Expert System Eating Disorder To Youth With The Hybrid Methode

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Abstract— the research aims to provide information for the wider community about bulimia nervosa that often afflicts the community especially teenagers. Bulimia nervosa is one type of psychiatric disorder that is habitual that has ingrained from the community itself. No people understand the symptoms or indications of eating disorder in adolescents, and not infrequently among sufferers not doing direct treatment or looking for a direct solution to this disorder. To communicate with doctors also have constraints with time and confusion about what is to be conveyed. Expert system is a solution, this system is able to provide information to researchers about eating disorders in adolescents and provide solutions like a doctor or nutrition expert. It was built using by hybrid method which combines certainty factors and forward chaining.

Keywords— Expert System; Eating Disorder; Hybrid;

I. INTRODUCTION

Eating disorders often occur among teenagers day by day. Many factors make it become. And usually it is triggered by one's life style. It is can be categorized as a mental illness that will have a negative impact on one's psychic (Franko et al. 2018).

The experts say that eating disorders are psychiatric conditions with serious psychological and medical consequences(Haslinda, Ernalia, and Wahyuni n.d.). Eating disorders, such as anorexia nervosa (AN) and bulimia nervosa (BN), are chronic diseases that are defined as eating disorders or behavior in controlling weight (Kurniawan, Briawan, and Caraka 2015).

Generally, the people who have perfectionist traits that are always self-oriented have a greater risk of experiencing it. They are who has it condition have high expectations for themselves, including the state of their body shape (Kusuma, Bintanah, and Handarsari 2016). This if left unchecked will have a negative impact on health, and will no doubt also cause sudden death. To find this out, it is provided convenience to the public in the form of general knowledge about eating disorders by providing updated information in accordance with expert knowledge (Noviyanti and Marfuah 2017).

That knowledge can be given directly by experts or nutritionists in direct consultation but also by using a system in the form of an expert system (Fanny 2017). Therefore an expert system was built using a hybrid method that combines two methods in finding facts, namely the hybrid method (Yucesan, Gul, and Celik 2018). In this hybrid method a search with forward chaining and certainty factor is used. Forward chaining is a method of tracking data at the beginning to provide clear information, the information is strengthened by using certainty factor methods that provide certainty of the value of information in the form of a percentage (Wiyandra and Yenila 2018).

II. Literature Review

2.1 Expert System

The expert system is an activity of adaptation of someone's expertise that is transferred into the system (Yenila and Wiyandra 2019). This system provides direct information to users about information about it that often occur among adolescents (Akil et al. 2017)

2.2 Inference engine

The expert system was built using a hybrid method, which combines the forward chaining method with certainty factors. These two methods have different steps and different ways of delivering output (Hasibuan et al. 2017):
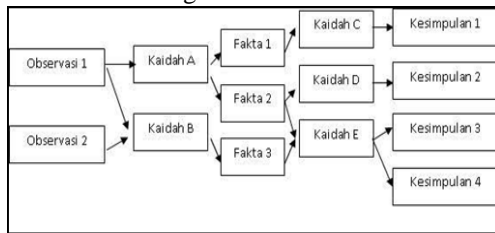
a. Forward chaining

Figure 1 The rule of Forward Chaining

Forward Chaining is a search of technique that starts with known facts, then matches facts from the IF part of the IF - THEN rule (Limantara, Winarto, and Mudjanarko 2017). If there is a fact that matches the IF section, then the rule is executed (Krisnanik 2018).

When the rules are executed, new facts (THEN section) are added to the database (Hasibuan et al. 2017).

The steps in creating an expert system using the forward chaining method are (Nurajizah et al. 2018):

a. Defining the problem starts with the selection of the problem domain and the acquisition of knowledge
b. Dendefenesian input data to start inference because it is required by the forward chaining system.
c. Define the data control structure to help control the activation of a rule.
d. Writing the initial code in the domain of knowledge
e. Testing the system in order to know the extent to which the system is running
f. Interface design based on knowledge
g. System development
h. System evaluation

b. Certainty Factor

The Certainty Factor method shows a measure of certainty about a fact or rule(Putri and Saputra 2018). Certainty Factor is a clinical parameter value given by MYCIN to show the amount of trust. The advantage of the Certainty Factor method is that it can measure something that is certain or uncertain in making decisions on this expert system (Sihotang 2014).

The basic formula of Certainty Factor:
$$CF(h, e) = MB(h, e) - MD(h, e)\ (1)$$
Information:

a. CF (h, e) = Certainty Factor (factor certainty) in hypothesis h is influenced by evidence (symptoms) e.

b. MB (h, e) = Measure of Belief (confidence level), is a measure of the confidence of the hypothesis h influenced by evidence (symptoms) e.
c. MD (h, e) = Measure of Disbelief (level of uncertainty), is a measure of mistrust of the hypothesis
d. h is influenced by symptoms e.
e. h = The resulting hypothesis or conclusion (between 0 and 1).
f. e = Evidence or event or fact (symptom)

The next calculation is a combination of two or more rules with different evidence but in the same hypothesis(Ramadhan n.d.):
$$Rule\ 1\ CF(h, e1) = CF1 = C(e1)xCF(Rule1)\ (2)$$
$$Rule\ 2\ CF(h, e2) = CF2 = C(e2)xCF(Rule2)\ (3)$$
$$CF combinasi\ [CF1, CF2] = CF1 + CF2(1 - CF1)\ (4)$$

III. Metodology Research

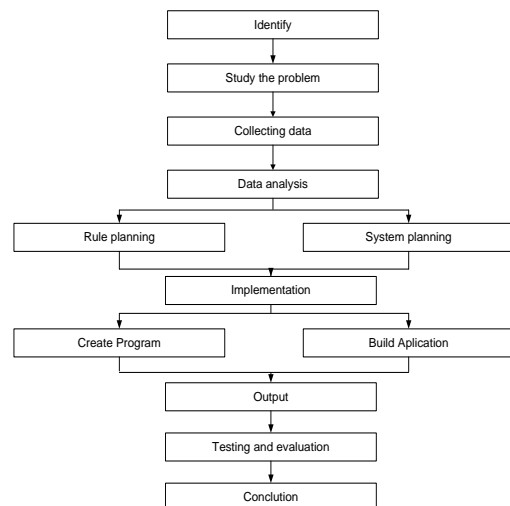The form of the research framework used in designing this system is as follows:

Figure 2 Metodology Research

Based on Figure 2 it can be explained that the stages of the implementation of this study began from identifying problems and setting goals, which aim to maintain consistency of this research so that this research is more directed, and the objectives of the research are expected to be achieved. Then the library review is continued, namely studying literature, journals, books related to research (problems that have been identified).

The next stage in this research is the collection of data and information, this stage is conducted to find out how to get data and information that will

later support this research, in data collection, there are several methods used, namely field research, library research (library research), and laboratory research (laboratory research). After data collection, the next step is a system analysis designed based on the identification of the problem and the data obtained.

The next stage is system design which consists of application design and program design. After this stage is completed, then it enters the implementation phase, which is making applications and making programs to get results, which are then tested and evaluated. After that a conclusion is drawn from the trial and evaluation of the results that have been carried out.

IV. Analysis and Results

Symptoms of eating disorders that are felt by patients can be seen from the following table 1:

Table 1 Symptoms of Eating Disorders

Code	Symptoms of Disease
G001	Excessive weight loss
G002	Look thin and not ideal weight
G003	Loss of sexual desire
G004	Disorders of the heart organ, such as palpitations
G005	Low blood pressure
G006	Kidney failure
G007	Dry skin on hands and feet due to lack of blood flow
G008	Dehydration
G009	Vomiting or abusing laxatives or diuretics in an effort to lose weight
G010	Use the bathroom often after meals
G011	Excessive exercise
G012	Preoccupation or think constantly about weight
G013	Tooth problem
G014	Sore throat
G015	Depression or mood swings
G016	Feeling out of control
G017	Swollen glands in the neck and face
G018	Heartburn, indigestion, and bloating
G019	Irregular menstruation
G020	Weakness, fatigue, and red eyes
G021	Can't stop myself when eating

Code	Symptoms of Disease
G022	Quickly consume food in large portions
G023	Keep eating even though you already feel full
G024	Hide when eating
G025	Eat normally in front of people but when you eat alone, eat greedily
G026	Always eat almost all day and do not have time to eat
G027	Feel stressed and depressed then think you can only calm down if you eat
G028	The growth of hair or fine hairs all over the body (lanugo)
G029	Dry skin
G030	Muscle becomes weak
G031	Often feel cold due to low body temperature
G032	Menstruation becomes irregular, does not even experience menstruation
G033	Hypotension or low blood pressure
G034	Anemia or lack of blood
G035	Bone Loss

Table 2 Types of Eating Disorders

Code	Types of Disorders
J001	Anorexia Nervosa
J002	Bulimia Nervosa
J003	Binge eating disorder
J004	Ortoreksia nervosa

Table 3 The Point of Certainty Factor

No	Information	Value By User
1	Not	0
2	Do not know	0.2
3	A little sure	0.4
4	Pretty sure	0.6
5	Sure	0.8
6	Very sure	1

Table 4 Certainty Factor Value for Each Premise

Code	Symptoms of Disease	Point
G001	Excessive weight loss	0.7
G002	Look thin and not ideal weight	0.6
G003	Loss of sexual desire	0.5

G004	Disorders of the heart organ, such as palpitations	0.9
G005	Low blood pressure	0.7
G006	Kidney failure	0.8
G007	Dry skin on hands and feet due to lack of blood flow	0.4
G008	Dehydration	0.5
G009	Vomiting or abusing laxatives or diuretics in an effort to lose weight	0.8
G010	Use the bathroom often after meals	0.5
G011	Excessive exercise	0.4
G012	Preoccupation or think constantly about weight	0.7
G013	Tooth problem	0.4
G014	Sore throat	0.8
G015	Depression or mood swings	0.7
G016	Feeling out of control	0.4
G017	Swollen glands in the neck and face	0.5
G018	Heartburn, indigestion, and bloating	0.6
G019	Irregular menstruation	0.4
G020	Weakness, fatigue, and red eyes	0.8
G021	Can't stop myself when eating	0.7
G022	Quickly consume food in large portions	0.9
G023	Keep eating even though you already feel full	0.4
G024	Hide when eating	0.1
G025	Eat normally in front of people but when you eat alone, eat greedily	0.8
G026	Always eat almost all day and do not have time to eat	0.7
G027	Feel stressed and depressed then think you can only calm down if you eat	0.8
G028	The growth of hair or fine hairs all over the body (lanugo)	0.7
G029	Dry skin	0.2
G030	Muscle becomes weak	0.5

G031	Often feel cold due to low body temperature	0.8
G032	Menstruation becomes irregular, does not even experience menstruation	0.6
G033	Hypotension or low blood pressure	0.7
G034	Anemia or lack of blood	0.7
G035	Bone Loss	0.8

The new rules are then calculated with certainty value using information provided by the expert using the Certainty Factor method by the user using the following equation:

$$CF(H,E) = CF(E)*CF\ (rule)$$
$$= CF(user)*CF\ (expert)$$

The final step is to combine the certainty factor values of each rule that is combined
CF 1 up to CF 4 with the equation

$$CFCOMBINE(CF1,CF2) = CF1 + CF2 * (1 - CF1)$$
$$CFCOMBINE\ (CF1,CF2) = 0{,}7 + 0{,}6 * (1 - 0{,}7)$$
$$= 0{,}7 + 0{,}18$$
$$= 0{,}78\ CFold$$
$$CFCOMBINE\ (CFold,CF3) = 0{,}78 + 0{,}5 * (1 - 0{,}78)$$
$$= 0{,}78 + 0{,}11$$
$$= 0{,}89\ CFold$$
$$CFCOMBINE\ (CFold,CF4) = 0{,}89 + 0{,}9 * (1 - 0{,}89)$$
$$= 0{,}89 + 0{,}09$$
$$= 0{,}98\ Cfold$$

From the above conditions, the percentage of confidence = CFCOMBINE * 100% is obtained, that is 0.98 x100% = 98% which states that based on certainty weights, it is stated that we are very confident.

a. System Implementation

The system was built by making it easy for users to provide information or ease in consultation. The first step taken by the system is to consult to provide complaint information from the user first and then provide a statement form to the user in the form of a confidence level or weight value of the conditions experienced.

After finishing using the initial display further on other system activities that are conducting consultations between the user and the system. Information provided in the form of events experienced by the user.
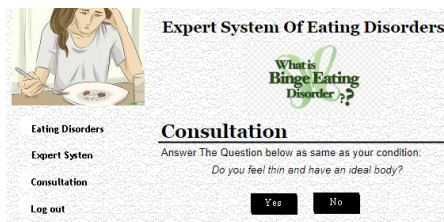
Figure 4 Consultation Display

Accoding by consultation activities can be provided information to patients about eating disorders faced by patients. After the first question is answered yes by the user then go to the next form which is to give the certainty value / weight given to the question. How sure is the user experiencing the conditions in the questions.

Figure 5 Certainty Factor

From the certainty of weight in accordance with the questions raised by the system conclusions / results from the system can be drawn as follows:
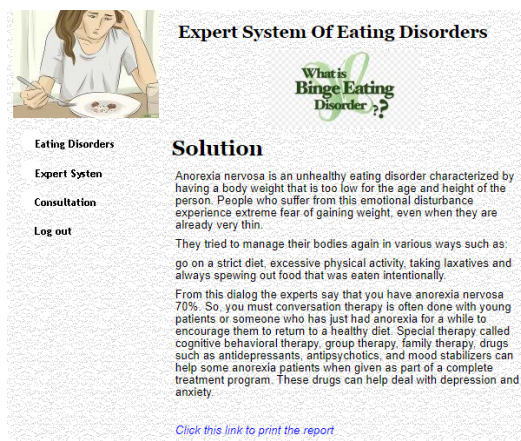

Figure 6 Conclusions

The results of the conclusions of the study can be used in a hard copy and can be used by users when needed.

V. Conclution

Based on the analysis and discussion carried out, it can be concluded several things as follows:

1. There are several factors that can determine appendicitis. The influencing factors are obtained from several choices given by the system, so that an expert system plan will be produced to determine which patients have inflammation of the intestine

2. The system designed can determine the possibility of inflammation of the intestine of the patient based on the user's chosen data entered.

3. Reasoning is done by using the backward chaining method with the aim of giving a percentage of the possibility of the patient experiencing intestinal inflammation.

4. The output of this system is in the form of information to help patients with intestinal inflammation or treatment for people with inflammation of the intestine in the initial stages which are seen by using a system in the form of hardcopy.

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