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Intelligent System Determines The Nutritional Needs Of Pregnant and Nursing Mothers Using Forward Chaining and Certainty Factor

Muhammad Amin
Science and Technology Faculty
Universitas Pembangunan Panca Budi
Medan, Indonesia

Muhammad Syahputra Novelan
Science and Technology Faculty
Universitas Pembangunan Panca Budi
Medan, Indonesia

Chairul Rizal
Science and Technology Faculty
Universitas Pembangunan Panca Budi
Medan, Indonesia

Abstract:- The intelligent system in this research is an intelligent system that provides information on composition of nutritional needs of pregnant and nursing mothers. The system provides consulting facilities to assist users in analyzing the need for composition of nutritional values needed. This identification process is carried out through the FAQ interaction between the system and the user. The method used is a rule-based method with Fordward chaining method (future Penulusuran) and a method of certainty factor that provides a level of confidence from the results of the consultation conducted, with an easy design and in accordance with the existing rules. Then the program is expected to represent an expert in analyzing the needs of nutritional composition needed by pregnant and nursing mothers. Database utilization to store knowledge base from the expert system will make it easier to create additional knowledge facilities. With the addition of knowledge, the change of rules on the Knowledge base and system development through the acquisition of new knowledge can make it easier to update the system.

Keywords:- *Intelligent System, Nutritional Composition, Fordward Chaining Method, Certainty Factor, Database.*

I. INTRODUCTION

The nutritional Status of mothers before and during pregnancy can affect the growth of the fetus being conceived. If the normal status of mother nutrition in time before and during pregnancy will most likely give birth to a healthy baby, enough months with normal body weight. In other words, the quality of babies that are born depends heavily on the nutritional condition of mothers before and during pregnancy.

One way to assess the quality of babies is by measuring the weight of the baby at birth. A pregnant mother will give birth to a healthy baby when her health and nutritional levels are in good condition. But until now there are still many pregnant women who are experiencing nutritional problems, especially less nutrition such as less chronic energy (KEK) and nutritional Anemia. [1].

Results of SKRT 1995 showed that 41% of pregnant women suffer from KEK and 51% who suffer from anemia have a tendency to give birth to infants with low birth weight (BBLR).

Women who are experiencing malnutrition before pregnancy or during the first week of pregnancy have a higher risk of giving birth to infants who suffer from brain and bone marrow damage due to the formation of the nervous system very sensitized in the first 2-5 weeks. When a woman has a nutritional deficiency in the last trimester it tends to give birth to a baby with low birth weight (less than 2500 grams), this is because at this time the fetus will grow very quickly and it happens to fill fat tissue.

Nutritional fulfillment during pregnancy is also necessary for the preparation of breast milk and growing baby. Although the lack of nutrition that is not prolonged and nonchronic in the mother has no effect on the quantity and quality of breast milk but to be able to provide and produce breast milk in maximum quality should still be noted the nutritional needs of mothers during lactation.

In this research will develop a system that can identify the nutritional needs of pregnant and nursing mothers. The identification is based solely on physical circumstances and there is no supporting examination such as laboratory examination. Then the result of output or data output of the system in the form of nutrient composition or nutrients needed, the type of food containing the nutrient composition. The intelligent system developed in this research is expected to help nutritionist or obstetrician and college students of nutrition or obstetrics to obtain solutions and information quickly and easily as well as advice and solutions to the problems encountered.

II. LITERATURE REVIEW

- *System*

The system is a collection of elements that interact to achieve a specific purpose. A system has certain characteristics or properties, namely having components (components), System boundaries (bouindary), external environment of the system (environtments), interfaces (inputs), inputs, outputs (output), processors (process) and targets (objectives) or goals (goal).

➢ *Intelligent System*

Intelligent systems are many found around us. Because of the increasing time, the computer also has considerable progress, especially in the field of intelligent Systems/AI. Because now the computer is not only used for counting, many equipment that can help humans are made with the computer. An example of using intelligent systems in daily life is application of expert systems in the field of pharmacology and therapy. Implementation of a system of experts in the field of Pharmacologiand therapy as a support of web-based decision making is made with the following rationale: Pharmacology and therapy is a large system and complex. The pharmacological and therapeutic task is to seek the basic use of the drug rationally for proper medical action, fast and accurate at the time of need.

➢ *Nutritional Substance For Pregnant And Nursing Mothers*

Nutrition (Nutrition) is a process of organisms using foods that are consumed normally through the process of processing, absorption, transportation, storage, metabolism, and the production of substances that are not used to maintain the life, growth and functioning of the normal organs and produce energy. Foodstuffs used to fulfill the nutritional needs of pregnant women should include six groups, namely foods that contain protein, both animal and vegetable, milk and dairy, the source of carbohydrates either bread or grain, fruits and vegetables high content of vitamin C, vegetables in dark green, and other fruits and vegetables

➢ *Certainty Factor Methods*

Certainty Factor (CF) indicates the measure of certainty of a fact or rule. In expressing the degree of conviction, Certainty Theory uses a value called Certainty Factor (CF) to assume the degree of confidence of an expert on a data. Certainty Factor introduces the concept of belief/belief and disbelief/inassured.

This concept is then formulated in the basic formulation as follows:

CF[H,E] = MB[H,E] – MD[H,E]

Descriptions:

CF = *Certainty Factor* (Certainty factor) in the H hypothesis that is influenced by the fact E.

MB = *Measure of Belief* (Confidence level), is a measure of the increase of beliefs the H hypothesis influenced by the fact E.

MD = *Measure of Disbelief* (Level of unbelief), is an increase of distrust of the H hypothesis influenced by the fact E.

E = *Evidence* (Events or facts)

There are 3 things that may happen in the certainty factor method, namely:

1. Some of the evidence combined to determine CF of a hypothesis.

If E1 and E2 are observations shown by figure 1, then:

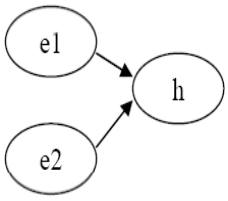

Fig 1:- Two Evidence

$$MB[h,e1 \wedge e2] = \begin{cases} 0 & \text{jika } MD[h,e1 \wedge e2] = 1 \\ MB[h,e1] + MB[h,e2] * (1 - MB[h,e1]) & \text{lainnya} \end{cases}$$

$$MD(h,e1 \wedge e2) = \begin{cases} 0 & \text{jika } MB(h,e1 \wedge e2) = 1 \\ MD[h,e1] + MD[h,e2] * (1 - MD[h,e1]) & \text{lainnya} \end{cases}$$

2. CF is calculated from a combination of several hypotheses.

If H1 and H2 are hypotheses shown by Figure 2.

Fig 2:- Combinations of Several Hypotheses

$$MB[h1 \wedge h2,e] = \min (MB[h1,e], MB[h2,e])$$
$$MB[h1 \vee h2,e] = \max (MB[h1,e], MB[h2,e])$$

$$MD[h1 \wedge h2,e] = \min (MD[h1,e], MD[h2,e])$$
$$MD[h1 \vee h2,e] = \max (MD[h1,e], MD[h2,e])$$

3. Some rules intertwined, the uncertainty of a rule becomes input to other rules. If multiple rules intertwined with the following figure 3:

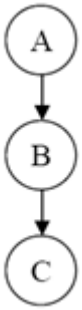

Fig 3:- Multiple Rules Mutually Join

MB[h,s] = MB'[h,s] * max (0,CF[s,e])

MB'[h,s] = Size of trust h based on full conviction of validity s.

According to Daniel (2010:30) His research on implementing an expert system to diagnose diseases with fever symptoms using a certainty factor method and by applying knowledge acquisition, very appropriately applied because after the same case tested in the old system, the output of the system gave the same value.

According to him, the system is designed to provide results in the form of possible diseases, percentage of confidence, and treatment solutions based on facts and values of confidence given by the user in answering questions during the consultation session when using the system. System implementation is used to evaluate the knowledge acquisition process in building a knowledge base.

III. METHODOLOGY

A. Running System Analysis

The system analysis described in this chapter is as a comparison material with the system to be designed. The author will display the consultation process of obtaining the nutritional composition information of pregnant and breastfeeding mothers manually. In order to process the consultation and produce the output in accordance with the expected, the experts need to know the input data from the patient. The input data provided by the patient to the expert is still manually inputted, which is to convey the patient data directly to the expert.

B. Stages of Research

Broadly, the stages of the whole study are as follows:

- *Describing the issue*

Describing the problem clearly can help in designing and making intelligent system to determine the nutritional nutrition of pregnant and breastfeeding mothers using forward chaining and certainty factor methods that will be researched should be described first, describing and determining and defining the limit of problems that will be researched, it will be obtained a good solution of the problem. So this step is an important first step in the study.

- *Problem analysis*

The problem analysis step is a step to understand the problem that the scope or boundaries have specified. By analyzing the problems that have been determined, the research is expected to find a solution to the problem well and can be understood by the user.

- *Determining objectives*

Based on the understanding of the problem, it can be determined the objectives that will be achieved in this study. At this goal the specified targets are to be achieved, especially those that can address the problems that exist in this study.

- *System Design*

This stage is the stage of the design of the tools created, at this stage created flowcharts and DFD (Data Flow Diagram) Intelligent system to determine the nutritional nutrition of pregnant and nursing mothers.

- *System creation*

This stage is a stage to make the system intelligent to determine the nutrition of pregnant and nursing mothers-based websites, the creation of intelligent systems based on a flowchart design and DFD (Data Flow Diagram) that has been created in the previous stage.

- *System Testing*

Intelligent testing System is done by reading the input data from the patient to the system so that it can be determined results based on the input.

C. Research Plan

To understand how the system running as a whole from the input, process and output it can be described through the image 4 below.

Fig 4:- System Context Diagramof The Nutritional Needs of Pregnant and Nursing Mothers

The flowchart of data shown in Figure 4 gives an overview that:

- Experts insert data related to the system that is designed into the system.
- The system will obtain data that is input by experts and display the knowledge base of the expert system for the user.
- Users consult the system in accordance with the user's condition and then obtain information on the composition of nutritional or nutritional value and the source of groceries for pregnant or nursing mothers.

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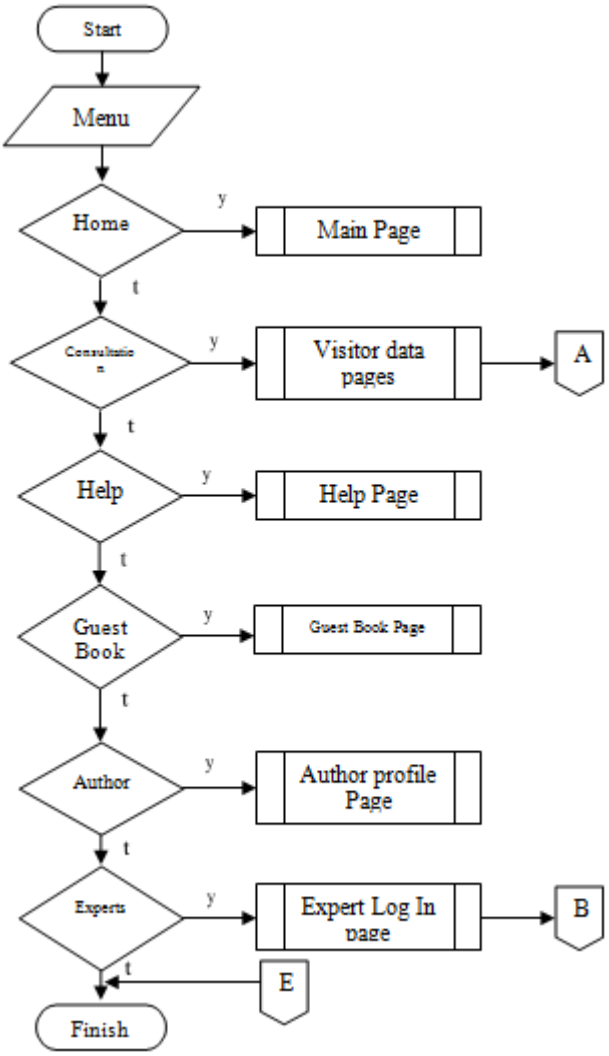

Fig 5:- Flowchart

IV. RESULT AND DISCUSSION

In this study will explain the result display of the application that has been created, which is used to clarify about the views that exist in the application of expert systems. So the implementation can be seen according to the results of the program that has been created. Below will be explained in each view of the program.

Fig 6:- Main Menu

This User page is used by the user before consulting a system of experts. User must fill in the user name before the consultation page. If the user has filled in the name then click the Advanced button then it will proceed to the consultation page. On the User Consultation page, select the category of consultation by selecting one of the category options on this page.

Fig 7:- Consultation Category Menu

On the consultation page will show the results of the consultation that is performed by the user. On the System results page will display the user name, nutritional composition, condition, food source and level of confidence. To see the results view can be seen in Figure 8 below.

Fig 8:- Consultation Results

On the help page explains the things that might help the user when they get into trouble or want to get an explanation when the user will use the consultation page. On this page also the user can see the conditions by selecting the menu that is available under the help page. User simply select the nutritional code and then click the button displayed then will be shown the conditions that are in accordance with the nutritional code that has been selected.

Fig 9:- Help Page

On the rule/System rules page will display all the condition lists. To create a relationship between nutrient composition and condition done by selecting one of the nutritional composition code then select the conditions related to the composition of the nutrient by giving cheklist to the appropriate conditions then to save the relationship that has been created click the Save Rule button under the Condition list. If you want to cancel the relationship/rules Select the button to be more and then all the cheklist will be deleted. To see the Rules page can be seen in the figure 10 below.

Fig 10:- Rule Page

This system works based on the input of the condition of the user done by answering any questions posed by the system. From that information the system will estimate the nutrient composition that may be fection of a computer. Once the system gets the conditions in accordance with the existing rules then the system will display the results of nutrient composition, condition, food source and level of confidence. Once the system is successfully built, the system will be tested to determine the function, superiority, and weakness of an integrated facility in the Sisem. For testing system that has been made, it takes two system implementations namely hardware (hardware) and software (software) requirements. Knowledge Base facilities are used to manage the knowledge base. The tests that will be conducted include adding data, modifying and deleting the Knowledge base.

V. CONCLUSIONS

From the test results and the discussion of research analysis that has been done can be concluded several things:

- Test Result "intelligent system determines the nutritional needs of pregnant and nursing mothers using Forward Chaining and Certainty Factor methods" suggests that this intelligent system can carry out the addition of knowledge bases such as nutrient composition data, condition data and relationship rules.
- Intelligent system that made will give nutritional composition, user conditions, food source and level of confidence aimed at users so as to provide information on nutritional composition needs for pregnant and nursing mothers.
- The calculation of certainty factor that has been implemented in this research has given quite good results because it has used methods that suit the needs of the system that combines the value of the certainty factor user with a value of certainty factor.

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