Web Based-Decision Support System to Diagnose Hepatitis Disease using SAW Method

B. Ayshwarya, Abdul Soim, Phong Thanh Nguyen, K. Shankar, Wahidah Hashim, Satria Abadi, Andino Maseleno

Abstract: Hepatitis is a disease caused by some types of viruses that attack and cause inflammation and damage to human liver organ cells. Liver is a very important organ of the human body that has a function as a sieve over any entry of harmful particles entering into a person's body. A person when suffering from the disease is no longer have other part of his body that can resist harmful particles or toxins into the body so that it can pose a risk of death. The quick and precise information needs of a health expert or a specialist in disease are indispensable, the treatment of Hepatitis health solution will be very helpful especially in the process of diagnosing, determining the type of hepatitis and therapies are needed. In the application of web-based technology there are several rules that are often used, one of which is the method of SAW (Simple Additive Weighting) is the calculation of the certainty level to the conclusions obtained based on the value of Probability of illness due to obviously/symptoms. The web system to be made is expected to help someone in diagnosing and determining the hepatitis suffered based on the physical symptoms.

Index Terms: hepatitis, decision support system, simple additive weighting, web

I. INTRODUCTION

Hepatitis is the disease of inflammation that affects the body organs that called the liver [1]. Thus is the understanding of hepatitis disease. Hepatitis itself is divided by Hepatitis A, B, and C. That's what we know in general. In fact there are also types of diseases hepatitis D, E, G but that type of hepatitis was not familiar for us. In order to prevent this, hepatitis is divided into two categories. Namely General and particular hepatitis prevention. Hepatitis disease is due to viruses and is largely transmitted through the blood or bodily fluids that are contaminated with this hepatitis virus then we must be really wary of the contagion of this hepatitis. Hepatitis disease is the first sequence of various liver diseases that arise before going to treatment. The web system programs that we present have been through step-by-step alignment, the knowledge of this web system is derived from journals, books, as well as interviews with experts in this case from doctors at the hospital of Pringsewu City, Lampung.

A. Background

• Hepatitis is a liver disorder in the form of liver cells inflammation.
• Built a decision-making system as a diagnosis of diseases to detect Hepatitis.
• The process of diagnosis using the SAW (Simple Additive Weighting) method and as its implementation media is web-based.

B. The Formulation of Problem

• Diagnose hepatitis through the application of a web system based on the input of symptoms of the disease that being suffered.
• Implement the SAW method (Simple Additive Weighting) in the process of diagnosing hepatitis.
• Using web technology as a medium to implement these symptoms into a diagnosis that is available for optimal presentation of information.
C. The Scope of Problem

- Diagnose a disease based on symptoms of physical symptoms suffered.
- Diseases to be diagnosed are Hepatitis A, Hepatitis B and Hepatitis C.
- Calculations using the SAW method (Simple Additive Weighting) which shows a measure of certainty about a fact.

D. Objective

The paper aimed to build a system of medicine knowledge-based in diagnosing Hepatitis which can be displayed in the WEB device, so that the time efficiency and lack of public knowledge will be Resolved.

E. Benefit

This research benefit is as the first stage of the usage of web-based decision support system to diagnosis hepatitis disease for the society that is lack information.

II. THEORETICAL BASE

A. Hepatitis

Hepatitis is a liver disorder in the form of liver (cells) inflammation [1]. This inflammation is characterized by elevated liver enzyme levels. This increase is due to interference or damage to the liver membrane. There are two factors caused by infections and non-infectious factors. Infectious factors include hepatitis virus and bacteria. In addition to Hepatitis A, B, C, D, E, and G virus are still many other viruses that potentially cause Hepatitis e.g. adenviruses, CMV, Herpes simplex, HIV, Rubella, varicella and others. While the bacteria that cause hepatitis include Salmonella typhi bacteria, Salmonella paratyphi, tuberculosis, Leptosvira.

Non-infectious factors for example because of the drug. Certain drug may interfere with liver function and cause hepatitis. Viruses that cause hepatitis viruses are in the human body fluid which can be transmitted at any time to others. Indeed, some people infected with this virus can heal by itself but the virus will settle in the body for lifetime.

B. Hepatitis A

The cause of the disease is a hepatitis A virus (HAV), a 27-NM-size picornavirus (i.e. a virus with a positive stain RNA). The Virus is grouped into Hepatovirus, a member of the family Picornaviridae. Symptoms of hepatitis A in adults in non-endemic areas are usually characterized by fever, malaise, anorexia, nausea, abdominal disorders followed by icterus disorder in a few days. In the developing country, Hepatitis A virus occurs in the children's age generally asymptomatic or symptoms of mild pain. Infections that occur in the age can only be examined through laboratory examination of the liver function. In large parts of the world emerged sporadically as a plague with a tendency to appear cyclically. In the developing country generally adults are already immune to these viruses so it is rare to happened. But with the improvement of environmental sanitation in large parts of the country in the world turned out to make the population of young adults become more vulnerable as the frequency occurs KLB tends to increase. In the developed country, the transmission of the disease occurs because of contact with the family environment and sexual contact with acute sufferers, and also appear sporadically in the middle age daycare places, attacking tourists traveling to the country where The disease is endemic, attacking users of injections of illegal drug addicts and homosexuals. In areas with low environmental sanitation, infections are generally occur at a very young age.

C. Hepatitis B

The cause of the disease is hepatitis B virus (HBV), including Hepadnavirus, measuring 42-nm double stranded viral DNA with a neucleocapsid core (HBc Ag) measuring 27 mm, surrounded by a layer of lippoprotein in the outer area containing the antigen Surface (HBsAg). Only a few of them are acute hepatitis B (HVB) infections that exhibit clinical symptoms. Less than 10% in children and 30%-50% in adults with acute Hepatitis B (HBV) efficiency will develop into icteric. In patients with clinical symptoms, symptoms usually insidious, and anorexia, vague abdominal disorders, nausea and vomiting, sometimes accompanied by arthralgia and trash and frequently developed into jaundice. Fever is mild or may not be at all.

Scattered around the world, endemic or seasonal variations. WHO estimates more than 2 billion people with HBV (including 350 million chronic). Each year about 1 million people die from infected HBV and more than 4 million clinical cases occur. In which HBV is endemic to high (HbsAg Prlevansi range above 8%), infections usually occur in all ages. Although chronic infection rates are mainly caused by the occurrence of transmission during pregnancy and in infancy and children.

D. Hepatitis C

The cause of the disease is hepatitis C virus (HCV) which is an RNA virus with envelopes, classified into a different genus (Hepacavirus) from the family Flaviviridae. At least there are 6 different genotypes and more than 90 HCV subtypes that are known right now. The symptoms of this disease are generally insidious, with anorexia, unclear abdominal disorders, nausea and vomiting, continuing to be persistent (jaundice) less often than Hepatitis B. Although the first infection may be asymptomatic (more than 90% of cases) or mild, but most (between 50%-80% of cases) will be chronic. In people who are infected with chronic infections, about half of them can develop into cirrhosis or liver cancer.

This type of Hepatitis is spread throughout the world. Prevalence HCV is directly related to the prevalence of people who use the syringe together among drug addicts and the customs prevalence using a syringe that is not sterile in the health service.

E. Decision Support System
A decision Support System (DSS) as a computer-based system that assists in the decision making process [7-10]. DSS as a computer information system that is adaptive [11-15], interactive [16-20], flexible [21-26], which is specially developed to support the solution of unstructured management problems [27-33] to improve the quality of decision making [34-37]. Thus, one definition of DSS is an adaptive [38-42], flexible [43-47], and interactive computer-based system that is used to solve unstructured problems [48-51], by increasing the score of decisions taken [52-56].

The decision support System is a systematic approach to the nature of a problem [57-62], the collection of the determining facts that are mature from the alternatives confronted and taking the most appropriate action [63-66].

F. SAW (Simple Additive Weighting) method

The SAW method is often also known by the weighted summation method [67][68]. The basic concept of the SAW method is finding the weighted summation of the performance rating on each alternative to all attributes. The SAW method requires the process of normalizing the decision Matrix (X) to a scale that can be compared with all existing alternative ratings.

G. Overview of the Web

Web is one of the applications that contains multimedia documents (text, images, sounds, animations, video) in it that uses HTTP protocol (Hypertext Transfer Protocol) and to access them using software called the browser. Some types of current popular browsers are: Internet Explorer which is in production by Microsoft, Mozilla Firefox, and Safari which is in production by Apple.

Browser is an application that capable of running Web documents in a translation way [69-75]. The process is conducted by components contained in a browser application that is commonly called Web Engine. All Web documents are in display by the browser in a translate way.

Web sites are Web documents that are gathered into a single entity that has a Unified Resource Locator (URL) or domain and is usually publish on the Internet or intranet.

Before starting to create a Web display design, it is good to understand the function of a website, so that the design is made adapted to the function of the website. The general website has functions, namely:

• Communication function
Most websites have a communication function. Some of the facilities that provide this communication function, such as: Web base email, contact form page, chat and others.

• Information function
Website has the function of information such as news, company profile, library, reference, and others.

• Entertainment function
The Website has entertainment functions. Some examples of websites with this functionality, such as web-sites that provide online games, online music, online movies, and so on.

• Transaction function
A website can be used as a suggestion for business transactions, such as: online order, credit card payment, etc.

III. SYSTEM ANALYSIS

A doctor in diagnosing an illness is to see the symptoms of a patient’s clinical symptoms. These symptoms are derived from the results of the questions given by the doctor to the patient, the doctor then concludes the disease suffered by the patient and how to cure it. Treatment and referral prescribed by the Doctor in accordance with the illness of the patient.

The diagnosis method of the doctor has an equation with the hepatitis Disease diagnosis model using the SAW (Simple Additive Weighting) method. Representation of doctor interpretation analysis is stated in the form of rule as a place to keep the knowledge and analysis from the doctor in the application, where two of that concluding a decision refer to a fact that the symptoms are derived. The symptoms given by the patient, in the SAW method, will be given a level of confidence that will be used to measure the certainty of a disease experienced by the patient as the doctor did.

To make a diagnosis of the web-based hepatitis disease accurately, data about the type of diseases of hepatitis, data on the symptoms of diseases, data on the type of therapy, therapeutic action data and medical record data. Medical Record Data is a file containing records and documents containing the patient’s identity, examination, treatment, actions and other services that have been given. The source of data or information can be obtained from an expert, and a variety of literature about diseases, while medical record data can we get from the hospital. Here is a general overview of the diagnosis process of patients with hepatitis disease.

The Data of the diseases, symptoms, therapies, and actions obtained from medical experts and medic records will be inserted into the system for process and processed which will then be used as information of the type of hepatitis disease experienced. The process begins with creating a table of diseases, symptoms table, and table therapy along with the details, as well as the creation of medical record table.

In table of symptoms and diseases will be conducted process of counting the probability of symptoms of the disease experienced according to the record data that has been inserted into the table.

Probability score that is the reference in the calculation of SAW (Simple Additive Weighting). As for the therapy data The doctor will determine how the therapy will be applied to the disease. Table 1 shows disease and symptom. Table 2 shows diagnosis and medical record.
Table 1. Disease and symptom

<table>
<thead>
<tr>
<th>No</th>
<th>Type of diseases</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hepatitis A</td>
<td>A. Nausea in the stomach or chest tightness.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Loss of appetite</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Stomach discharge (vomiting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D. Fatigue in body power.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E. Pain in the joints.</td>
</tr>
<tr>
<td>2.</td>
<td>Hepatitis B</td>
<td>A. Loss of appetite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Fatigue in body power.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Mild fever</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D. Jaundice</td>
</tr>
<tr>
<td>3.</td>
<td>Hepatitis C</td>
<td>A. The skin and sclera of the eyes are yellow.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Nausea vomiting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. defecate pale color.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D. Urine color like old tea</td>
</tr>
</tbody>
</table>

Table 2. Diagnosis and medical record

<table>
<thead>
<tr>
<th>No</th>
<th>Diagnosis</th>
<th>Medical Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>If there is jaundice and symptoms described above, and you are worried about the possibility of suffering from hepatitis A, your doctor may be diagnosed through blood screening. It's a positive action for those who suffer from acute.</td>
<td>Hepatitis A</td>
</tr>
<tr>
<td>2.</td>
<td>Because the symptoms are few, most people do not realize that they are infected with hepatitis B. If patient have been suspected of being infected with hepatitis B then do blood check.</td>
<td>Hepatitis B</td>
</tr>
<tr>
<td>3.</td>
<td>Examination for knowing the virus Hepatitis C was developed in the year 1989 despite the serious researched that there is still a lot to be learned about this virus. Blood screening can be conducted to knowing hepatitis C virus.</td>
<td>Hepatitis C</td>
</tr>
</tbody>
</table>

IV. IMPLEMENTATION

The login page is the first page to be shown when opening a web diagnosis. Users must input the username and password on the login page in order to be included in the web diagnosis of hepatitis disease as shown in figure 1.

Figure 1. Login Page

Figure 2 shows display of questions to identify the symptoms experienced by the user who will do a diagnosis on the application of diagnosis of hepatitis disease.

Figure 2. Symptom identification question display

The results of diagnosis conducted on the application in case 1 came to the conclusion that the results of the patient's examination of medical record with the results of diagnosis performed on the application as shown in Figure 3.

Figure 3. Diagnosis Result

V. CONCLUSION

Based on the results, web-based decision support system for diagnosis of hepatitis using SAW (Simple Additive Weighting) made is able to diagnose the hepatitis experienced by patients and provide certainty score to the disease suffered and produce a diagnosis data that contains about disease therapy and meal plan food menu that can help the user provide solutions to the hepatitis disease sufferer. Based on the explanation on the decision support system that has been made, there
are some suggestions for development of this system as follows:

- The system can be developed further in terms of utilization of a media-based consultation such as Android, Blackberry, and I-Phone so it can easily access and conduct consultations.
- The system can be developed to be more complex, namely this application can be expanded area of disease that will be in the diagnosis include hepatitis disease along with the complications of diseases that accompany it.

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