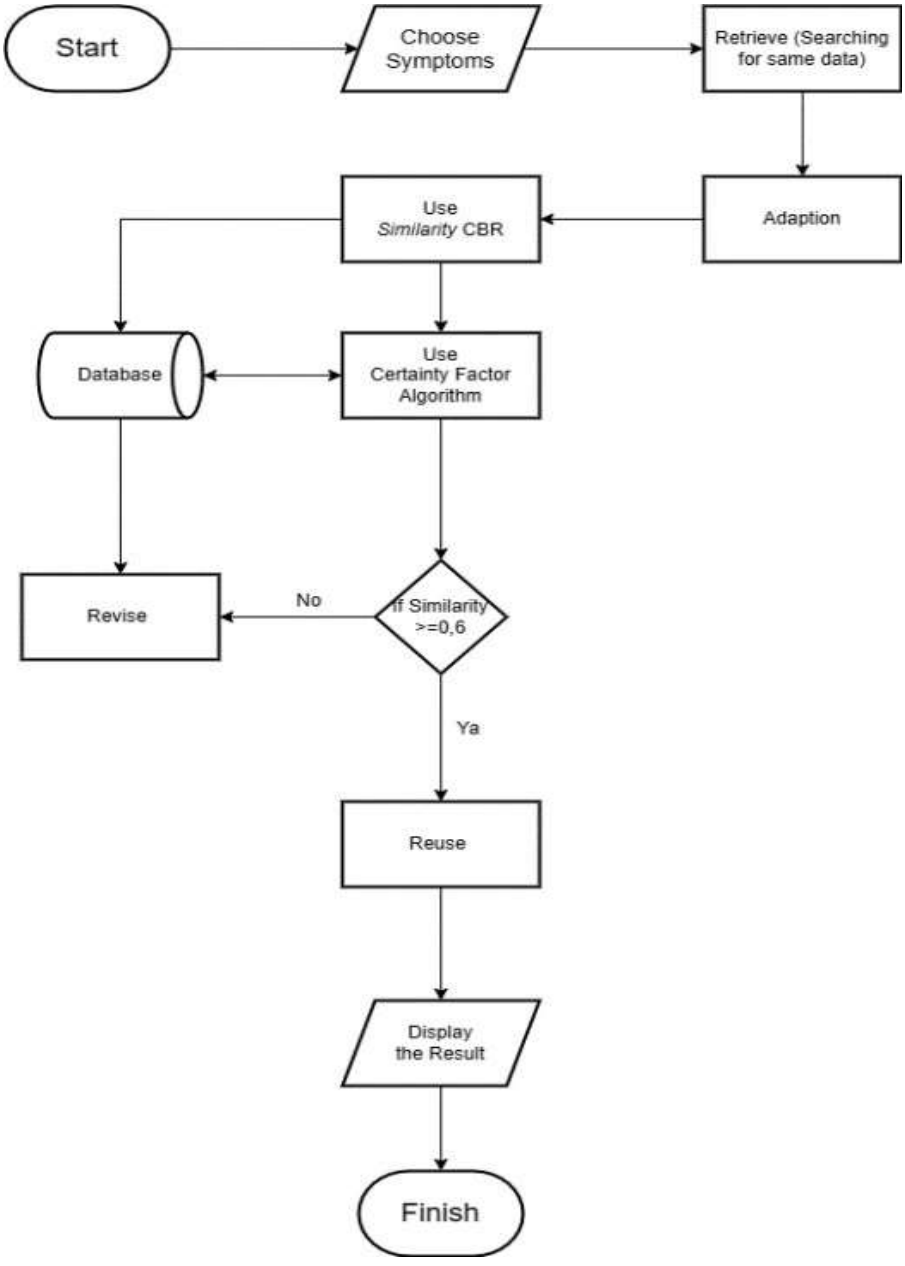


Figure 3: Flowchart System

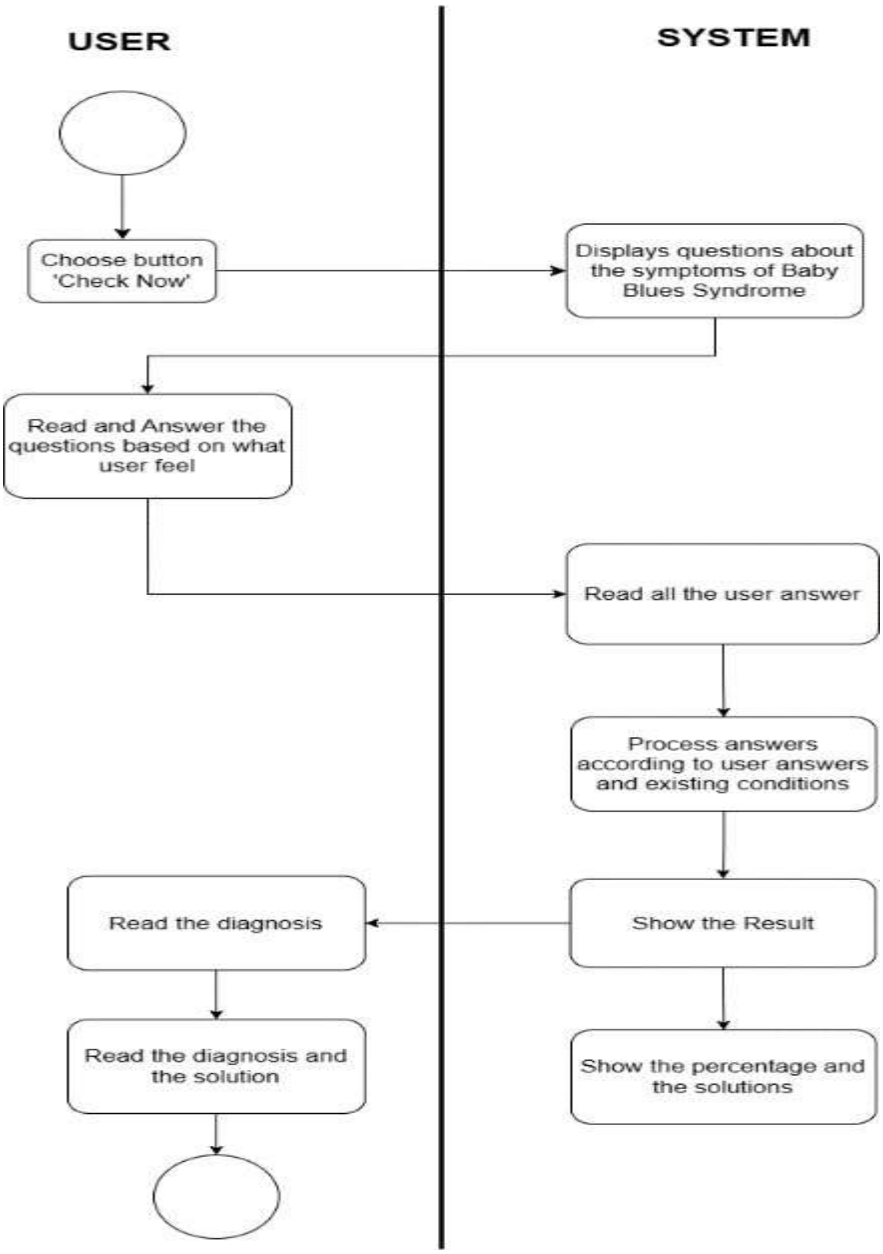


Figure 4: Activity Diagram

4. EXPERIMENTAL SETUP

Table 1: Level Baby Blues Syndrome

Code	Name of Disease
P01	Baby Blues Syndrome (Level 1)
P02	Post Natal Depression (Level 2)
P03	Puer Peral Psikosis (Level 3)

Table 2: Solution Baby Blues Syndrome

Code Disease	Code Solution	Solution
P01	S01	a. Eating healthy food and nutritious b. Take time for yourself for a moment c. Enough rest
P02	S02	a. Eating healthy food and nutritious b. Take time for yourself for a moment c. Do Exercise d. Reduce thoughts that are too heavy e. Ask for environmental support
P03	S03	a. Immediately come to the nearest psychologist as well as carrying out therapy and counseling b. Eat healthy and nutritious food c. Enough rest d. Avoid toxic environments or environments e. Avoid staying at home or taking care of the baby alone f. Ask for support from your partner, family etc

Table 3: Symptoms of Baby Blues Syndrome

Code	Symptoms	CF Expert
G01	Easy to feel sad and cry too much	0,8
G02	Moodswing	0,8
G03	Sleep Disorders	0,8
G04	Loss of appetite	0,4
G05	Tired Easily	0,4
G06	Difficulty and fear of taking care of the baby	0,8
G07	Lack of confidence	0,4
G08	Difficulty thinking clearly/concentrating	0,6
G09	Thoughts of hurting yourself	0,8
G10	Feeling confused, suspicious, afraid	0,6
G11	Becoming aggressive/rude	0,8
G12	Feeling hopeless	0,9
G13	Feeling worthless	0,9

```php
<?php
require('db_connection.php');

function getdisease()
{
    global $conn;
    $list_disease = [];

    $sql = "SELECT * FROM disease";
    $result = $conn->query($sql);

    if ($result->num_rows > 0) {
        while ($row = $result->fetch_assoc()) {
            $disease = new stdClass();
            $disease->code_disease = $row['code_disease'];
            $disease->name_disease = $row['name_disease'];

            $list_disease[] = $disease;
        }
        return $list_disease;
    }
}
?>
```

Figure 3: Solution Coding

Figure 3 is a coding solution. The solution is taken from the database, then we make a connection to make it connect. Then we just need to call the solution the de same as the disease code. It will show on the program according to the diseaseand its solution.

```php
<?php
require('db_connection.php');

function getsolution($code_disease)
{
    global $conn;
    $solutions = [];

    $sql = "SELECT * FROM solution WHERE code_disease = ?";
    $stmt = $conn->prepare($sql);
    $stmt->bind_param("i", $code_disease);
    $stmt->execute();

    $result = $stmt->get_result();

    if ($result->num_rows > 0) {
        while ($row = $result->fetch_assoc()) {
            $solutions[] = $row['solution'];
        }
    }
    $stmt->close();
    return $solutions;
}
?>
```

Figure 4: Disease Coding

Figure 4 is disease coding where to connect diseasein the database to coding, same as solution coding above.

```php
<?php
require_once('db_connection.php');

function getsymptom()
{
    global $conn;
    $symptoms = [];

    $sql = "SELECT * FROM symptom";
    $result = $conn->query($sql);

    if ($result->num_rows > 0) {
        while ($row = $result->fetch_assoc()) {
            $symptom = new stdClass();
            $symptom->code_symptom = $row['code_symptom'];
            $symptom->name_symptom = $row['name_symptom'];
            $symptom->CF_pkr = $row['CF_pkr'];

            $symptoms[] = $symptom;
        }
        return $symptoms;
    }
}
?>
```

Figure 5: Symptom Coding

Example:

Table 4: User Input

Input Symptom	Symptoms	Weight User
G01	Easily feeling sad and cry	0,8
G02	Mood changes drastically	0,8
G06	Fear of touching the baby	0,9
G09	Thinking about hurting yourself	0,9
G11	Becoming aggressive/rude	0,9
G12	Feeling hopeless	0,6

Steps:

1. The retrieval process is the initial stage to identify problems with new cases and existing cases or old cases.
2. After completing the retrieve process, then enter the second stage, reuse. Beliefs are given to find the similarity value, each of which has a value. If there is a match, a valueof 1 is given, and if there is no match, a valueof 0 is given.
3. Then calculate the similarity value of the old case with the new case using the similarity formula.

P01 = Symptoms 1, 2, and 6

$$\frac{1*0,8 + 1*0,8 + 1*0,9 + 0*0,9 + 0*0,9 + 0*0,8}{0,8 + 0,8 + 0,9 + 0,9 + 0,9 + 0,8}$$

$$= \frac{0,8 + 0,8 + 0,9 + 0 + 0 + 0}{5.1}$$

$$= \frac{2,5}{5.1}$$

$$= 0.49 * 100\% = 49\%$$

P03 = Symptom 6,9,11,12

$$\frac{1*0,8 + 1*0,8 + 1*0,9 + 1* 0,9 + 1*0,9 + 1*0,}{0,8 + 0,8 + 0,9 + 0,9 + 0,9 + 0,8}$$

$$= \frac{0 + 0 + 0,9 + 0,9 + 0,9 + 0,8}{5,1}$$

$$= \frac{3,5}{5,1}$$

$$= 0,68*100\% = 68\%$$

From the calculation above, there is the lowest similarity weight, namely P01 at 49% and P03 has the highest similarity weight, namely 68%.

4. In the reuse process, the solution that can be given with the highest similarity weight, namely P03 with a percentage of 68%.

Table 5: Calculation of Certainty

$CF[H,E]_1$	0,8	x	0,8	=	0,64
$CF[H,E]_2$	0,7	x	0,8	=	0,56
$CF[H,E]_3$	1	x	0,9	=	0,90
$CF[H,E]_4$	0,9	x	0,9	=	0,81
$CF[H,E]_5$	0,9	x	0,9	=	0,81
$CF[H,E]_6$	0,6	x	0,8	=	0,48

6. Next is the process of combining the CFvalue with the following formula:

P02 = Symptom 2,7,11

$$\frac{0*0,8 + 1*0,8 + 1*0,9 + 1*0,9 + 0*0,9 + 0*0,8}{0,8 + 0,8 + 0,9 + 0,9 + 0,8}$$

$$= \frac{0 + 0,8 + 0,9 + 0,9 + 0 + 0}{5,1}$$

$$= \frac{2,6}{5,1}$$

$$= 0,50 * 100\% = 67\%$$

5. The process of calculating the symptoms of new cases to obtain a certainty value can be seen in Table 2 using the following formula formulation:

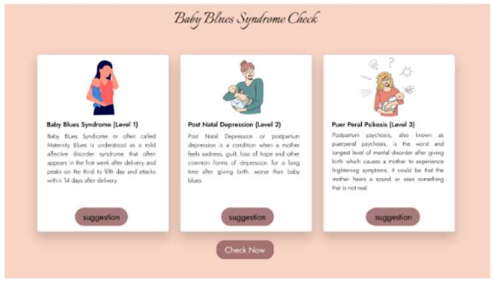
$$[H,E] = CF[user]\ x\ CF[\text{expert}]$$

5. IMPLEMENTATION

A. Home Page

Figure 5: Home Page

B. Info Page



CF [H, E] = CF [user] x CF [expert]

$CF[H,E]_1 = 0,64 + 0,56 * (1-0,64) = 0,8416$

$CF[H,E]old_{1,3} = 0,8416 + 0,9 * (1-0,8416) = 0,98416$

$CF[H,E]old_{2,4} = 0,98416 + 0,81 * (1-0,98416) = 0,9969904$

$CF[H,E]old_{3,5} = 0,9969904 + 0,81 * (1-0,9969904)$

$=0,99942818$

$CF[H,E]old_{4,6} = 0,99942818 + 0,48 * (1-0,99942818)$

$=0.9997026$

7. Then calculate the trust ratio value usingthe following formula:

$$Ratio\ Trust = CF\ Combine\ x\ 100\%CF\ Combine x\ 100\% = 99.97\ x\ 100\ \%$$

(Extremely Assured)

The results of the case study consultation above produced Puer Peral Psychosis (level 3) with a similarity value of 68% and a certainty value of 100% (Very Confident). The similarity valueresults are obtained from the similarity between the old case and the new case, while the certainty value is obtained from the calculation between the CF value given by the expert and the CF value given by the user.

C. Pop-Up Solution Page

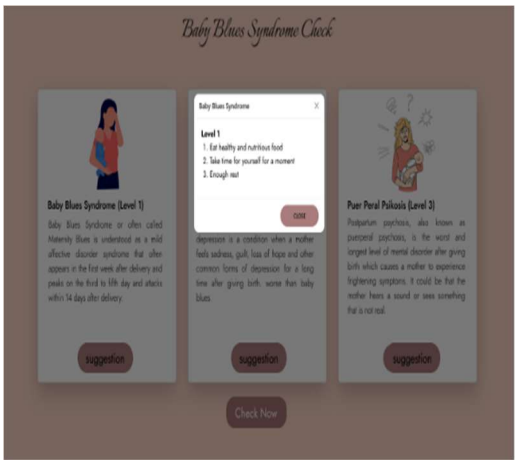


Figure 6: Pop Up Page

D. Check Page

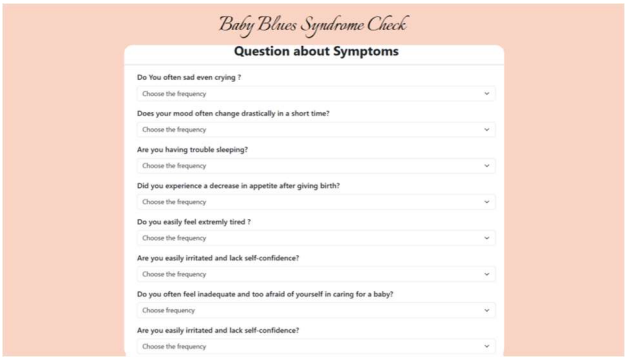


Figure 7: Check Page

E. Result Page

Figure 8: Result Page

6. TESTING

Table 6: Expert System Testing Result

Experienced Symptoms	Diagnosis Expert	Diagnosis System	Result
G01,G02,G03,G04, G05	BBS	BBS	Appropriate
G01,G03,G05,G07, G09	BBS	BBS	Appropriate
G02,G03,G04,G09	BBS	BBS	Appropriate
G01,G02,G03	BBS	BBS	Appropriate
G01,G06,G07,G08	BBS	BBS	Appropriate
G03,G04,G05,G09, G10	BBS	BBS	Appropriate
G01,G11,G12,G13	PND	PND	Appropriate
G03,G05,G08,G09	BBS	BBS	Appropriate
G01,G02,G07,G01 1,G13	PPP	PPP	Appropriate
G07,G09,G10,G11, G12	PND	PND	Appropriate
G10,G11,G12,G13	PND	PND	Appropriate
G05,G10,G13	InIndentify	PPP	InAppropriate
G09,G10,G11,G12	PND	PND	Appropriate
G02,G03,G04,G05	BBS	BBS	Appropriate
G05,G08,G12	InIndentify	PND	InAppropriate
G04,G05,G10,G12, G13	PND	PND	Appropriate
G08,G10,G12,G13	PND	PND	Appropriate
G09,G11,G13,G13	PPP	PPP	Appropriate
G06,G07,G08,G11, G12	PND	PND	Appropriate
G09,G10,G11,G12	PND	PND	Appropriate
G06,G07,G08,G09	BBS	BBS	Appropriate
G11,G12,G13	PPP	InIdentify	InAppropriate
G02,G04,G06,G08, G10	BBS	BBS	Appropriate
G09,G10,G11,G12, G13	PPP	PPP	Appropriate
G06,G07,G09,G10	PND	PND	Appropriate
G11,G12,G13	PPP	PPP	Appropriate
G08,G10,G11,G12, G13	PPP	PPP	Appropriate
G10,G11,G12,G13	PPP	PPP	Appropriate
G08,G09,G10,G12, G13	PND	PND	Appropriate
All Symptoms	PPP	PPP	Appropriate

The accuracy of the comparison between the expert diagnosis findings and the system diagnosis results can be computed using the test results of the thirty test data in Table 1 above.

$$\text{Accuracy} = \frac{Amount\ of\ appropriate\ test\ data}{Total\ test\ data} x100\%$$

$$= \frac{27}{30} x100\%$$

$$= 90\%$$

Based on expert identification, it can be inferred thatthe system's accuracy is 90%, indicating its potentialfor effective operation.

7. CONCLUSION

The expert system initially designed to prevent baby blues syndrome by offering general information has evolved to provide diagnosis results based on user-supplied symptoms. This comprehensive system encompasses 13 symptoms, categorizes them into 3 disease levels, and utilizes 30 tests, boasting an impressive 90% accuracy rate. Drawing upon data sourced from interviews with psychologists and user inputs, the system facilitates mental disorder symptom assessment and early treatment solutions. However, it is essential to remember that while the system leverages expert knowledge, the most prudent course ofaction remains to consult directly with a healthcare professional for the bestpreventive measures and accurate diagnosis.

REFERENCES

[1] Lewi Jutomo et. Al (2023) The Influence of Individual Characteristics, Internal and External Factors of Postpartum Mothers with Baby Blues Syndrome in Rural and Urban Areas in Kupang City. EAS Journal of Nursing and Midwifery. ISSN: 2663-6735. Published By East African Scholars Publisher, Kenya.

[2] Suryawanshi IV, O., & Pajai, S. (2022). A comprehensive review on postpartum depression. Cureus, 14(12).

[3] Dowlati, Y., & Meyer, J. H. (2021). Promising leads and pitfalls: a review of dietary supplements and hormone treatments to prevent postpartum blues and postpartum depression. Archives of Women's Mental Health, 24, 381-389.

[4] Alshawwa, I. A., Elkahlout, M., El-Mashharawi, H. Q., & Abu-Naser, S. S. (2019). An expert system for depression diagnosis.

[5] Mardani, A., Hooker, R. E., Ozkul, S., Yifan, S., Nilashi, M., Sabzi, H. Z., & Fei, G. C. (2019). Application of decision making and fuzzy sets theory to evaluate the healthcare and medical problems: a review of three decades of research with recent developments. Expert Systems with Applications, 137, 202-231.

[6] Leake, D., Wilkerson, Z., Ye, X., & Crandall, D. J. (2023). Enhancing Case-Based Reasoning with Neural Networks. In Compendium of Neurosymbolic Artificial Intelligence (pp. 387-409). Amsterdam, The Netherlands: IOS Press.

[7] Goksel, N., & Bozkurt, A. (2019). Artificial intelligence in education: Current insights and future perspectives. In Handbook of Research on Learning in the Age of Transhumanism (pp. 224-236). IGI Global.

[8] Sulistiani, H., Muludi, K., & Syarif, A. (2021). Implementation of various artificial intelligence approaches for the prediction and recommendation of personality disorder patients. In Journal of Physics: Conference Series (Vol. 1751, No. 1, p. 012040). IOP Publishing.

[9] Gupta, I., & Nagpal, G. (2020). Artificial intelligence and expert systems. Mercury Learning and Information.

[10] Moyo, G. P. K., & Djoda, N. (2020). Relationship between the baby blues and postpartum depression: A study among Cameroonian women. American Journal of Psychiatry and Neuroscience, 8(1), 26-29.

[11] Sipasulta, N. G. C., Imamah, I. N., & Tanihatu, G. E. (2023). Experiences and Expectations of Post-Partum Mothers Toward Psychosocial Nursing Services for Mothers Who Have Experienced Postpartum Blues in the City of Balikpapan. Pharmacognosy Journal, 15(3).

[12] Khosravani, M. R., & Nasiri, S. (2020). Injection molding manufacturing process: Review of case-based reasoning applications. Journal of Intelligent Manufacturing, 31, 847-864.

[13] Amin, M. N., Iqbal, M., Ashfaq, M., Salami, B. A., Khan, K., Faraz, M. I., ... & Jalal, F. E. (2022). Prediction of strength and CBR characteristics of chemically stabilized coal gangue: ANN and random forest tree approach. Materials, 15(12), 4330.

[14] Santhoshkumar, S., & Dhinesh Babu, L. D. (2020). Earlier detection of rumors in online social networks using certainty-factor-based convolutional neural networks. Social network analysis and mining, 10, 1-17.

[15] Santhoshkumar, S., & Dhinesh Babu, L. D. (2020). Earlier detection of rumors in online social networks using certainty-factor-based convolutional neural networks. Social network analysis and mining, 10, 1-17.

[16] Rosmini, Ummi Syafiqoh, Asmah (2023). Implementation of Case-Based Reasoning (CBR) for the development of an expert system for diagnosing dental disease. Journal Media Information Budidarma. Vol 7, No 3, Page 1455-1462. DOI Publishing.