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Expert System for Detecting Malaria Using the Certainty Factor Method

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ABSTRACT

The expert system in this study is an expert system for diagnosing Malaria. The system provides consultation facilities to help users diagnose malaria. This identification process is carried out by selecting the symptoms experienced by the patient. The method used is the certainty factor method which provides a level of confidence from the results of the consultations carried out, with an easy design and in accordance with existing rules. So the program created is expected to represent an expert in diagnosing malaria. Utilization of databases to store the knowledge base of expert systems will make it easier to make knowledge addition facilities. With the addition of knowledge facilities,

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1. INTRODUCTION

Efforts to control malaria in Indonesia since 2007 can be monitored using the Annual Parasite Incidence (API) indicator.(Zohra et al., 2019). This is related to the Ministry of Health's policy regarding the use of one indicator to measure the incidence of malaria, namely the API. In 2007 this policy required that every case of malaria must be proven by the results of a blood smear examination and all positive cases must be treated with artemisinin-based combination therapy or ACT (Artemisinin-based Combination Therapies).(Ngame & Aty, 2019).

Malaria is still found in all provinces in Indonesia. Based on the API, an area stratification was carried out where the eastern part of Indonesia was included in the high malaria stratification, moderate stratification in several areas in Kalimantan(Wiwoho et al., 2018),(Manangsang et al., 2021), Sulawesi and Sumatra while Java-Bali are included in the low stratification, although there are still high malaria villages/focuses. API from 2008 – 2009 decreased from 2.47 per 1000 population to 1.85 per 1000 population. When viewed per province from 2008 – 2009 the provinces with the highest API were West Papua, NTT and Papua, there were 12 provinces above the national API rate.(Sitorus et al., 2016).

In the Strategic Plan of the Ministry of Health for 2010-2014, malaria control is one of the diseases targeted to reduce the morbidity rate from 2 to 1 per 1,000 population.(Gunawan & Simaremare, 2016). The malaria morbidity rate (API) in 2009 was 1.85 per 1000 population, so

effective efforts still have to be made to reduce the 0.85 morbidity rate per 1000 population within 4 years, so that the target of the 2014 Health Strategic Plan is achieved.(Wiwoho et al., nd).

Malaria is still a major public health problem, because it affects the morbidity of infants, toddlers and mothers giving birth and causes extraordinary events (KLB).(Kinansi et al., 2021). The number of endemic districts/cities in 2004 was 424 out of 579 districts/cities, with an estimated percentage of the population at risk of transmission of 42.42%. The problem of malaria in Eastern Indonesia covers all areas, both from the village, sub-district, district and province levels, while in other areas the transmission is local specific in certain areas.(Salahuddin, 2021). In 2006 there were outbreaks of malaria in several areas. Mitigation efforts either by mass treatment, fever surveys, house spraying, disease vector investigations and other actions such as draining breeding sites have been carried out well(Dinata, 2018).

It is estimated that in 2009 of the 225 million cases of malaria worldwide, 781,000 thousand of them ended in death. Mosquitoes with Plasmodium are widespread in parts of the world, especially tropical and sub-tropical regions such as most of Asia (especially Southeast Asia), America (especially South America) and Sub-Saharan Africa (Ministry of Health RI 2011; 1).

Based on the explanation above, the author is interested in creating an expert system using the certainty factor method to overcome the difficulty of data certainty in providing the information needed by users.

The advantage of the Certainty Factor method is that this method is suitable for use in expert systems to measure whether something is certain or uncertain in diagnosing a disease as one example. Calculations using this method in one count can only process two data so that the accuracy of the data can be maintained.(Fatkhurozi & Kurniawan, 2020),(Ramadan et al., 2017).

While the disadvantages of the Certainty Factors method are the general idea of modeling human uncertainty using the numerical certainty factors method which is usually debated. Some people will dispute the opinion that the formula for the certainty factors method above has little truth(Ramadan et al., 2017), This method can only process uncertainty/certainty of only two data. Data processing needs to be done several times for data that is more than two pieces. The CF value given is subjective because the assessment of each expert can vary depending on the expert's knowledge and experience(AGUSTINA et al., n.d.).

2. RESEARCH METHOD

The method used in this research is the certainty factor method. Researchers have done several ways to solve the problems faced by the medical community and people affected by malaria. Among others are:

a. Library Studies (Library Research)
   The author conducts a literature study to obtain data related to thesis writing from various reading sources such as: books and journals about information systems and Visual Basic applications, Artificial Intelligence, Malaria Disease and others, from the internet or not.
b. Interview (Interview),
   The data collection technique used by the author is to conduct interviews directly with doctors regarding malaria, as well as books related to the author's title. This method is used to obtain the necessary data such as the symptoms that cause malaria, and other data related to research.

2.1. Existing System Analysis)

There are several procedures used in this study. The design procedure is the procedures and steps needed to achieve the design objectives carried out. The steps are :

a. Analyze the existing problems in the detection process of Malaria and determine the types of the disease.
b. Create applications with the VB.Net programming language and SQL Server database.

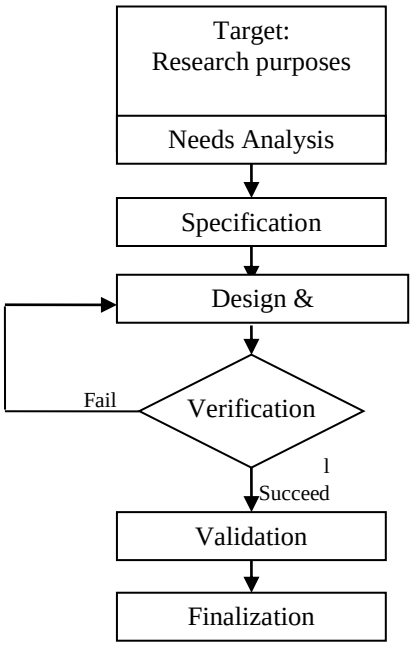

Figure 1: Design Procedure

In the picture above the system design procedure can be described into several stages, namely Research Objectives, Needs Analysis stage, Specifications, Design stage (Implementation), Verification, Validation and Finalization stage. And the activities carried out at each stage are as follows;

a. Research targets/objectives
   The research target was carried out to create an application that could facilitate the medical community and the community in diagnosing malaria and produce information that is faster, easier and more precise.
b. Needs Analysis
   Contains things that must exist in the results of the design in order to be able to solve existing problems according to the purpose. Some of the things that must be met are: There is an application that runs to detect malaria, There is a database to store patient data and diagnostic results, Hardware that supports all software tools used in building this expert system. Users are users who are not experts or general users who carry out consultations, students who wish to obtain information about malaria and the types of the disease.
c. Specification
   Contains specifications for the designed tools, components, test equipment used and block diagrams of the equipment to be designed. The system design uses the VB.Net programming language and SQL Server database. Computer specifications used by PCs or laptops with processors above Pentium IV, memory above 1 GB DDR3 and 320 GB hard drives.
d. Design and Implementation
   This stage is in the form of designing an attractive interface so that users don't feel bored from the system used. System design using VB.Net. Implementation, namely testing the system that has been built, whether the software is running as designed and the database connection.
e. Verification

Verification is carried out to re-check the state of the expert system that has been created. Thus if there are errors or deficiencies can be corrected first and return to the design and implementation stages.

f. Validation
Contains the steps taken when testing the equipment as a whole, the quantities to be tested, and measures to assess whether the tool is working properly according to specifications. After the application is created, it will then be run on the computer if it is appropriate and running properly. Run new applications to be tested on old systems and perform system maintenance. See the results of information from applications that are made with the specifications of the computer used.

g. Finalization
Finalization is the final stage of the design procedure. At this stage, testing the expert system is carried out and re-checking the stages that have been carried out in this design procedure. If at this stage all the systems have been running well and smoothly, then the system is ready to use.

2.3 Location

The location of the research was carried out at RSU.SEHAT which is located at Jl. Letda Sudjono No. 20 E - Bandar Selamat Medan.

3. RESULTS AND DISCUSSIONS

3.1 Results Display

This chapter will explain the display of the results of the application that has been made, which is used to clarify the views that exist in the expert system application. So that the results of its implementation can be seen in accordance with the results of the program that has been made. The following describes the display of results from an expert system for detecting malaria using the built-in certainty factor method, namely;

a. Display Form Select User
This view is a display for selecting users so they can access the main form according to the user's access rights. In this menu the user can choose according to the access rights as a user. Display image of the User Select Form as shown in Figure 1

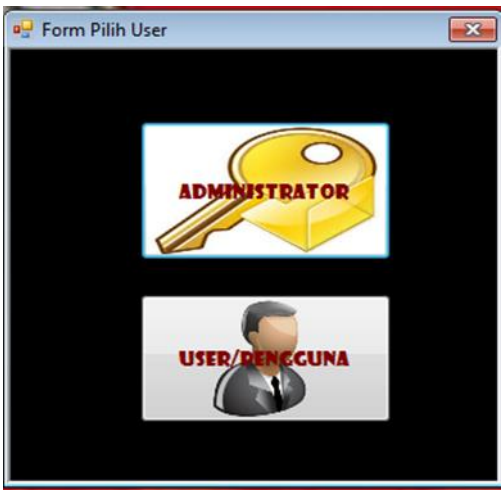

Figure 1: Display Form Select User

b. Admin Login view

This view is a login display as an admin before accessing the admin form. In this menu, before logging in, the admin must enter a username and password so that the program can be opened, as shown in Figure 2.

Figure 2 Admin Login view

c. Main Menu Display

The display of this form functions to display the Registration, User, Admin Expert menus, as shown in Figure 3.

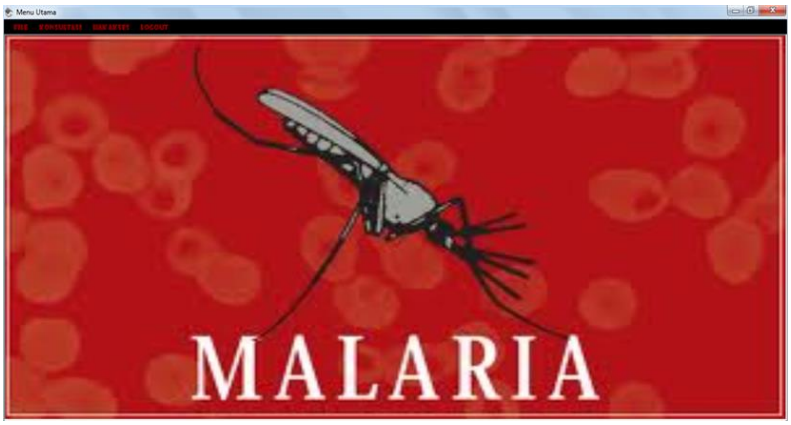

Figure 3: Display Main Menu

d. Display of Symptom Data Input Form

In the symptom data input form, it functions to input symptom data as shown in Figure 4.

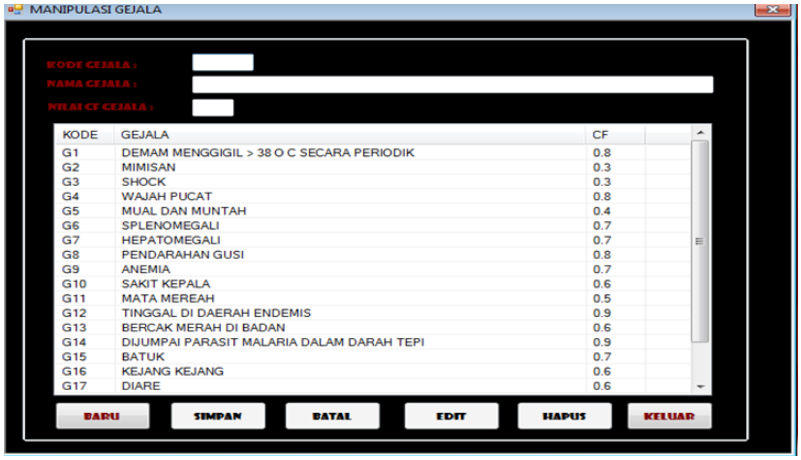

Figure .4: Display the Symptom Input Form

e. Display of Rule Base Data Input Form

The data input form functions to input disease data and regulatory data, as shown in Figure 5

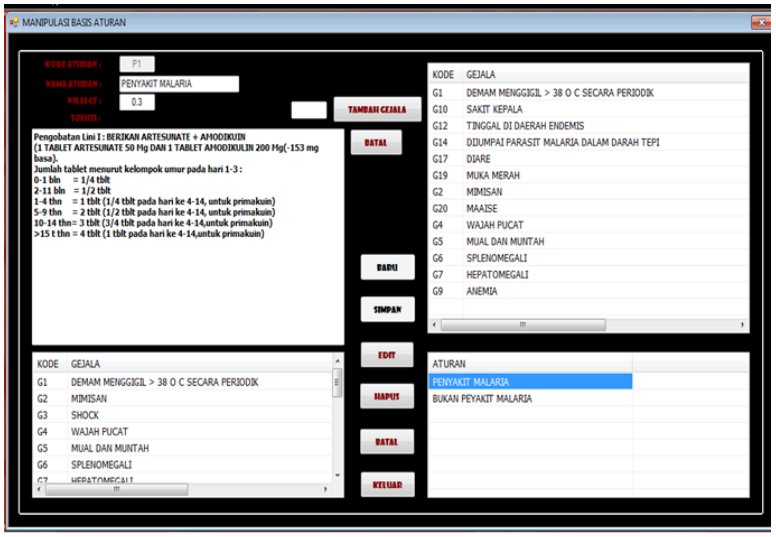

Figure 5 : Display of Rule Base Data Input Form

f. Display the registration form

This view is a view to access the application as a patient. Before conducting a consultation, patient data cannot be empty. The Registration display image is shown in Figure 6.

Figure 6: Display Registration Form

g. Display the Consultation Input Form

This display is a display to start the consultation by selecting the symptoms available by the system, after selecting the symptoms and pressing the continue consultation button, the system will provide output in the form of consultation results based on the patient's selected symptoms. The consultation display image is shown in Figure 7.

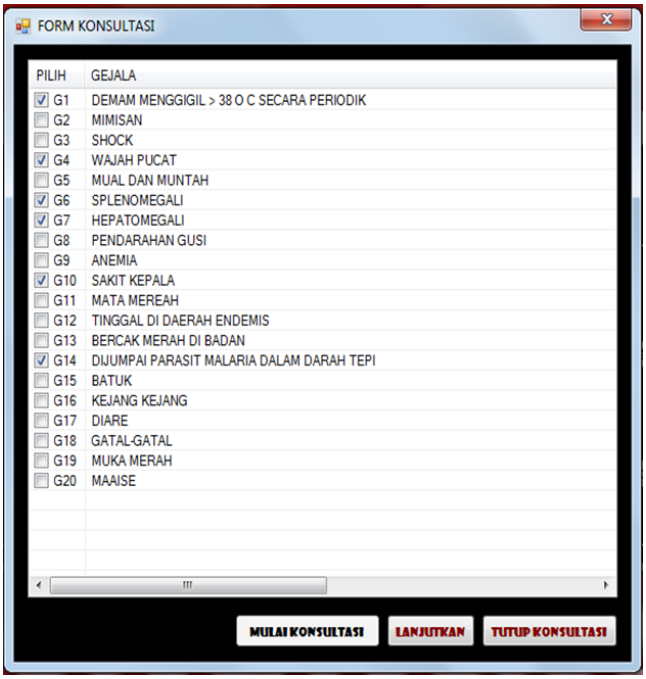

Figure 7 : Display the Consultation Input Form

h. Consultation Results Form

This form is a display to display the results of consultations carried out by patients. The result display image is shown in Figure IV.8 below:

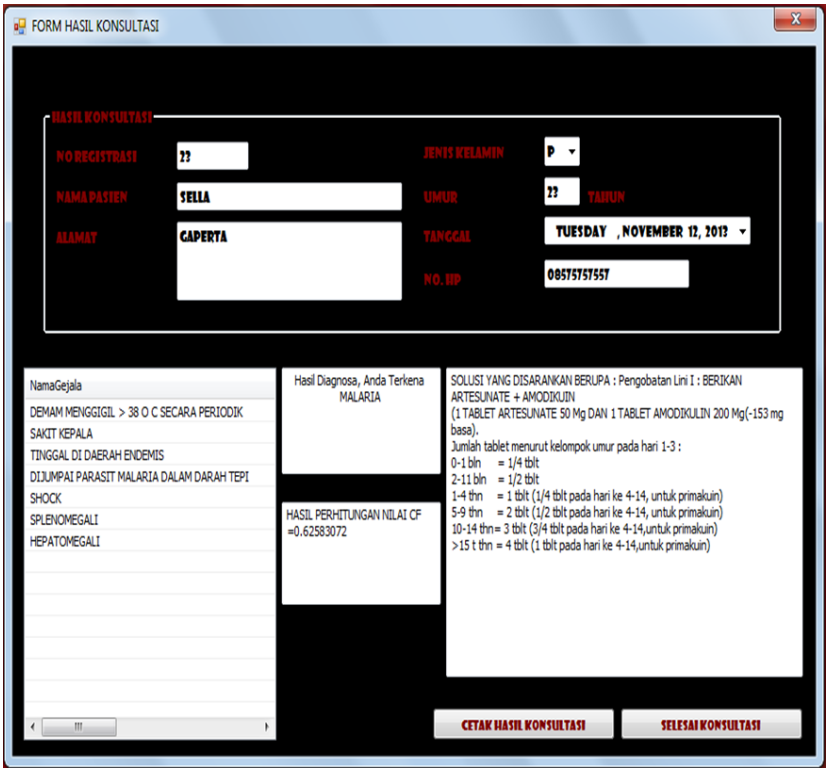

Fig.8: View the Consultation Results Form

i. Print Display of Consultation Results

The Print results of the consultation display displays the results of the consultation by the patient. Print Display of Consultation Results can be seen in Figure 9.

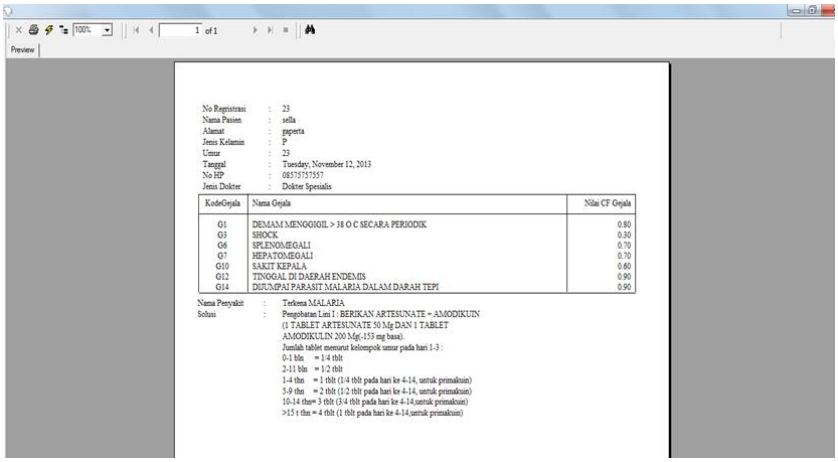

Figure 9: Display Print Consultation Results

3.2 Discussion

In designing "Expert System for Detecting Malaria Using the Certainty Factor Method", the authors used a program based on Microsoft Visual Studio 2010 and used Microsoft SQL Server 2008 R2 as a database. The commands in the program that the author made are also quite easy to understand because the user only needs to click on the available buttons according to their needs.

4. CONCLUSION

Based on the results of the discussion and trials that have been carried out, it can be concluded: The results of the test "Expert System for Detecting Malaria Using the Certainty Factor Method" show that this expert system can diagnose malaria according to the symptoms experienced by the patient. The expert system created will provide general handling solutions. The results of calculating the certainty factor that has been implemented in this thesis have given satisfactory results because the method has been used according to the needs of the system which combines the value of the certainty factor for symptoms and diseases. The expert system is designed using the Visual Basic programming language because the programming language is complex and more flexible so that it can minimize the errors/flaws used when running the program. Using the SQL Server 2008 database as a data storage container to make it easier to integrate between one table and another so that it makes it easier for users to use it.

REFERENCES

AGUSTINA, E., MAGISTER, M., TELEMATIKA-CIO, K., & T TEKNOLOGI, S. N. (n.d.). *SISTEM PAKAR UNTUK M PENYAKIT TANAMAN PA METODE FORWARD CHA FACTOR*.

Dinata, A. (2018). *Bersahabat dengan Nyamuk: Jurus Jitu Atasi Penyakit Bersumber Nyamuk*. Arda Publishing House.

Fatkhurozi, B., & Kurniawan, A. A. (2020). Sistem Pakar Untuk Diagnosa Penyakit Sars, Mers, Dan Covid-19 Menggunakan Metode Certainty Factor. *SENASTER" Seminar Nasional Riset Teknologi Terapan"*, *1*(1).

Gunawan, E., & Simaremare, E. S. (2016). Formulasi Sirup Antimalaria Ekstrak Kulit Batang Kayu Susu (Alstonia scholaris (L.) R. Br.). *PHARMACY: Jurnal Farmasi Indonesia (Pharmaceutical Journal of Indonesia)*, *13*(1), 1–9.

Kinansi, R. R., Mayasari, R., & Sitorus, H. (2021). Malaria pada kelompok wanita usia subur dan anak di Indonesia: analisis data Riskesdas 2013. *Jurnal Vektor Penyakit*, *15*(1), 17–32.

Manangsang, F., Ganing, A., Purba, E. R. V, Rumaseb, E., & Sarwadhamana, R. J. (2021). Analisis Faktor Risiko Lingkungan terhadap Kejadian Malaria di Kabupaten Kerom Provinsi Papua. *Indonesian Journal of Hospital Administration*, *4*(2), 37–42.

Nggame, Y., & Aty, Y. M. (2019). *Studi Epidemiologi Penyakit Malaria Di Puskesmas Oesapa Kota Kupang Tahun 2010-2012*.

Ramadhan, R., Astuti, I. F., & Cahyadi, D. (2017). Sistem Pakar Diagnosis Penyakit Kulit Pada Kucing Persia Menggunakan Metode Certainty Factor. *Prosiding SAKTI (Seminar Ilmu Komputer Dan Teknologi Informasi)*, *2*(1).

Salahuddin, S. (2021). Penambatan Molekul Senyawa Turunan Beta Asaron Sebagai Antimalaria: Molecular Docking of Derivated Compounds of Asaron Beta as an Antimalaria. *Proceeding of Mulawarman Pharmaceuticals Conferences (Proc. Mul. Pharm. Conf.)*, *13*, 261–268.

Sitorus, H., Andriayani, D., & Mayasari, R. (2016). Faktor Risiko yang Berhubungan dengan Kejadian Malaria di Indonesia (Analisis Lanjut Riskesdas 2013). *Indonesian Bulletin of Health Research*, *44*(1), 20142.

Wiwoho, F. H., Hadisaputro, S., & Suwondo, A. (n.d.). *FAKTOR RISIKO KEJADIAN MALARIA*.

Wiwoho, F. H., Hadisaputro, S., & Suwondo, A. (2018). Faktor Risiko Kejadian Malaria di Puskesmas Cluwak dan Puskesmas Dukuhseti Kabupten Pati. *Jurnal Epidemiologi Kesehatan Komunitas*, *1*(1), 1–8.

Zohra, A. F., Anwar, S., Fitri, A., & Nasution, M. H. (2019). Klasifikasi Wilayah Provinsi Aceh berdasarkan tingkat kerentanan kasus malaria tahun 2015–2018. *J Kesehat Lingkung Indones*, *18*(1), 25–33.