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DPD Tool: Diabetes Pre-Diagnostic Tool Using Rule-Based Expert System for Mayoralgo-Vinluan Clinic

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Abstract— **Diabetes is a common disease in the world that causes death, especially with the people who don't have the ability to have a proper check-up. Living in a world that you can't get anything you want is hard enough, what else if you cannot get anything that you need. In order to help the people in need we are now developing a system that can help everybody to have a regular check-up. The Diabetes Pre-Diagnostic Tool or DPD Tool is a web-based system that involves symptoms of diabetes that will be generated as the input of the study, and the recommendation for the user to get his/her proper lifestyle as an output. The DPD tool will be very helpful because it will provide information as well as recommendation for their everyday living. This system will be a success since the generation today uses a computer in their daily life, in this way we can help those people who are in need.**

Keywords-Diabetes, Rule-Based, Expert System, Pre-Diagnostic Tool, Web-based

I. INTRODUCTION

Diabetes mellitus (DM), commonly referred to as diabetes is a group of metabolic disease in which there are high blood levels over a prolonged period. This is a common disease and it is already estimated that 387 million of people have this kind of disease. Some symptoms of diabetes as follows: diabetes symptoms include frequent urination, intense thirst and hunger, weight gain, unusual weight loss, fatigue, cuts and bruises that do not heal, numbness. If it is left untreated it can lead to complications which stroke, kidney failure, foot ulcers, and damage to the eyes.

Everyone has the right to protect their own health. As we all know health has a big factor in our life; this is next to knowledge when it comes to our own wealth. Having diabetes is not really easy, can you imagine, you are instructed not to eat frozen food or even sweetened food, stay hydrated always, coordinating your meal, as well as, your medications, and should keep an exercise schedule.

The most important thing is that patients should go to their doctor for a proper check-up, not all people who suffer from diabetes have the money and time to go to their doctor. In 2012, diabetes was the direct cause of 1.5 million deaths. More than 80% of diabetes deaths occur in low and middle-income countries and last 2014, 9% of adults 18 years and older had diabetes. That is why diabetes is one of the top common diseases that cause death. So by this problem the researcher came up with a system that could help in a different way. Diabetes Pre-Diagnostic Tool or DPT, is like a regular check-up and consultation, it will only be Web-based and does not include mobile application. The patient just has to answer to questions regarding his/her health, this will be the input in the system after that it will generalize and will display results of the consultation and recommendation, and this will serve as the output of the system. DPD Tool can also manage the patient's own healthy lifestyle and the patient's health status can be viewed anytime.

The researchers aim is to develop a system that can help diabetic patients, especially in Mayoralgo-Vinluan Clinic by the end of this study; the researchers will provide answers to the following questions in order to attain the main objective of the called study. (1) How could the Diabetes Pre-Diagnostic Tool integrate rule-based expert system method? (2) How to use a rule-based approach by examining the patients? (3) How to help the poor with diabetes to maintain their healthy living?

With the researchers approach DPD Tool will be a success since the system is very helpful for a diabetic patient and since the generation today is into technology I would be easier to understand and use the system.

II. RELATED LITERATURE

In this chapter the researcher listed some related works about diagnosing diabetes and also its conclusion.

Diabetes mellitus (DM), an increasingly-prevalent disease, is one of the most important issues in public health today. In 2014, DM affected about 387 million people worldwide. Despite the introduction of modern remedies, physicians and patients are still faced with many DM-related problems that can affect their quality of life in multiple ways. Moreover, once patients are put on DM medications, they typically stay on them for life; the medications do not offer a cure.

Indeed in medical area, a diagnosis procedure is important

process to identify patient's problem or what kind of disease she or he has. The patient with high risk factors or symptoms or predicted to be highly effected with certain illness or disease could be short listed to see the doctors or specialist for further treatment. Before meeting with the doctors, patients themselves may check their level of health momentarily using advanced web application in which a lot of sites are viewed to users to make a simple and quick check up. Many computer programs or software are developed by emulating human intelligence could be used to assist the users or patients in reviewing their health briefly.

Urine and blood tests can be used to confirm a diagnosis of diabetes based on the amount of glucose in the urine and blood. Urine tests can also detect ketones and protein in the urine, which may help diagnose diabetes and assess how well the kidneys are functioning. These tests can also be used to monitor the disease once the patient is under treatment.

Because diabetes is now affecting many in the workforce, it has a major and deleterious impact on both individual and national productivity. It is a growing public health problem in the world. Diabetes is largely preventable. It is important to step up the knowledge levels of health personnel especially nurses since they are the first point of call when it comes to diabetes management, so that effective education as well as care of the diabetic is well taken care of.

III. METHODOLOGY

In this chapter, the researchers' discusses the methodology on how this study is made. You will be able to see here the structure and explanation about the system.

A. Percentage

To get the percentage of the data gathered the researchers' used this following formula.

$$Percentage = \frac{Number\ data\ gathered}{Total\ number\ of\ data}$$

B. Data Gathering

a) Aging range of Respondents

The table represents that aging range of the respondents and shows the largest percentage which are the people who ages 25-64 years old at 45%.

Table 1. Aging range

Aging	Number	Percentage
1. 15-17 years old(Teen)	33	22.1
2. 18-24 years old (Young Adult)	26	17.4
3. 25-64 years old(Adult)	67	45.0
4. Older than 64 years old	23	15.4
Total	149	100.0

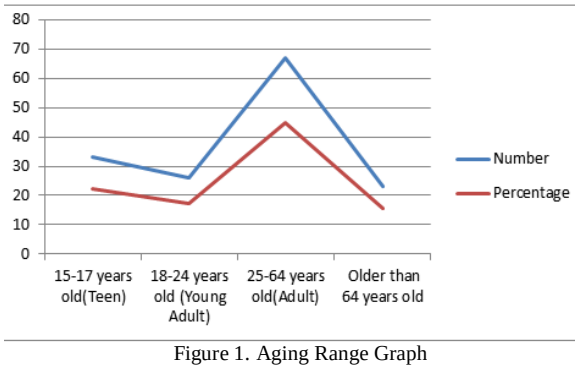


Figure 1. Aging Range Graph

This figure shows the graph of Aging Range wherein it can be seen that ages raging 25-64 years old are at the highest peak while ages raging 18-24 years old are the lowest.

b) Gender type

The table shows the gender of the respondent, there 56.4 % of Female and 43.6% of Male.

Table 2. Gender of Respondents

Gender	Number	Percentage
1. Female	84	56.4
2. Male	65	43.6
Total	149	100

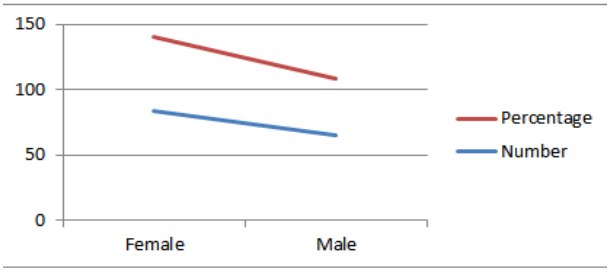


Figure 2 . Gender Graph

This figure shows the graph of Gender of the researchers' respondents. It shows that female respondents are greater than male respondents.

c) Sugar-level of Respondents

The table represents the sugar-level of the respondent wherein 42.3 % has a high sugar-level, 32.2% has a low sugar-level, and 25.5 % don't have any idea of their sugar-level.

Table 3. Sugar-level

Sugar-level	Number	Percentage
1. High	63	42.3
2. Low	48	32.2
3. I don't know, I would rather not answer	38	25.5
Total	149	100

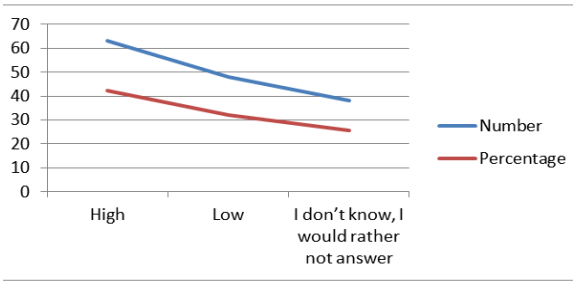


Figure 3. Sugar-Level Graph

This figure shows the how well the respondents know their sugar-level.

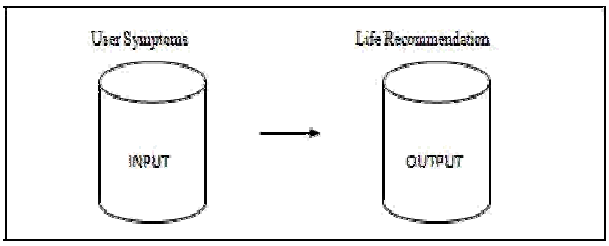
IV. Result Analysis

Based on the data from the researchers' respondents, ages 25-64 years old are most likely prone to diabetes since they are already getting old, their system are also getting weaker.

So by getting all the data needed the researchers are able to answer the following questions.

1. Diabetes Pre-Diagnostic Tool integrates rule- based method.

Mayoralgo-Vinluan can integrate method using rule-based expert system, wherein the *if and then statement* is used. The *if statement* will fire a condition and if it is correct the



then statement will be trigged and will generate the condition.

Figure 4. DPD Tool Architecture

The figure shows how the system's process will flow and what the relationship of the input and output of the system..

2. Using rule-based approach in examining patients.

Since as a rule-based system only uses if, then rules, Mayoralgo-Vinluan Clinic can use this. The DPD Tool uses rule-based wherein the system triggered the *if and then* statement will be fired. For an instance if the input in sugar-level is high, then a recommendation will be displayed. By that the system will recommend a solution to the patient using the input he/she gave.

3. Helping the poor with diabetes maintain their healthy living.

Many diabetic don't have the money to have a proper check-up and medication so by using the DPD tool the pain that they are feeling can be lessen. Since the system will give recommendation depending on the patient's input they can follow the advice. The system also records the health of the patient so it is a way on maintaining it, if there is changes in the patient's health it will recommend a way to solve it.

According to the data, there are still a lot of person who don't know their sugar-level, diabetes is a common disease people must be told to be familiarized or to know what their sugar-level is since this disease can cause death. By knowing your sugar-level, it is already a way of preventing diabetes.

The DPD tool is really convenient since our generation today like technology; it would not be new to them on how to operate a web-based system. The system is way cheaper than the usual check-up but it the quality of the consultation is more likely the same.

A. System Design

Figure 5. DPD Tool Home Page

This figure shows the home page of the system. Click the "Start Consultations" to proceed consultation.

Figure 6. DPD Tool Interface

This shows how the system will work. The user will put all the needed information and the system will give an output.

Figure 7. "Why ask?"

The figure shows if the user chose "Why ask?" the system will give an explanation. If user wants to return to consultation page, user must choose "Return" if user wants to restart consultation, he/she must choose "Restart"

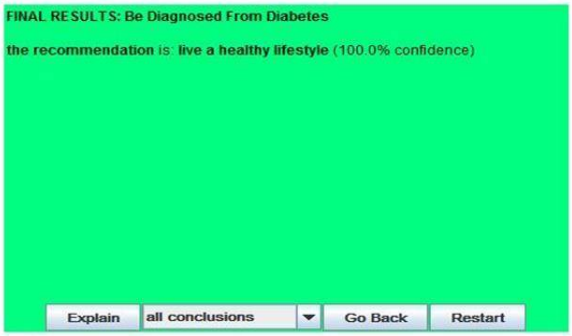


Figure 8. Sugar-Level is Low

This figure explains that if the sugar is low, the following output will be seen. Depending on the percentage of the user's sugar-level.

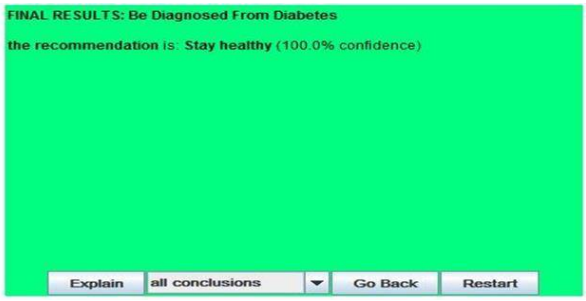


Figure 9. Sugar-Level is High

This figure explains that if the sugar is high, the following output will be seen. Depending on the percentage of the user's sugar-level.

V. CONCLUSION AND RECOMMENDATION

A web-based diabetes diagnostic tool for Mayoralgo-Vinluan clinic was presented in this research. The focus of this paper is to help the people with diabetes that has a major problem when it comes to money.

The researchers concluded that adults are prone to diabetes since they are getting older and weaker, it would be easier for them to maintain their health by using the DPD tool since it will give recommendations on what the patient must do.

DPD Tool is very convenient to use and is a great help especially to those diabetic who don't have enough money to have a proper check-up. This is also highly recommended for patients who are suffering diabetes and who don't have enough money to have a proper check-up.

There are still occurring problems in the system that will be improved in the further study.

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