

Development of Online Islamic Medication Expert System (OIMES)

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Abstract—This paper presents an overview of the design and implementation of an online rule-based Expert Systems for Islamic medication. This Online Islamic Medication Expert System (OIMES) focuses on physical illnesses only. Knowledge base of this Expert System contains exhaustively the types of illness together with their related cures or treatments/therapies, obtained exclusively from the Quran and Hadith. Extensive research and study are conducted to ensure that the Expert System is able to provide the most suitable treatment with reference to the relevant verses cited in Quran or Hadith. These verses come together with their related ‘actions’ (bodily actions/gestures or some acts) to be performed by the patient to treat a particular illness/sickness. These verses and the instructions for the ‘actions’ are to be displayed unambiguously on the computer screen. The online platform provides the advantage for patient getting treatment practically anytime and anywhere as long as the computer and Internet facility exist. Patient does not need to make appointment to see an expert for a therapy.

Keywords—Expert System, Quran and Hadith, Islamic Medication, Rule-Based.

I. INTRODUCTION

MANY diseases or sicknesses have a certain form of cure, therapy, or treatment and they come in many forms. Generally it can be either through modern or traditional medications. Modern medications are well known to everyone world wide whilst the traditional medications are more confined to certain cultures and religions.

In Malaysia, modern health care facilities have grown enormously over the decades. Hospitals, clinics and health centers are being built and furnished with highly trained staff, sophisticated equipment and a wide range of drugs. As urban centers grow, so do private clinics and hospitals to cater to the spectrum of health needs of a growing population. This development is linked to the country’s economic prosperity and modernization process; however, this trend is not without its impact to the users’ financial capacity. Modern medical care to a large extent is directed towards disease problems, and within this context it is said to be disassociated from the body-mind-spirit interaction [1].

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A. Traditional Medical Systems

The World Health Organization (WHO) has used the term “traditional medicine” for the last 30 years [1]. Traditional medicine comprises of the practices based on beliefs that were in existence, often long before the development and spread of modern scientific medicine and which are still in use today. As its name implies, it is part of the tradition of each country and employs practices that have been handed down from generation to generation either through textual or oral traditions [1].

In Malaysia, the traditional medical systems of the various ethnic groups have long been in existence and involve both healing and culture heritage. Users of traditional medicine have an understanding of and belief in these systems. These beliefs essentially are founded on the philosophical premise that there are biological, mental and spiritual aspects of health and illness [1].

B. Malay Traditional Medicine

Malay traditional medicine essentially draws on Islamic principles with some elements of Hinduism and animism. The fundamental idea is that “there is a cause for every disease” and “there is a cure for every disease” [1]. Accordingly this disease theory system includes physical, biological, mental and spiritual factors. Malay traditional medical healers are equipped with religious knowledge and are endowed with spiritual power to assess the unknown. In addition, they possess knowledge of medicinal plants, skills at manipulating body parts such as in the practice of massage and bone setting [1].

C. Islamic Medication

Among Muslim community there exists a process of treating sicknesses and finding cures by quoting or reciting relevant Quranic verses (Quran, holy book of Muslim People) and Prophet Muhammad s.a.w. verses. The process is normally completed by a related ‘actions’ or bodily gestures performed by the patient with full faith. For example, it is mentioned in one of the verses from Prophet Muhammad s.a.w. in the form of Hadith [2],

عَلَيْكُمْ بِالشِّفَاءَيْنِ : الْعَسَلِ وَالْقُرْآنِ

The translation:

You should find cures for all diseases using honey and al-

Quran – Quoted From Ibnu Majah.

Muslims are also encouraged to use and practice Islamic medication based on Quran and sunnah, so as not be misled by culture practices which may involved the use of spiritual power which is prohibited by Islam. This spiritual power can be used to heal and cure the sickness but this involves usage of genes and this can lead to abuse and for black magic. If we were to depend too much on this power we may assume that this power is the one that cure the disease instead of God.

Muslims also need to be cautious before consuming modern medicines that are categorized as intoxicating or narcotic as alcohol or narcotic as they are forbidden in Islam. Furthermore, medicines that contain animal products or blood are to be taken with full consciousness and care ensuring that they are not from animals which Islam forbids consuming.

Currently in Malaysia, Islamic medication is practiced mainly by some religious guru called “Ustaz”. He is someone who is well versed in Al Quran, can understand Arabic, very religious and a well-respected personnel in the Muslim community. However, it is not easy to find these people now as Malaysia is growing and everybody is concentrating on modern technology and medication.

With certain prohibitions in consuming modern medicines and compounded with high cost of modern medical treatment it is not surprise to notice that there are many Muslims prefer to have their illness or sickness treated the traditional ways and via the teaching and the suggested therapies from the Al Quran. Hence it motivates the authors to find an alternative to the modern medication and also as a way to preserve the practices from Quran and Hadith to find cures in the sense that treatment can be readily available. One of the main efforts is to create a knowledge base in an online server to keep all kinds of disease, its related cures, and its relevant ‘actions’ as per the Quran contents. The knowledge may be accessed through Internet wirelessly allowing patient to access and use this expert system practically anywhere and anytime.

D. Expert Systems

Expert system is a computer program that contains the knowledge and analytical skills of human expert related to a specific subject [3]. It has been used widely in modern medical applications for diagnosing illness and suggesting the treatments. For example, CADUCEUS [3] is an Expert System for diagnosing blood-borne infectious bacteria, MYCIN [4] for diagnosing infectious blood diseases and recommend antibiotics, and STDWizard [5] is used for recommending medical screening tests.

For this project our main focus would be on physical illnesses such as headaches, toothache, stomachache, sore eyes which later shall be extended to other type of diseases. Our expert system works by asking the type of sickness or illness that requires treatment. List of symptoms will be displayed for the user to choose after type of illness has been chosen. After choosing the symptoms the system will suggest possible disease and later suggested treatment in the form of Quran

verse(s) or hadith with the related gestures. This is, of course, has to be done with full faith that we humans must always try to find cures and it is Allah (God) that will bless us with the health. The system also has extended functionalities to suggest nearest solution(s) should the precise verse(s) is (are) not available after an exhaustive search through the database or knowledge base.

E. Motivating Factors

The advancement in communication technology has encouraged the authors to develop a system that can provide an alternative in assisting people in finding the best solution for their health problems without consulting the real expert directly. Below are some of the factors that motivated the authors to develop the OIMES.

1. Create awareness and overcome the limitation of getting knowledge and information on Islamic medication especially on online basis. One of the popular website available in Malaysia that provides such information is Darussyifa' Online [6] system.
2. Very small number of experts in Islamic medication available nowadays in Malaysia and if a patient wants to get treatment from the Islamic medication specialist, he/she has to make an early appointment to avoid being put into a waiting queue that makes him/her waiting for hours. This is clearly inefficient and making the patient endures unnecessary agony [7].
3. To preserve this valuable Islamic medical practices since ancient times by making it easily available through online platform anytime anywhere with very low cost. The authors perceive that online and web accesses are one of the most effective tools for spreading these medical practices widely and easily [7].

II. SYSTEM ARCHITECTURE

OIMES is implemented based on the system architecture in Figure 1 which composes three major parts, which are the user terminals, the server, and the data communication network.

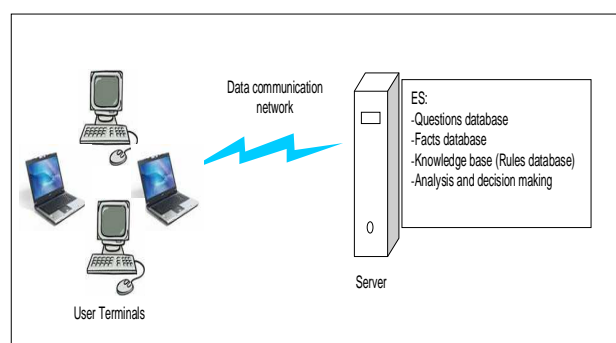


Fig. 1 Overall System Architecture of OIMES

User terminals act as the entry points to this system. They are equipped with a front-end user-friendly interface to cater for layman users. The interface, allows users to input the type of illness, and the symptom(s) of illness. These inputs will be

communicating to the server through data communication network. The server will analyze the input data interactively and plays a final decision making role to present appropriate therapy to the user. Various databases are available in the server to support the decision making functionality. The databases include (a) Question database – which contains questions that may be asked to get further clarification from users, (b) Facts database – which contains facts input from users and conclusion/action facts derived from applying certain rules, and (c) Knowledge base which contains rules for determining conclusions/actions facts. Figure 2 depicts the process flow in OIMES.

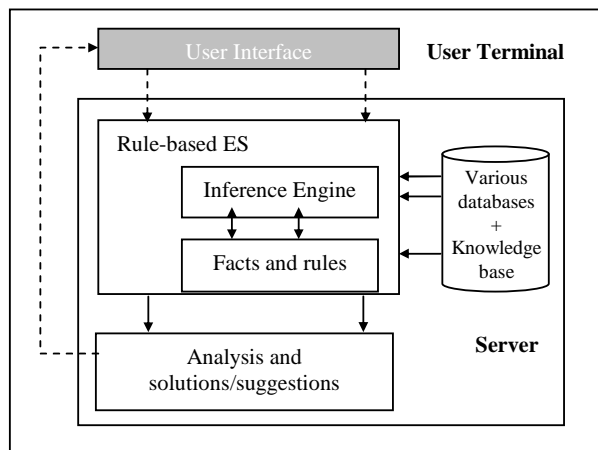


Fig. 2 OIMES Process Flow

The process of generating suitable treatment(s) to a patient begins with the user identifying his/her type of illness via the facts displayed on the user interface on the client side. Based on the facts received by the server the inference engine shall infer the best-fit rule in the Knowledge base to assess the facts. Conclusion derives from the rule(s) will trigger the system into posing more specific questions to the user for further and more accurate diagnosis. This online interactive mode of consultation or diagnosis would finally allow the system to draw a conclusion for appropriate treatment(s) to the patient's disease. The treatment would be forwarded to the user in the form of Quranic and/or Hadith verses inclusive of the actions to be performed for conducting the treatment(s).

The authors would like to emphasize here that the solution(s) provided by OIMES is spiritual in nature. In other words, some of the treatments or therapies suggested by OIMES may not be easily (or should not be) explained through scientific means or reasoning. They are to be absorbed as spiritually or religiously oriented practices which are accepted throughout the Islamic community since ancient time. Furthermore, the success of the treatment(s) suggested is depended greatly upon the patient's confidence and spiritual faith.

The graphical user interface (GUIs) is developed using Dreamweaver because of its features and as a useful tool to create and maintain the complete web pages [8]. Database is

built using MySQL, the open source Relational Database Management System (RDBMS) that is flexible for many usages. OIMES uses PHP programming language for its web development. PHP modules can be easily integrated with Apache HTTP web Server, which is the server that we used for this system. PHP is a language found to be well suited to interact with database. It can accept and validate information that users input via the web forms and store them into the appropriate databases [9],[10],[11].

III. RESULTS AND DISCUSSIONS

As mentioned earlier knowledge of OIMES is developed using Rule-Based concept. Part of the declarative knowledge is represented in the form of production rules. An example of toothache rules is illustrated below:

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IF    Feel pain when eat hot or cold or sweet food
AND   Feel pain when chewing
AND   Gum bleed during tooth brushing or flossing
AND   See visible pits or holes in the teeth
THEN  Diagnosed kind of toothache under Dental
        Cavities, Gum Disease and Periodontal Disease
THEN  Suggest treatment/therapies with relevant gesture
  
```

These rules are may be expressed in the form below:

```

+Toothache = Pain_eat_hot_cold_sweet_food
-Toothache_symptom1= Pain_when_chewing
-Toothache_symptom2 =
  Gum_bleed_during_tooth_brushing_or_flossing
-Observation = Visible_pits_or_holes_in_teeth
Possible_type1 = Dental_cavities_100%
Possible_type2 = Gum_disease_33%
Possible_type3=Periodontal_Disease_40%
Treatment_for_dental_cavities = treat_dental.pdf
Treatment_for_gum_disease = treat_gum.pdf
Treatment_for_Periodontal_Disease= treat_periodontal.pdf
  
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A. Database Design

As mentioned earlier database for this OIMES system is developed using MySQL, the open source Relational Database Management System (RDBMS) and the interface (GUIs) is developed using Dreamweaver.

An interface has been developed for the administrator to modify the data in the database should there needs to update any information. Figure 3 shows the administrator interface.

Fig. 3 Administrator Interface

Figure 4 is the administrator interface features if he/she needs to make any changes, in this for toothache category.

Fig. 4 Administrator Interface Features

Tables have been used to store the data in the database and they are identified as question_db, question_symptom, sickness, and treatment. Figure 5 shows the database tables created for this OIMES system. Sickness is categorized as T for toothache, ST for stomachache, SS for sinusitis, E for eye pain, H for Headache and R for rashes. Question_symptom contained list of questions to be used by the user as well as the administrator to enter the type of sickness. The type of sickness is kept according to the categories mentioned earlier and the database will automatically generate question_id and sickness_id and these ids are unique and is the primary key in the database. Figure 6 shows the list of questions in question_symptom table for toothache and Figure 7 shows list of sickness table for toothache category.

Fig. 5 Database Table for OIMES

question_id	question_name	category
1	Do you feel pain when chewing?	T
2	Do you feel a sharp pain when biting?	T
3	Do you feel pain when eating hot or cold or sweet ...	T
4	Does your gum bleeding without having any pain?	T
5	Does your gum bleeding when you brush or floss you...	T
6	Does your gum change to brighter red or red purple ...	T
7	Does your gum get easily bleed when chewing and th...	T
8	Do you always feel pain at your gum and you are ha...	T
9	Do you have fever and fatigue when you are having ...	T
10	Are you a smoker?	T
11	Does your gum only feel tender when being touched ...	T
12	Do you see any visible holes or pits at your teeth...	T
13	Do you see that your tooth look longer than before...	T
14	Do you see any fractures on your tooth?	T

Fig. 6 Question_symptom Table for Toothache Category

sickness_id	sickness_name	category
1	dental cavities	T
43	periodontal disease	T
44	trench mouth	T
3	gum disease	T
2	cracked tooth syndrome	T

Fig. 7 Sickness Table for Toothache Category

Question_db is where all the data in question_symptom and sickness tables will be matched to get the type of sickness by using one to many relationships and this is done by using the primary key. Figure 8 below shows the structure of the primary key for matching sickness_id and question_id.

questiondb_id	sickness_id	question_id
3	1	12
309	1	3
308	1	1
303	2	14
302	2	2
255	3	4
256	3	5
258	3	11
291	3	3
294	3	6
11	3	15

Fig. 8 Primary Key in the Database

Treatment table contained the treatment_file, treatment_id and the sickness_id. The treatment file is retrieved by users in PDF format due to its smaller size and easy to download. Figure 9 is an example of list of treatment in treatment table.

Sort by key:		None	 <input type="button" value="Go"/>		
 		treatment_id	sickness_id	treatment_file	
<input type="checkbox"/>			1	1	treat_dental.pdf
<input type="checkbox"/>			2	3	treat_gum.pdf
<input type="checkbox"/>			3	43	treat_periodontal.pdf
<input type="checkbox"/>			4	14	treat_acute_ss.pdf
<input type="checkbox"/>			5	15	treat_acute_ss.pdf
<input type="checkbox"/>			6	16	treat_acute_ss.pdf
<input type="checkbox"/>			7	19	treat_acute_ss.pdf
<input type="checkbox"/>			8	6	treat_ccmigraine.pdf
<input type="checkbox"/>			9	8	treat_ccmigraine.pdf
<input type="checkbox"/>			10	17	treat_chronic_ss.pdf
<input type="checkbox"/>			11	20	treat_chronic_ss.pdf
<input type="checkbox"/>			12	21	treat_chronic_ss.pdf
<input type="checkbox"/>			13	22	treat_chronic_ss.pdf
<input type="checkbox"/>			14	10	treat_cluster.pdf
<input type="checkbox"/>			15	2	treat_crack.pdf
<input type="checkbox"/>			16	24	treat_gastrik.pdf

Fig. 9 List of Treatment in Treatment Table

The relationship of the database is one to many as shown in Figure 10 for toothache of dental cavities type. This relationship makes the system able to diagnose the symptoms and giving the possible type of sickness. In Figure 10 if a user ticks question_id number 1,3 and 12, these symptoms are diagnosed and related to dental cavities.

sickness_id	sickness_name	category
1	dental cavities	T
43	periodontal disease	T
44	bleach mouth	T
3	gum disease	T
2	cracked tooth syndrome	T

question_id	question_name	category
1	Do you feel pain when chewing?	T
2	Do you feel a sharp pain when biting?	T
3	Do you feel pain when eating hot or cold or sweet ...	T
4	Does your gum bleed without having any pain?	T
5	Does your gum bleed when you brush or floss you ...	T
6	Does your gum change to brighter red or red purple ...	T
7	Does your gum get easily bleed when chewing and th ...	T
8	Do you always feel pain at your gum and you are ha ...	T
9	Do you have fever and fatigue when you are having ...	T
10	Are you a smoker?	T
11	Does your gum only feel tender when being touched ...	T
12	Do you see any visible holes or pits at your teeth ...	T
13	Do you see that your tooth look longer than before ...	T
14	Do you see any fractures on your tooth?	T
15	Do you feel that your mouth sore?	T
16	Is there any fester between your teeth?	T

Fig. 10 One to Many Relationship

Each symptom in the database is mapped to its related illness. The system calculates the weightage in percentage form for the possible types of sickness based on the symptoms ticked by the user. The system will analyze the type of sickness based on these symptoms. The weightage of the possible type of sickness is accumulating if the system read the same sickness. In general, the total number of symptoms related to sickness is calculated from the sum of the symptoms that are assigned to each sickness in the database. The total number of symptoms related to the sickness tick is the symptoms choose by the user. The percentage is calculated by comparing these two results using the percentage formula below:

Percentage of Possible Type of Sickness

$$= \frac{\text{Total number of symptoms related to the sickness tick}}{\text{Total number of symptoms related to sickness in the database}} \times 100$$

For example if a user ticks all the 3 symptoms of dental cavities as in the database, the possibility that the user is having dental cavity is 100%. It is the same for gum disease if a user ticks 2 out of 6 symptoms of gum disease, the result is 33% and if 2 out of 5 symptoms for periodontal is ticked, the result is 40%.

B. System Development

Figure 11 shows the main page of OIMES where there are links available for user to choose from. For instance, the user may click the Diagnosis System link if he/she wishes to diagnose his/her sickness and to know possible type of sickness and suggested treatments.

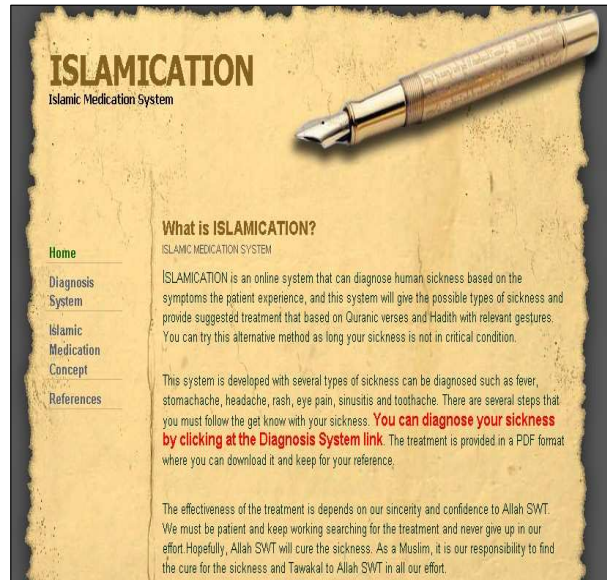


Fig. 11 Main Page of OIMES

The Diagnosis System link shall leads the user to a Diagnosis System page as shown in Figure 12 where he/she can choose the type of sickness.

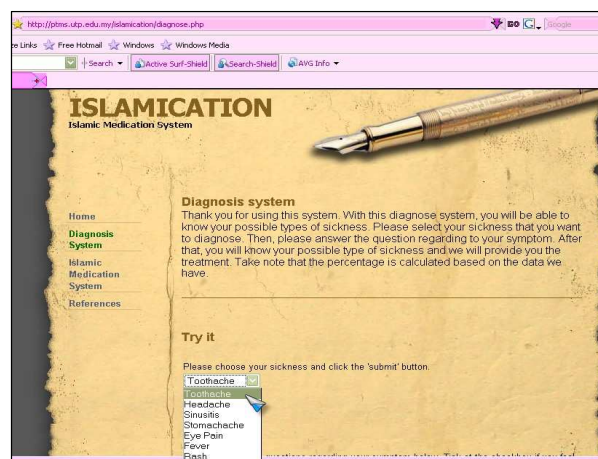


Fig. 12 Diagnosis Systems Menu for choosing the type of Sickness

If toothache is chosen then list of symptoms for toothache would be displayed as in Figure 13. User shall click the appropriate boxes related to his/her symptoms. The chosen symptoms will allow the system to perform proper analysis to derive the possible type of sickness related to the toothache. The system shall finally suggest its possible treatment together with its related gestures that the patient needs to perform based

on the Quran or Hadith verses. The suggested treatments are kept in pdf files where user may read it on the screen or save it for later perusal. Figure 14 below shows the possible sickness related to the symptoms chosen in Figure 13. It shows this toothache and the probability of having this sickness and the suggested treatment link.

Fig. 13 List of symptoms to be chosen for toothache

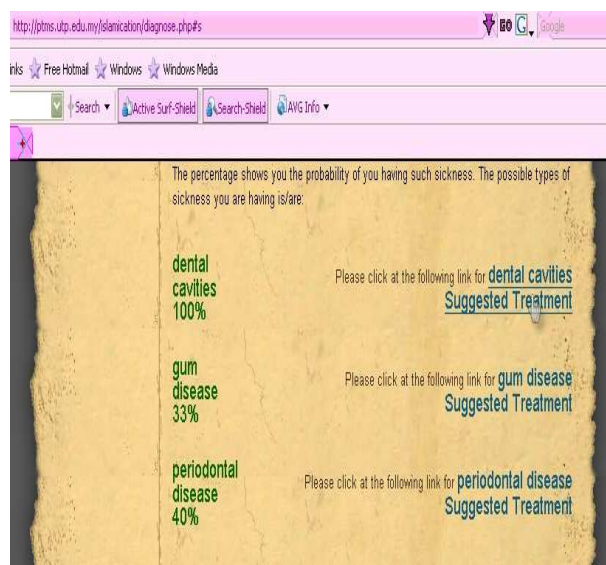


Fig. 14 Possible types of sickness and their percentage

If for example the suggested treatment for dental cavities is chosen the related verses would be displayed in pdf format as shown in Figure 15.

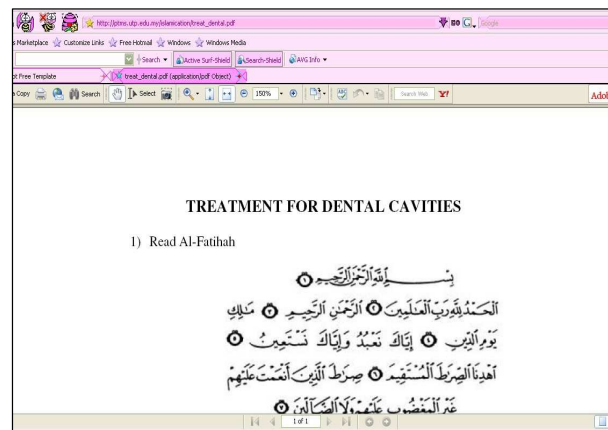


Fig. 15 Suggested Treatments for Dental Cavities

The complete verse is listed below for clarity. It contains this information:

1. Read verse Al-Fatihah as below:

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
 الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ ۝ الرَّحْمَنُ الرَّحِيمُ ۝ مَلِكُ
 يَوْمِ الدِّينِ ۝ إِيَّاكَ نَعْبُدُ وَإِيَّاكَ نَسْتَعِينُ ۝
 اهْدِنَا الصِّرَاطَ الْمُسْتَقِيمَ ۝ صِرَاطَ الَّذِينَ أَنْعَمْتَ عَلَيْهِمْ
 غَيْرِ الْمَغْضُوبِ عَلَيْهِمْ وَلَا الضَّالِّينَ ۝

2. Then, recite the below doa/verses 7 times over a container of water.

اللَّهُمَّ أَذْهِبْ عَنْهُ سُوءَ مَا يَجِدُ وَفُحْشَهُ بِدَعْوَةِ نَبِيِّكَ الْمَكِينِ الْمُبَارَكِ
 عِنْدَكَ

3. Drink the water daily with intention to seek His Almighty's help to cure the sickness. Repeat this therapy until the pain is gone. If the pain persists, please consult an experience Islamic Practitioners for further advices.

There exists a link on the main page for users to check out and understand the Islamic Medication concept in details. This page is shown if Figure 16 below.

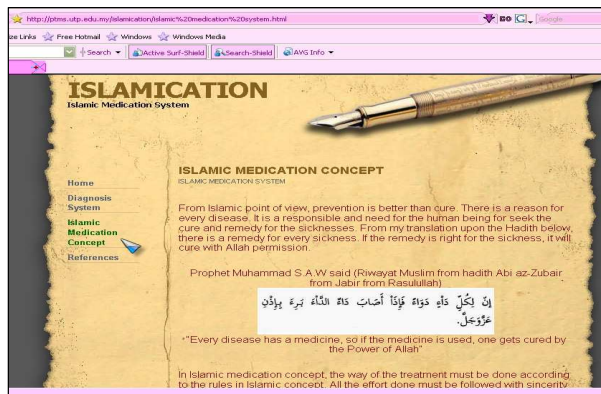


Fig. 16 Explanation of Islamic Medication Concept

A References link is also provided for users who are interested to explore deeper/further to help expanding this system with better enhancement. Figure 17 shows these links.



Fig. 17 References

The Islamic Medication concept is not a widely discussed topic by many and in fact not many references are available. The authors encountered various difficulties in finding relevant information in completing this project. The authors understand that Islamic Medication is a very crucial topic for Muslim and it is related to firm facts with religion aspect, thus this research has been carefully conducted and the content of the project has been verified by an expert, Dr. Rushdi Ramli, the Senior Lecturer from the Department of Fiqh & Usulludin, Academy of Islamic Studies, University of Malaya in Kuala Lumpur.

The authors are hoping that the development of this system shall create awareness to this and future generations on the importance of referring to Quran and Hadith in all aspects of life, even for medication. We also are trying to overcome the limitation of getting knowledge and information on Islamic medication especially on online basis. As experts in this area are becoming less, a system is required to preserve their knowledge and make it available online that may be accessed by anyone practically anywhere and anytime.

IV. CONCLUSIONS AND FUTURE WORKS

The research on Islamic Medication has become an interesting topic to modern medication nowadays in Malaysia. The development of OIMES is with the aim to ease the trouble of patient in finding the experts or specialists on IM because only a handful of them are available now. The cost to consult those experts may not be as high as the modern medication but it will still be costly if compared to accessing OIMES online. The only limitation as foreseen by the authors is that the availability of the system may depend on the Internet coverage. There are certain areas in Malaysia where Internet facilities are not accessible and/or not stable yet. However with the advancement of technology and competitions among Internet Service Providers it is hopeful that this problem can be overcome in the near future.

The main extension to this project is to make this system available on mobile platform such as via handphones, PDAs and etc. As for now this project is focusing only on physical illnesses, it is certainly possible that the OIMES knowledge be enhanced with therapies for spiritual illnesses such as psychology, mental, stress, *sihir* (black magic) and etc.

The rule based concept used in OIMES can be explored for further improved using Artificial Neural Network, Genetic Algorithm or Fuzzy Logic and thus their performance and accuracy shall be measured and compared. Reliability test also shall be conducted to ensure the knowledge is accurate.

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