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Expert System for Diagnosing Diseases in Children Aged One to Six Years Using the Forward Chaining Method

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ABSTRACT

Expert systems are stems that try to integrate human knowledge into computer systems so that computers can solve problems as usually done by professional. This expert system aims to provide early information or symptoms to parents about children's diseases so that parents can find out the diseases experienced by children. This system works by entering all symptom data into the system to be traced so as to get a diagnosis of the detected results. This system was developed with *PHP* and *MySQL* programming languages as database *servers*. The creation of an expert system uses *the Waterfall* development methodology and the reasoning method used is the forward chaining method. The author hopes that this expert system can ease parents to find early solutions to treat diseases in children.

I. Introduction

The development of a *web-based* information system that displays a lot of information will make it easier for people to access. *The website* itself is an information system provided through the internet so that it can be accessed throughout the world as long as it is connected to the internet network. The component of a *website* consists of text, images, sounds, animations so that it becomes an interesting information medium to be visited by others.

Body health is a primary need for humans, but sometimes some people pay less attention to it. Disease is the cause of health problems in the human body. These are all obstacles that are often faced by society. All humans are aware that their bodies are experiencing health problems, but most people do not know the diseases that their bodies are suffering from and how to treat them.

The expert system [1]-[2] is one solution that can be used to provide early information to parents about children's illnesses so that parents can find out the diseases experienced by children. After knowing the symptoms of the disease suffered by children and how actions must be taken by parents and society in general and the first action that needs to be done because if the handling is not right it will be fatal.

The expert system that will be created works by entering all symptom data into the system to get a diagnosis of the detected results. With this expert system, it can make it easier for parents to find early solutions to treat diseases in children and get the right diagnosis [3].

II. Literature Review

Some studies on expert systems have been conducted by researchers [4] who conduct research on expert systems to determine the symptoms of diseases caused by the measles virus in children. In this expert system, in addition to the initial diagnostic information provided, also how treatment and prevention can be done. This system runs on a mobile-based device so that the system can be

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accessed anywhere and anytime. Researchers [5] conducted an expert systems study to diagnose heart disease. This research can help to determine heart health conditions so that they can anticipate heart disease earlier. The expert system in this study can also consult with heart disease doctors based on the symptoms experienced by application users. Researchers [6] conducted research on an expert system for the diagnosis of stunting in toddlers. This research can help parents to find out the symptoms of stunting in children so that this disease can be prevented earlier. The symptoms used in this diagnosis are gender, body length, and learning memory. Researchers [7] conducted research on an expert system for diagnosing diseases in infants and toddlers using android-based devices . Diagnosed diseases are those caused by germs and bacteria. The results obtained stated that 81.3% of experts strongly agree with the diagnosis provided by the application. Researchers [8] conducted research on expert systems for diagnosing skin diseases. This system can also provide symptoms and solutions that can be run so that patients can more easily find out the skin disease experienced.

III. Method

The methodology used in making this expert system uses the waterfall method. This model uses a systematic and sequential approach. The stages of the waterfall model include requirements, design, implementation, and verification.

A. Requirement

At this stage, the author conducts a needs analysis needed in designing this expert system. This needs analysis includes a table of the relationship between symptoms and diseases along with a representation of knowledge. Table 1 shows the relationship of several diseases along with the symptoms caused and reference sources that are used as references.

Table 1. Symptom and Disease Data

No	Symptom	Disease	Journal
1	- Headache - Lots of sweating - Body fatigue - Nausea in vomit - High fever	Malaria	"Revi Rosavika Kinansi" (*Malaria in the Reproductive Age Group of Women and Children in Indonesia: Analysis of Riskesdas, 2013*)
2	- Itching around the anus -Often feel stomach pain -Uncomfortable during sleep -Loss of appetite	Worms	"Ella Yurika et al" (Profile of parents' knowledge related to deworming diseases and deworming programs and risk behavior for deworming in children. Journal of Community Pharmacy Vol. 6, No. 2, (2020) 52-59)
3	- Mushy and liquid feces - Headache - Loss of appetite - Continuous thirst - Blood in the faeces	Diarrhea	"Fera Meliyanti" (factors associated with the incidence of diarrhea in toddlers. Journal of Health Sciences Aisyah Stikes Aisyah Pringsewu Lampung Volume 1 No. 2 (July – December 2016))
4	-Muscle, bone and joint pain - Nausea and vomiting - Pain behind the eyes - Swollen glands -Rash	DBD	"Melissa G. Tansil" (Risk factors for the occurrence of dengue hemorrhagic fever in children. Journal of Biomedicine. 2021; 13(1):90-99)
5	-Legs move like pedaling a bicycle -The baby's head nods - Changes in breathing patterns - Stiff whole body and flickering eyes	Step	"Roly Marwan" (factors related to first treatment incidence of febrile seizures in children aged 6 months – 5 years at the health center. journal.umbjm.ac.id/index.php/caring-nursing. Vol. 1 No. 1 (April, 2017)

B. Design

At this stage, translate expert system analysis needs into UML diagram form and also perform the necessary interface modeling. Figure 1 shows the admin and user flowcharts used in this application.

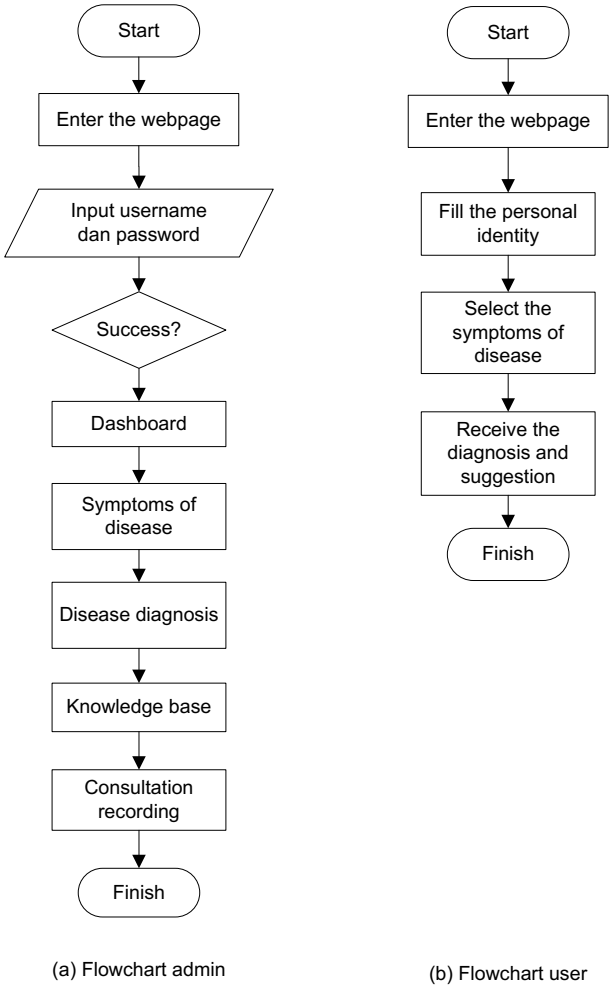

Fig. 1. (a) Flowchart admin. (b) User flowchart

C. Implementation

This stage implements coding using PHP and MySQL applications. The application flow begins with the display of the question menu and the selection of symptoms provided. Figure 2 shows the form of relationships between tables in this application database.

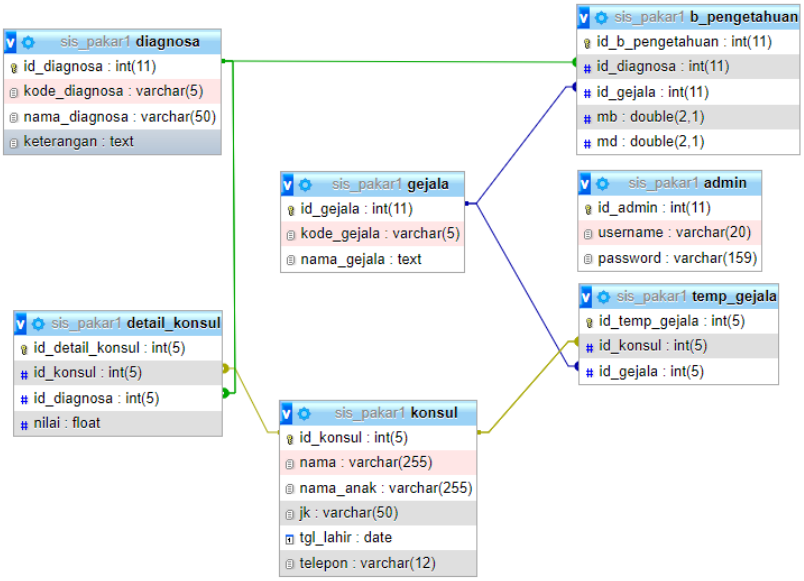

Fig. 2. Relationship Table

Figure 3 is an admin table that serves to hold *admin login* data. In the *admin* table there are attributes, namely id_admin, username and password.

	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	id_admin	int(3)			No	None		AUTO_INCREMENT
☐	2	username	varchar(30)	latin1_swedish_ci		No	None		
☐	3	password	varchar(80)	latin1_swedish_ci		No	None		

Fig. 3. Database admin

Figure 4 is a table that serves to hold symptom data. In the symptom table there are id-symptom, kode_gejala, and nama_gejala attributes.

	#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
☐	1	id_gejala	int(3)			No	None		AUTO_INCREMENT
☐	2	kode_gejala	varchar(3)	latin1_swedish_ci		No	None		
☐	3	nama_gejala	text	latin1_swedish_ci		No	None		

Fig. 4. Symptom Database

D. Verification

This stage tests the design results of the system that has been made using Blackbox testing and functional testing. Also test whether the desired results are in accordance with the knowledge base owned by experts.

IV. Results and Discussion

From the design and implementation stages carried out, the design results are obtained which are described in the section below.

A. Login page

The *login* page is the start page before going to the *admin* view. On the *login* page used to enter the *username* and *password* shown by Figure 5.

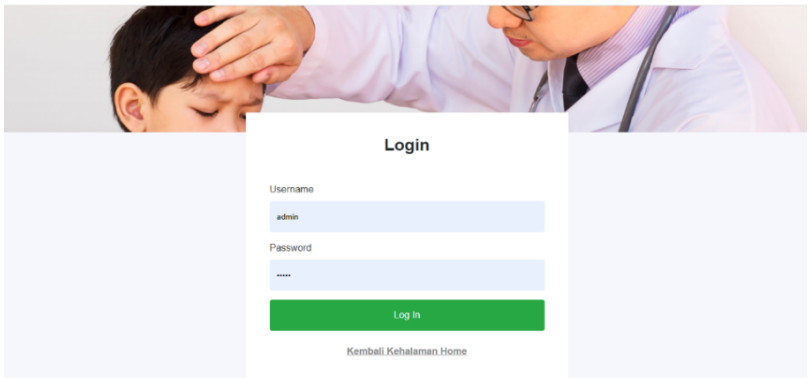

Fig. 5. *Login* Page

B. Dashboard Page

The dashboard page shows visitor statistical data that displays data from the results of *user* consultations. This page is shown by Figure 6.

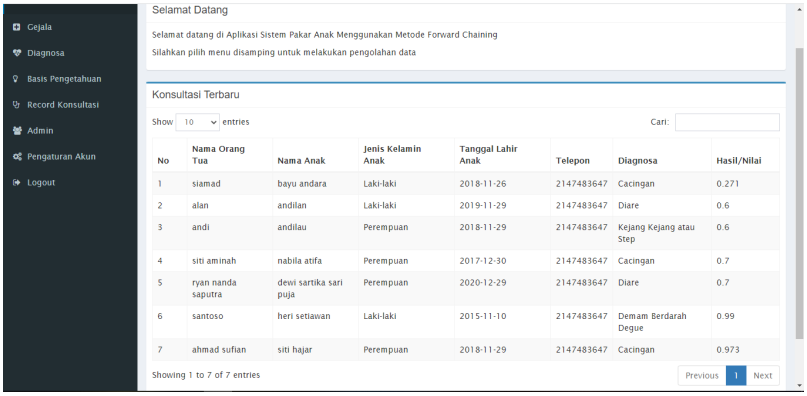

Fig. 6. Page dashboard

C. Disease Diagnosis Page

The disease diagnosis page is a page that displays diagnostic biodata and also adds new diagnostic data. This page is shown by Figure 7.

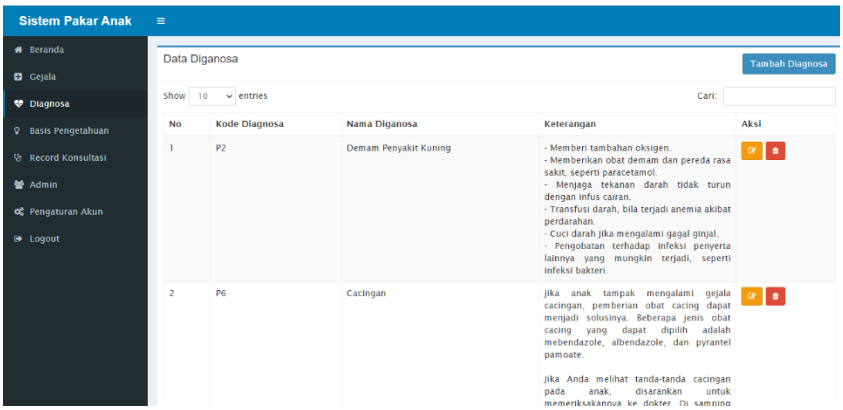

Fig. 7. Diagnose Page

D. *Knowledge Base Page*

The knowledge base page is a page that displays data additions that will be made by the *admin* to determine the symptom values needed for diagnostic data. This page is shown by Figure 8.

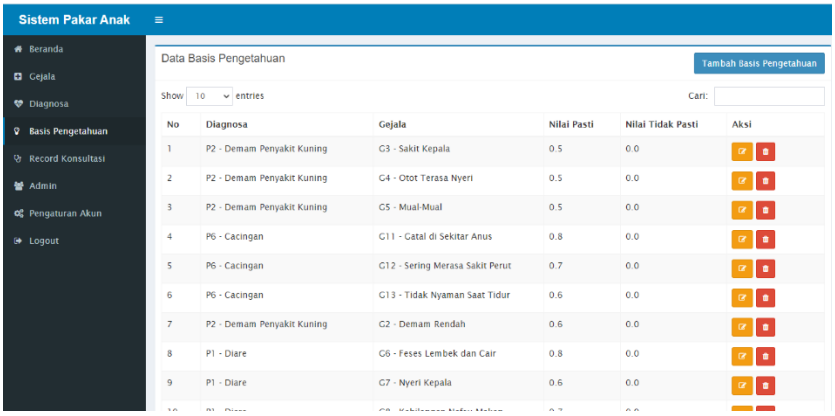

Fig. 8. Knowledge Base Page

E. *Consultation Recording Page*

The consultation recording area is a page that displays the results of consultations from *users* that will be stored in the consultation display. This page is shown by Figure 9.

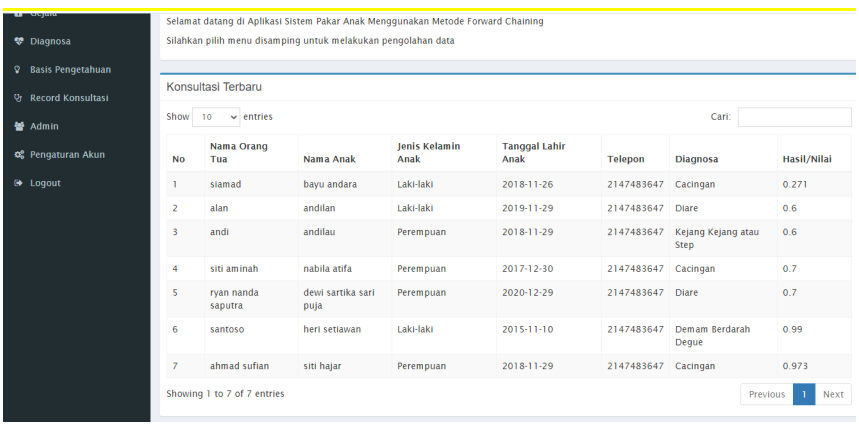

Figure 9. Consultation Recording Page

F. Consultation Results Page

This consultation results page is a page that displays data from the results of symptom choices and gets the results of diagnoses made by the *user*. This page is shown by Figure 10.

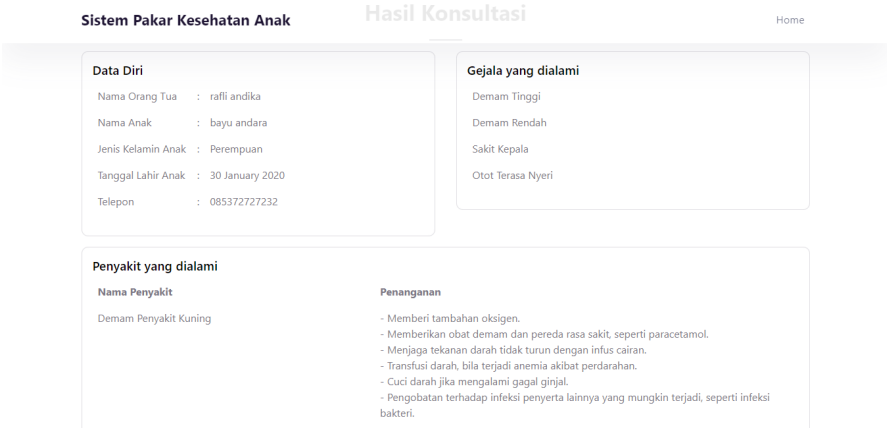

Fig. 10. Consultation Results Page

V. Conclusion

This expert system application can be used for initial information in diagnosing childhood diseases. Using the forward chaining method, this application processes user input with rules in the knowledge base so as to produce conclusions about the diagnosis of diseases in children. Based on the test results based on 5 types of diseases and 23 types of symptoms, all functions in this application get valid results. With this expert system application, parents can more quickly get the first treatment for children if they are attacked by disease.

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