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EXPERT SYSTEM TO DIAGNOSE ERYTHEMA MULTIFORME USING THE CERTAINTY METHOD WEB-BASED FACTOR

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Abstract

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Information technology plays an important role for human survival. Information technology is almost inseparable from various aspects of everyday life, Expert system 2 is one of the branches of artificial intelligence that studies how an expert thinks and thinks in solving a problem, and makes a decision or draws conclusions from a number of conclusions. existing facts. In some cases, this disease can cause complications, such as poisoning the blood (septicemia), septic shock (when blood pressure drops to its lowest level), skin infections (cellulite), permanent skin damage, permanent eye damage, and inflammation of organs such as the liver and kidneys. lungs. So it is difficult for patients to get information about Erythema Multiforme and how to handle it. In this research, an expert system web will be designed to diagnose the disease in Erythema Multiforme using the Certainty Factor method. Therefore, technological sophistication is also used by sufferers of Erythema Multiforme to seek information on solutions and prevention of the disease. Erythema Multiforme is a hypersensitivity reaction on the skin that is often triggered by infection, especially viral infections such as the Herpes Simplex virus (HSV). The previously designed system has not implemented the client server feature so as to facilitate centralized database processing. Always back up data to avoid possible loss of important data caused by hardware damage. Then a web expert system will be designed to diagnose the disease in Erythema Multiforme using the Certainty Factor method. This expert system web reasoning uses a chain that is traversed from a chain that is traversed from a hypothesis back to facts that support the hypothesis.

Keywords: Expert System, Artificial Intelligence, Certainty Factor, Website

1. INTRODUCTION

Technological developments have had a major impact on various parts of the world as well as several fields. This has resulted in advances in software that are balanced with sophistication, information technology has become an important role for human survival. Information technology is almost inseparable from various aspects of everyday life, Expert system 2 is one of the branches of artificial intelligence that studies how an expert thinks and thinks in solving a problem, and makes a decision or draws conclusions from a number of conclusions. existing facts. In this research, an expert system web will be designed to diagnose the disease in Erythema Multiforme using the Certainty Factor method. Therefore, technological sophistication is also used by sufferers of Erythema Multiforme to seek information on solutions and prevention of the disease.[1]

Erythema Multiforme is a hypersensitivity reaction on the skin that is often triggered by infection, especially viral infections such as the Herpes Simplex virus (HSV).Erythema Multiforme is characterized by the appearance of reddish skin lesions, acute in nature, can heal without causing

complications for the patient. The emergence of the main factors, namely fever, chills, weakness, joint pain, feeling unwell, the genitals feel sore and painful when urinating, red and sore eyes, blurred vision and are more sensitive to light, pain in the mouth and throat area, so that difficult to eat and drink.[2]

In some cases, Drugs are a rare cause of EM, most of the literature reporting drug-related problems should be considered for similarity to other diseases such as annular or maculopapular urticarial eruptions with multiple lesions resembling the target lesion. The drugs most commonly associated with the occurrence of EM are antibiotics, especially sulfa and beta-lactam groups, anticonvulsants phenytoin and carbamazepine, allopurinol, non-steroidal anti-inflammatory drugs and oral anti-diabetic drugs.

A girl, 10 years old, Balinese, Indonesian citizen, with medical record number 16.01.79.93, was consulted from pediatric triage to the Dermatology and Venereology section of Sanglah Hospital Denpasar on 2 May 2016 with a suspected Stevens Johnson Syndrome. The patient was consulted with complaints of reddish spots on the face and whole body since 3 days ago. Initially the spots appeared on the patient's chest, then increased in number and spread to the face and body. The patches that appeared were not accompanied by itching or pain. In addition, there were also sores on the lips since 2 days ago, the sores on the lips felt painful so that the patient was a bit difficult to eat and drink. Complaints of red eyes and discharge from the eyes were also felt by the patient since 1 day ago. In addition, the patient complained of genital sores. and pain when urinating. The patient also has a mild fever since 5 days ago. Prior to complaints on the skin, eyes and genitals, the patient had taken paracetamol and capsida herbal medicine (Coriandri fructus, Cantella herb, Imperatae rhizoma, Amomi fructus, Languatis rhizoma, Curcumae, Zingibeis, Burmani cortex, Andrographidis herbs) since 5 days ago.

The history of applying oil or traditional ingredients before or after complaints appeared was denied. The patient had never experienced the same complaint before. There was no history of having watery nodules on the lips or on the genitals before the complaint appeared. There was no history of cough, runny nose and shortness of breath. There is no history of similar complaints in the family. History of drug allergy, asthma, frequent morning sneezing, other diseases and malignancies were denied to both the patient and family. Physical examination showed moderate general condition, awareness of compost mentis. Blood pressure 110/70 mmHg, pulse 84x/minute, respiration 20x/minute, axillary temperature 38.3 oC, Visual Analog Score 1, weight 40 kg, height 150 cm, good nutritional status.

The general status of the patient was found to be normocephalic. The eyes showed conjunctival hyperemia and discharge in both eyes, signs of anemia and icterus were not found. Examination of the ears, nose and throat did not reveal any abnormalities. Cardiac examination revealed single, regular S1 and S2 heart sounds, no murmurs. Examination of the lungs revealed vesicular breath sounds, no rales or wheezing. Abdominal examination revealed bowel sounds within normal limits, there was no distension, the liver and spleen were not palpable. Examination of the extremities was warm and no edema was found. Enlarged lymph nodes were not found. Hair examination. No abnormalities were found, nails and sweat glands. Nerve examination did not reveal peripheral nerve thickening, paresthesias or macular anesthesia. This disease can cause complications, such as poisoning the blood (septicemia), septic shock (when blood pressure drops to its lowest level)

2. Method

2.1 Expert System

This study uses the transfer of expertise from experts to computers and then transferred to other people who are not experts. An expert is someone who is able to explain a response, learn new things around the problem topic (domain), reorganize knowledge if deemed necessary, break rules if needed and determine whether their expertise is relevant or not.[3]. The knowledge transfer process requires 4 activities, namely: Add knowledge (from experts or other sources).

a. Represent knowledge (to computer)
b. Perform knowledge inference.
c. Transfer of knowledge to the user.

The knowledge stored in the computer is called the knowledge base. There are 2 types of knowledge, namely: facts and procedures (usually in the form of rules). There are two main parts of an expert system, namely: 1. Development environment: used to incorporate expert knowledge into the expert system environment. 2. Consultation environment: used by non-expert users to acquire expert knowledge. The structure of the expert system is given in the following figure.[4]

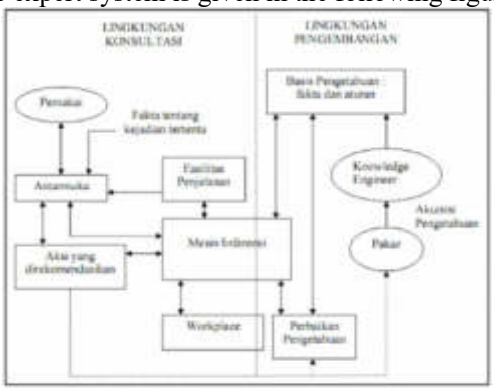

Figure 1. Expert System Structure.

2.2 Flowchart

The flowchart of this system is the steps to carry out the process of identifying the diagnosis of a disease that begins by inputting the symptoms of the disease and then will be processed by matching 34 diseases using the certainty factor method. If the premise is suitable using the work method, it will continue with testing. If not then it will return to the input disease symptoms. After that the percentage of symptoms will be displayed.[5]

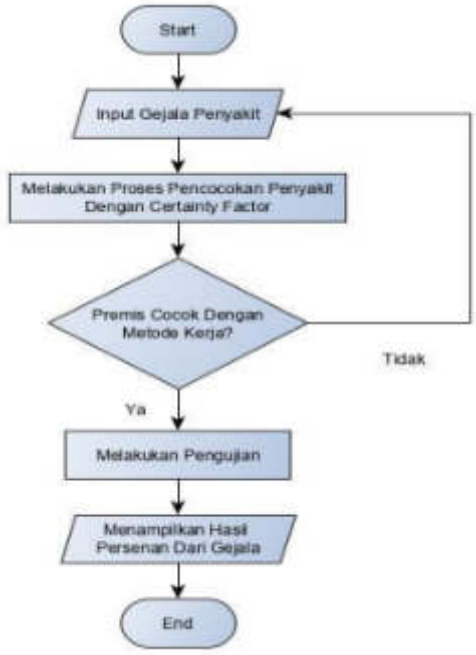

Figure 2. Flowchart System

2.3 Certainty Factor

The certainty factor method is used when facing a problem for which the answer is uncertain. This uncertainty can be a probability. This method was introduced by Shortlife Buchanan in the 1970s. He uses this method when diagnosing and treating meningitis and blood infections [6]

IF E1 [AND / OR] E2 [AND / OR] ... En
THEN H (CF = Cfi) (1)

Information :

E1 .... En : the facts (evidence) that exist.

H : the resulting hypothesis or conclusion.

CF : level of confidence (Certainty Factor) the occurrence of hypothesis H due to the facts E1 to En

This flowchart is a step to calculate the required value, which value will be used to determine the value of certainty and uncertainty of erythema multiforme disease. The workings of the certainty factor method system is to input the symptom value, then look for the rule base certainty factor, after the rule is found then the next process is to search for the exact value and uncertainty, after getting the value the data will be stored and display the calculation results.[7]

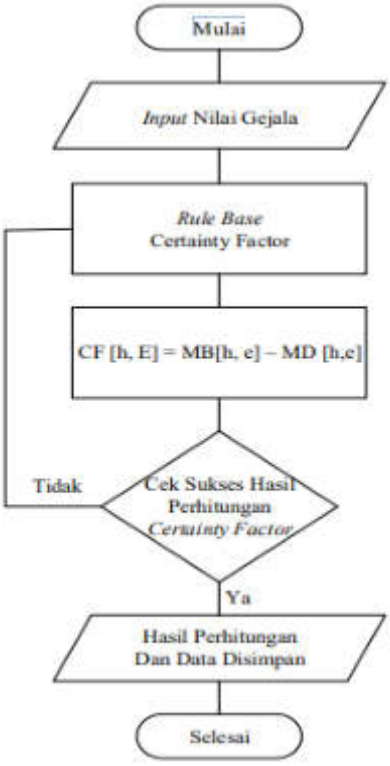

Figure 3. Flowchart Method Certainty Factor

This flowchart is a stage to find the combined value, which is the result of the search for the certainty factor value, which starts by inputting the value of the certainty factor symptom, then performs a combine calculation then checks the calculation results whether the value is appropriate or not, if not then return to the calculation search. combine. If it is appropriate then the calculation is complete[8]-[9]

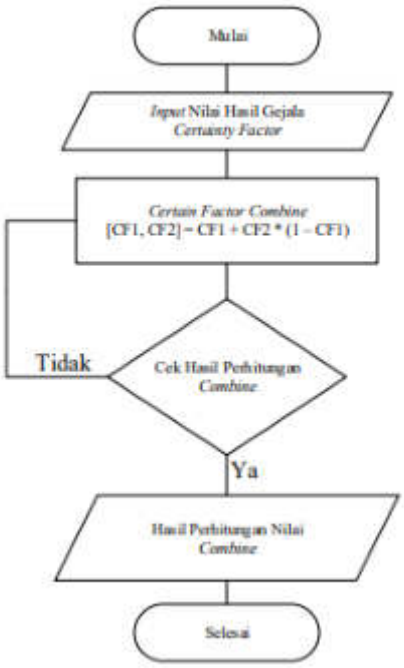

Figure 4. Flowchart Finding Combine Values

The system design that runs is useful for identifying and evaluating the expert system for diagnosing Erythema Multiforme disease using the Certainty Factor method, analysis in order to find problems in processing the expert system for diagnosing Erythema Multiforme disease using the Certainty Factor method in determining the symptoms so that it is easy to diagnose. determine the type of Erythema Multiforme disease suffered by the user.[10]-[11]

3. RESULT AND DISCUSSION

3.1 Design

The needs analysis stage is the stage carried out to obtain information on what needs are used to build the system so that it runs properly. These requirements include hardware and software.[12]

1. Use Case Diagram Design.
   a. System For Admin
   b. System For Users
2. Class Diagram Design.
   a. Admin
   b. Knowledge Base
   c. Symptom
   d. Results
   e. Condition
   f. Disease
3. Sequence diagram design.
   a. Expert Data Sequence
   b. Knowledge Base Process Sequence
   c. Symptom Data Process Sequence
   d. Result Process Sequence
   e. Sequence Process Condition
   f. Disease Process Sequence
4. Database Design.
   a. Expert Table = username + password + full_name.

b. Knowledge Base Table = knowledge_code + disease_code + symptom_code + mb + md.
c. Symptom table = symptom_code + symptom_name +
d. Result Table = result_id + date + disease + symptom + result_id + result_value.
e. Condition table = id + condition + type.
f.Table Disease = code_disease + name_disease + det_disease + srn_disease + picture.

5. Activity Diagrams
a. Activity Diagram Expert Login Data Form.
b. Activity Diagram Knowledge Base Form.
c. Activity Diagram Data Form Symptoms.
d. Activity Diagram Form Data Conditions.
e. Activity Diagram of Disease Virgin Form.
f. Activity Diagram Result Form.

6. Input Design
a. Expert Login Form Design.
b. Main Form Design.
c. Expert Data Form Design.
d. Disease Data Form Design.
e. Symptom Form Design.
f. Draft Rule Form.
g. Consultation List Form Draft.
h. Patient Consultation Result Form Design.

7.Output Design
a. Patient Consultation Result Report Output Design[13]-[14]

This study describes the results and testing of the web to diagnose erythema multiforme using the certainty factor method. Web that uses the PHP programming language and uses a database stored in mysql. The data used is data taken from the results of interviews by dermatologists. The test is carried out using the certainty factor method.[15]

$$CF[h, e] = MB[h,e] - MD \quad (2)$$

Information :
a. CF[h,e] = certainty factor
b. MB[h,e] = measure of belief, a measure of confidence or level of confidence in the hypothesis (h), if given evidence (e) between 0 and 1.
c. MD[h,e] = measure of disbelief, a measure of distrust or level of disbelief in the hypothesis (h), if given evidence (e) between 0 and 1.

There are several combinations of Certainty Factor on certain premises:
a. Certainty factor with one premise. CF[h,e] = CF[e] * CF[rule] = CF[user] * CF[expert]
b. Certainty factor with similar conclusions. CF combined [CF1, CF2] = CF1 + CF2 * (1-CF1)[16]

Table 1 Disease

No.	Kode Penyakit	Nama Penyakit
1.	P01	*Eritema Multiforme Mayor*
2.	P02	*Eritema Multiforme Minor*

Table 2 Symptoms of MB and MD Values

No.	Kode Gejala	Nama	MB	MD
1.	G01	Demam	0.9	0.8
2.	G02	Sakit Kepala	0.9	0.6
3.	G03	Rasa Tidak Sehat	1	0.7
4.	G04	Bibir Bengkak & Berkerak	1	0.9
5.	G05	Ruam Yang Gatal	0.7	0.1
6.	G06	Luka Pada Alat Kelamin	1	0.7
7.	G07	Badan Terasa Nyeri	0.7	0.5
8.	G08	Mata Merah & Perih	0.9	0.5
9.	G09	Pandangan Kabur	0.8	0.4
10.	G10	Luka Didalam Mulut	1	0.7
11.	G11	Nyeri Sendi	1	0.8

Table 3. Rule Base

No.	Nama Penyakit	Rule Base
1.	*Eritema Multiforme Mayor*	**IF** Demam **AND** Sakit Kepala **AND** Rasa Tidak Sehat **AND** -Sangat Yakin Bibir Bengkak **AND** -Yakin Mata Merah **AND** -Cukup Yakin Pandangan Kabur **AND** Luka Dalam Mulut **AND** Luka Pada Alat Kelamin **AND** Nyeri Sendi **THEN** Eritema Multiforme Mayor
2.	*Eritema Multiforme Minor*	**IF** Ruam Yang Gatal **AND** -Sedikit Yakin Badan Terasa Nyeri -Tidak **Then** Eritema Multiforme Minor

Table 4 Value Options

No	Gejala	Nilai
1.	Sangat Yakin	0,5
2.	Yakin	0,4
3.	Cukup Yakin	0,3
4.	Sedikit Yakin	0,2
5.	Tidak	0,1

So manual calculations with the certainty factor method obtained the highest value, namely erythema multiforme major disease with a value of 0.927986464, then the results of the consultation with erythema multiforme major. Erythema multiforme using the certainty factor method was chosen because it has the best performance for diagnosing erythema multiforme compared to the forward and backward chanting methods. Many journals discuss diagnosing diseases, this of course helps researchers in making this research.[17]

A specification that when instantiated will produce an object and is the core of object-oriented development and design. Class diagrams describe the state (attributes/properties) of a system, as well as offering services to manipulate these states (methods/functions).[18]-[19]

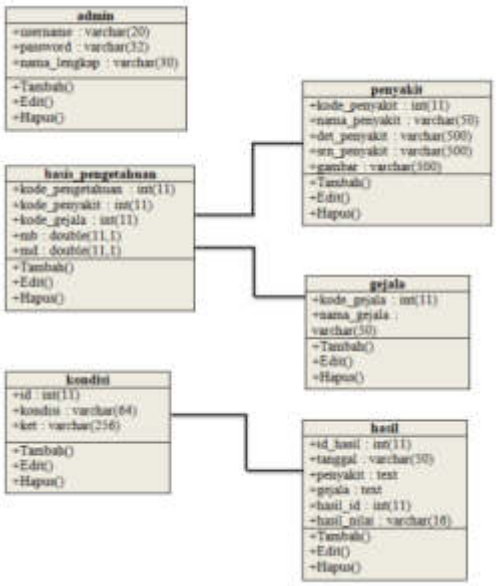

Figure 5. Class Diagram of an Expert System for Diagnosing Erythema Multiforme Disease Using the Certainty Factor Method

The database design is a place that will be used to store every data of the users who use this application.

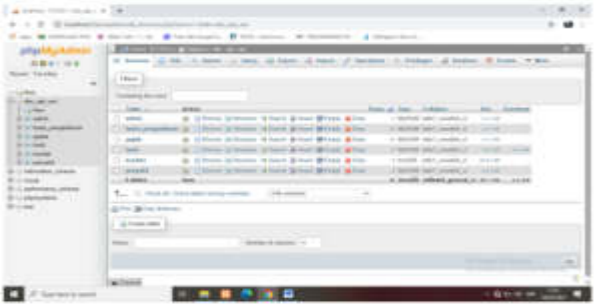

Figure 6. Design Database

The initial form is the main page or home page to display what features will be enabled. This form contains the main page in the form of total symptoms, total disease, total knowledge, total admin experts, homepage, diagnosis, history. In this initial form there is also an explanation of knowledge for erythema multiforme disease.

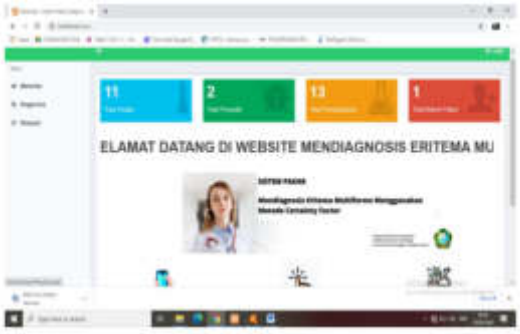

Figure 7. Initial Form

In this form to input the symptoms that will be experienced by the user or patient.

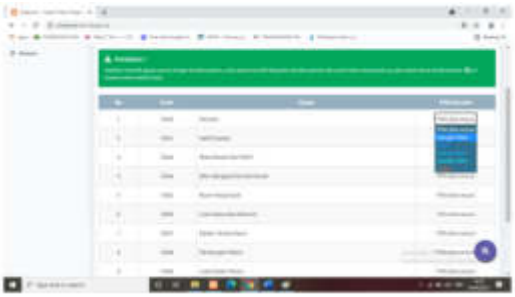

Figure 8. Symptom Input Menu

In this picture is the final display of the user's or patient's diagnosis and an illustration of erythema multiforme will be shown.

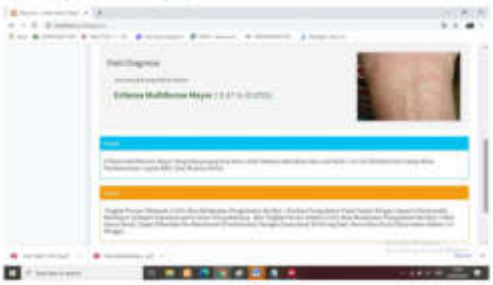

Figure 9. Final Result of Diagnosis

In this form the user or patient can view the history of previous diagnoses to see the development of symptoms experienced by the user or patient.

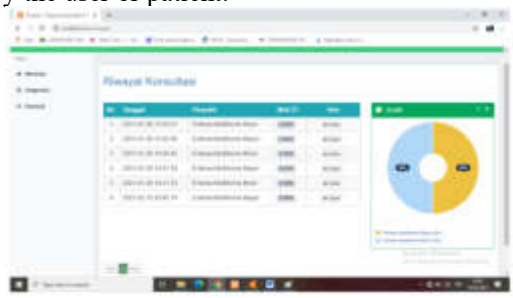

Figure 10. History Form Display

The final display of the patient's consultation report will display the user's consultation result data and the results of the consultation which as for the patient's leave can be printed.

Figure 11. Consultation Result Display

The application in this program system is to be able to find out where the match is to the expert who wants to be known and can help someone who wants to know the explanation and how many percent of a person is affected by erythema multiforme major or erythema multiforme minor.

4. CONCLUSION

After testing this research with erythema multiforme, it can be concluded as follows: Reported a case of major EM in a 10-year-old girl suspected to be caused by paracetamol and capsida. The diagnosis is based on history, physical examination and supported by serological examination and chest radiography. lesions, while physical examination revealed atypically elevated target lesions accompanied by 3 mucosal involvement (eyes, lips and genitalia). The patient was hospitalized and given intravenous fluid therapy, systemic corticosteroids in the form of methylprednisolone, topical triamcinolone acetonid for lesions on the lips and 0.9% NaCl compress on the lips and genitalia. can be treated in a polyclinic.

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