Implementation of Expert System Design for Detection of Menstrual Blood an Istihadah with Forward Chaining Method

Sinta Nuriyah Putri[1*], Ahmad Homaidi[2], Lukman Hakim Lidimilah [3]
[1,2,3]Ibrahimy University, Indonesia, 68374
*Corresponding author: Sh1nt4nuriy4hputr1@gmail.com

ABSTRACT

The implementation of an expert system design for detecting menstrual blood and istihadhah using the forward chaining method addresses the need for efficient identification and management of menstrual-related conditions. This system utilizes forward chaining to incrementally analyze user-inputted symptoms and characteristics, providing accurate diagnoses. Through a user-friendly interface, it offers quick and precise recommendations, enhancing user understanding and facilitating effective condition management.

Keywords:
Expert System, Menstrual Blood, Istihadah, Forward Chaining.

INTRODUCTION

In Islam, special attention is given to women concerning various types of bleeding they experience, namely menstruation (haid), dysfunctional uterine bleeding (istihadah), and postpartum bleeding (nifas). Each type of bleeding has different legal implications on the religious obligations of women, such as prayer (salah) and fasting (sawm). However, many women still struggle to distinguish between the types of bleeding, particularly between menstruation and istihadah. Misidentification can significantly impact the validity of their religious practices.

The distinction between menstruation and istihadah is crucial in Islamic teachings. Menstruation is the regular monthly bleeding experienced by women, while istihadah refers to bleeding outside the normal menstrual cycle, often caused by medical conditions. According to the Shafi'i school of thought, understanding this difference is essential as each type of blood has different rules and consequences regarding religious practices. Misunderstanding and misidentifying these types can lead to women incorrectly performing their religious duties, ultimately affecting their spiritual well-being.

With current technological advancements, effective and efficient solutions can be provided through the application of artificial intelligence (AI). Expert systems, a branch of AI, offer great potential to provide accurate solutions in identifying menstrual and istihadah blood. Expert systems can use the Forward Chaining method to derive conclusions based on available data, providing users with accurate and consistent recommendations.

Problem Formulation

The problem formulation based on the background provided is as follows: 1. How can we develop a comprehensive knowledge base for an expert system to identify menstrual and istihadah blood according to Shafi'i jurisprudence?, 2. How should we design and implement an expert system using the Forward Chaining method to help women identify menstrual and istihadah blood?, 3. How can we ensure the accuracy and reliability of the expert system in providing correct identifications?, 4. In what ways can the expert system enhance women's understanding of blood-related rulings and assist them in performing their religious duties correctly?

Research Objectives

This research aims to: Develop and compile a knowledge base for an expert system to identify menstrual and istihadah blood according to Shafi'i jurisprudence, Design and implement an expert system using the Forward Chaining method to analyze data and produce accurate conclusions regarding the type of blood, Test and validate the expert system to ensure its accuracy in real-world conditions, and Help improve women's understanding of blood-related rulings through an easily accessible and user-friendly expert system.

Research Benefits

This research is expected to provide various benefits, including: 1.Practical: Helping women identify the type of blood more accurately and quickly, Reducing errors in performing religious duties due to ignorance about the type of blood, and providing easy and quick access to information on blood-related rulings. 2. Educational: Increasing women's knowledge about the differences between menstrual and istihadah blood and their legal implications, raising awareness about the importance of understanding blood-related rulings in performing religious duties. 3. Technological: Applying artificial intelligence in the religious domain, opening opportunities for further development, providing innovation in the development of expert systems based on the Forward Chaining method. 4. Academic: Adding to the literature in the field of artificial intelligence and its applications in specific issues, Serving as a reference for further research related to technology in a religious context.

Through this research, it is hoped that a tangible contribution can be made in helping Muslim women perform their religious duties more accurately and in accordance with religious teachings, utilizing technology for more effective and efficient solutions.

METHOD

An expert system is a computer-based system where this system uses knowledge, facts and problem solving techniques which usually can only be solved by an expert in that field.[1] In general, an expert system is a system that copies knowledge from humans (experts) to a computer, so that the computer can solve problems like experts do.

Expert system expertise in solving a problem is obtained by representing the knowledge of a person or several people in a certain format and storing it in a knowledge base.

The knowledge base contains knowledge, understanding, formulation and problem solving which is of course limited to a particular domain applied by the expert system designer. In a knowledge base there are two forming elements, namely facts and rules. a. Fact : facts are data that state a symptomatic object which is a guide to formulating rules. b. Rules: rules are rules that form a knowledge base owned by the system, rules are presented in the form of IF-THEN, IF symbolizes conditions where the condition can have a large value, can have a false value, while THEN represents the action taken if the condition is true.

A rule-based expert system is an expert system that uses rules to represent knowledge in its knowledge base. One of the most commonly used methods for representing knowledge is in the form of the "IF...Then.." (IF..THEN..) rule type.[2]

Table 1 Example Of Forward Chaining Rules

No	Aturan
R1	IF A & B THEN C
R2	IF C THEN D
R3	IF A & E THEN F
R4	IF A THEN G
R5	IF F & G THEN D
R6	IF G & E THEN H
R7	IF C & H THEN I
R8	IF I & A THEN J
R9	IF G THEN J
R10	IF J THEN K

Menstruation is an event that can be considered important in a woman's life from the age of 9 years. Therefore, it is very important to discuss menstruation before they experience it. They are required to recognize their bodies and what happens when their first menstruation comes, so that they are not shocked and surprised. They can also be better prepared about what they have to do. [3]

Istihadah is a type of blood that comes out of a woman's genitals. Istihadah is blood that comes out of the uterine canal outside of menstruation and postpartum days.[4]

Research methods are something that is done to gain new knowledge or solve certain problems through collecting, analyzing and interpreting data. The method used to build an expert system for detecting menstrual blood and istihadah is as follows:

Type of Research : In this final assignment research, the author uses several research methods, namely: Field Research and Library Research. Field Research is where data and information are obtained directly through work conducted in the field or practical investigation, While Library research is research carried out by reading books that are relevant to the problems the author discusses. This method is used to allow the author to obtain a broader picture of the material.

Data Collection Methods of this research is observation, interview, and library research. Observation is Observation is a data collection technique by directly observing activities occurring in the field in order to understand the flow of running system processes which aims to obtain data or information about the research object. The researcher made observations at the Salafiyah Syafi'iyah Islamic boarding school. where in this research the objects were students in the Ma'had Aly dormitory. Interviews are one of the data collection techniques, with interviews researchers can carry out face-to-face interviews with participants, interview them by telephone, or be involved in focus group interviews consisting of six to eight participants per group.[5] The researcher conducted this interview with several students who had problems with vaginal discharge. They are students who are still confused about detecting their feminine blood. Liibrary Research is a data collection process by taking from books, articles and journals related to menstrual blood detection and istihadah.

The system development method used by reseachers in this reseacrh is the Waterfall Method. Waterfall Waterfall is a method that provides a sequential or ordered software life flow approach. This method has a series of stages carried out sequentially, starting from requirements analysis, design, coding, testing, to maintenance. Each stage must be completed before moving on to the next stage. The stages in the waterfall method are: Requirement Analysis: collecting and defining all the system requirements from stakeholders to ensure a clear understanding of the system needs, System Design: creating the system architecture and design based on the requirements gathered. This step involves defining the system structure, components, interfaces, and data flow, Implementation: developing the actual system by coding based on the system design. Each module or component is implemented individually, Integration and Testing: integrating all the modules and testing the system as a whole to ensure it meets the specified requirements and functions correctly, Deployment: deploying the system to a live environment where it can be used by the end-users, and Maintenance**:** providing on going support and maintenance to address any issues or updates needed after the system is deployed.
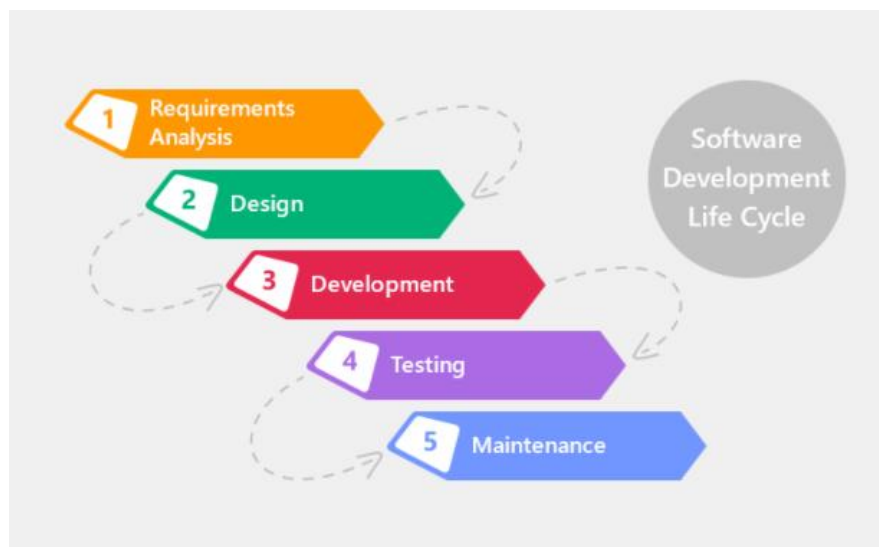

Figure 1.System Development Method

RESULTS AND DISCUSSION

The following is a discussion of an expert system for detecting menstrual blood and istihadah using the forward chaining method.

Expert Data Collection: observation, interview, and library research. Observation is Observation is a data collection technique by directly observing activities occurring in the field in order to understand the flow of running system processes which aims to obtain data or information about the research object. The researcher made observations at the Salafiyah Syafi'iyah Islamic boarding school. where in this research the objects were students in the Ma'had Aly dormitory.

No	Haid	Mustahadah Mubtada'ah Mumayyizah	Mustahadah Mubtada'ah Ghairu Mumayyizah	Mustahadah Mu'tadah Mumayyizah	Mustahadah Mu'tadah Ghairu Mumayyizah Dzakirah li Adatiha Qadran wa Waqtan	Mustahadah Mu'tadah Ghairu Mumayyizah Nasiyah li Adatiha Qadran wa Waqtan (Mutahayirah)	Mustahadah Mu'tadah Ghairu Mumayyizah Dzakirah li Adatiha Qadran Laa Waqtan (Mutahayiirah bin Nisbatil liwaqtil Adhah)	Mustahadah Mu'tadah Ghairu Mumayyizah Dzakirah li Adatiha Waqtan Laa Qadran (Mutah bin Nisbatil liqadril)
1	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanitaan	Mengeluarkan Darah dari Kewanita
2	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (Hijriyah)	Berumur 9 Tahun kurang 16 Hari (H
3	Darah yang keluar minimal 24 Jam	Darah yang keluar melebihi 15 hari 15 malam	Darah yang keluar melebihi 15 hari 15 malam	Darah yang keluar melebihi 15 hari 15 malam	Darah yang keluar melebihi 15 hari 15 malam	Darah yang keluar melebihi 15 hari 15 malam	Darah yang keluar melebihi 15 hari 15 malam	Darah yang keluar melebihi 15 hari 1
4	Darah yang Keluar maksimal 15 hari 15 malam	Pertama kali mengeluarkan darah	Pertama kali mengeluarkan darah	Dapat membedakan antara darah kuat dan lemah	Tidak dapat membedakan antara darah kuat dan lemah	Tidak dapat membedakan antara darah kuat dan lemah	Tidak dapat membedakan antara darah kuat dan lemah	Tidak dapat membedakan antara d dan lemah
5	Darah yang keluar berada di masa haid	Dapat membedakan antara darah kuat dan lemah	Tidak dapat membedakan antara darah kuat dan lemah	Sudah pernah mengeluarkan darah sebelumnya	Sudah pernah mengeluarkan darah sebelumnya	Sudah pernah mengeluarkan darah sebelumnya	Sudah pernah mengeluarkan darah sebelumnya	Sudah pernah mengeluarkan darah sebelumnya
6				Darah yang keluar berada di luar masa haid	Ingat kebiasaan haid sebelumnya baik jumlah maupun waktu haid	Tidak ingat kebiasaan haid sebelumnya baik jumlah maupun waktu haid	Hanya ingat waktu keluarnya darah tidak dengan jumlah keluar darah	Hanya ingat jumlah keluarnya darah lupa dengan waktu keluarnya darah
7					Darah yang keluar berada di luar m	Darah yang keluar berada di luar masa h	Darah yang keluar berada di luar masa haid	Darah yang keluar berada di luar m

Figure 2. Identification of Menstrual Blood and Types of Istihadah Blood

From the identification data above, a decision rule can be concluded. Rule 1 : IF Mengeluarkan Darah dari Kewanitaan, AND Berumur 9 Tahun kurang 16 Hari (Hijriyah), AND Darah yang keluar minimal 24 Jam, AND Darah yang Keluar maksimal 15 hari 15 malam, THEN Haid.

Rule 2 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND Pertama kali mengeluarkan darah, AND dapat membedakan antara darah kuat dan lemah, THEN Istihadah Mubtadaah Mumayyizah.

Rule 3 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND Pertama kali mengeluarkan darah, AND tidak dapat membedakan antara darah kuat dan lemah, THEN Istihadah Mubtadaah Ghairu Mumayyizah.

Rule 4 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND dapat membedakan antara darah kuat dan lemah, AND sudah pernah mengeluarkan darah sebelumnya, Darah yang keluar berada di luar masa haid THEN Istihadah Mu'tadah Mumayyizah.

Rule 5 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND tidak dapat membedakan antara darah kuat dan lemah, AND sudah pernah mengeluarkan darah sebelumnya, AND ingat kebiasaan haid sebelumnya baik jumlah maupun waktu haid, AND Darah yang keluar berada di luar masa haid THEN Istihadah Mu'tadah Ghairu Mumayyizah Dzakirah li Adatiha Qadran wa Waqtan.

Rule 6 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND tidak dapat membedakan antara darah kuat dan lemah, AND sudah pernah mengeluarkan darah sebelumnya, AND tidak ingat kebiasaan haid sebelumnya baik jumlah maupun waktu haid, AND Darah yang keluar berada di luar masa haid THEN Istihadah Mu'tadah Ghairu Mumayyizah Nasiyah li Adatiha Qadran wa Waqtan.

Rule 7 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND tidak dapat membedakan antara darah kuat dan lemah, AND sudah pernah mengeluarkan darah sebelumnya, AND hanya ingat jumlah keluarnya darah dan lupa dengan waktu keluarnya darah, AND Darah yang keluar berada di luar masa haid THEN Istihadah Mu'tadah Ghairu Mumayyizah Nasiyah li Adatiha Qadran Laa Waqtan.

Rule 8 : IF mengeluarkan darah haid, AND Darah yang keluar melebihi 15 hari 15 malam, AND tidak dapat membedakan antara darah kuat dan lemah, AND sudah pernah mengeluarkan darah sebelumnya, AND hanya ingat waktu keluarnya darah dan lupa dengan jumlah keluarnya darah, AND Darah yang keluar berada di luar masa haid THEN Istihadah Mu'tadah Ghairu Mumayyizah Nasiyah li Adatiha Waqtan LaaQadran.
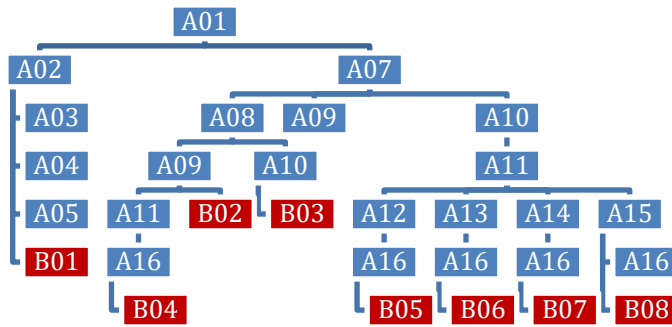
Figure 2. Decision Tree Of Expert system detection menstrual Blood and Istahadah.

Below is a Context diagram for the design of a menstrual blood Aand istihadah expert system. A context diagram is a system process flow plan designed to make it easier to create a system. The following is the context diagram of the menstrual blood detection expert system design:
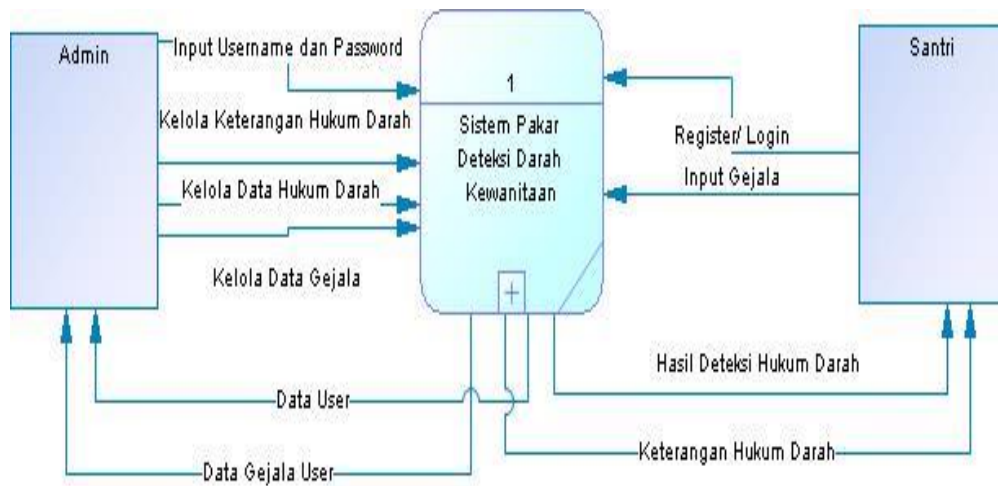

Figure 3. Diagram Context of Expert System

In the context of the diagram above, it explains several activities that can be carried out by the user. In the picture you can see two users, namely admin and students. Admin users can input usernames and passwords from users, manage blood legal data, manage symptom data, manage blood legal information. Meanwhile, the student inputs his identity and answers all the questions in the system, which includes the blood symptoms he is experiencing. Furthermore, from the image above it is also explained that from this system the admin gets user data and user symptom data. while the students get the results of blood detection as well as legal information about the blood.

The following is the interface display for the expert system for detecting menstrual blood and istihadah: Login, Question Page, and Result Page.

Login : is an authentication process in which a user provides credentials, such as a username and password, to access a particular system or application. This process ensures that only authorized users can access certain data or features in the system.
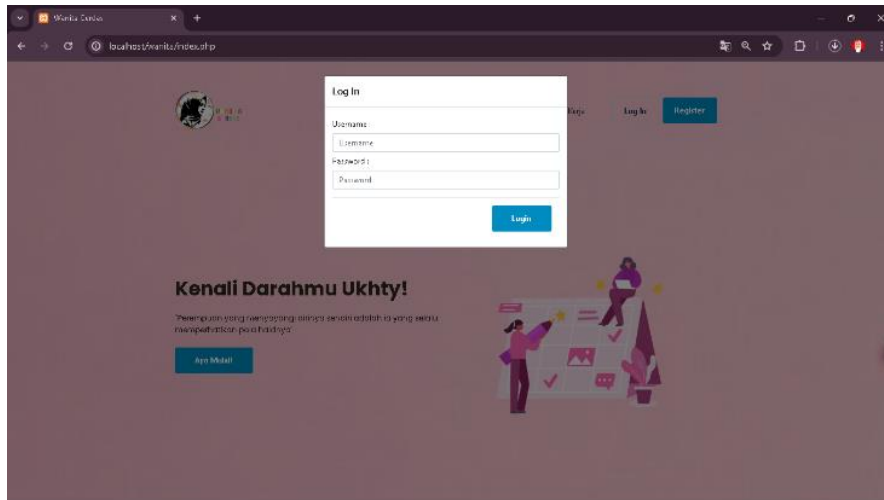
Figure 4. Login of Expert System

Question Page: The question page is a page for the user where they are presented with several questions. Based on these questions, the system can identify the type of bleeding the user is experiencing.
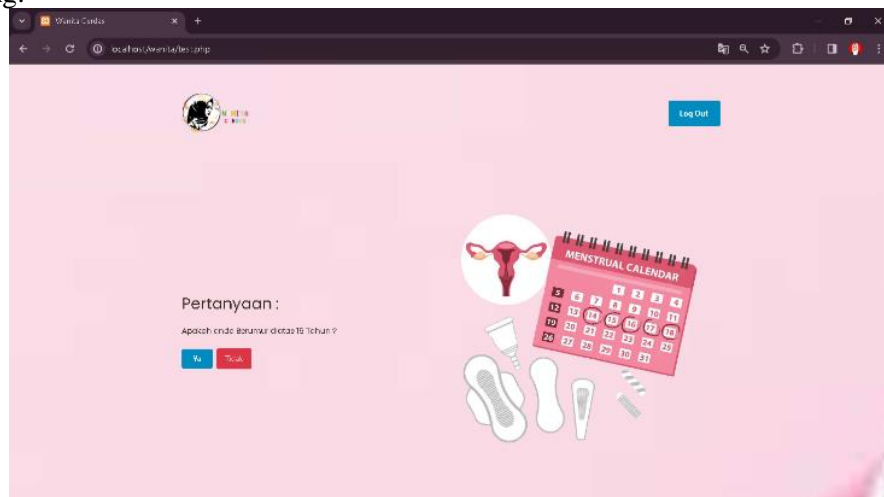

Figure 5. Question Page of Expert System

Result Page: The result page is where the system displays the identified type of bleeding based on the user's responses to the questions. This page provides the user with the diagnosis and relevant information about the identified type of bleeding, along with any recommended actions or guidance.
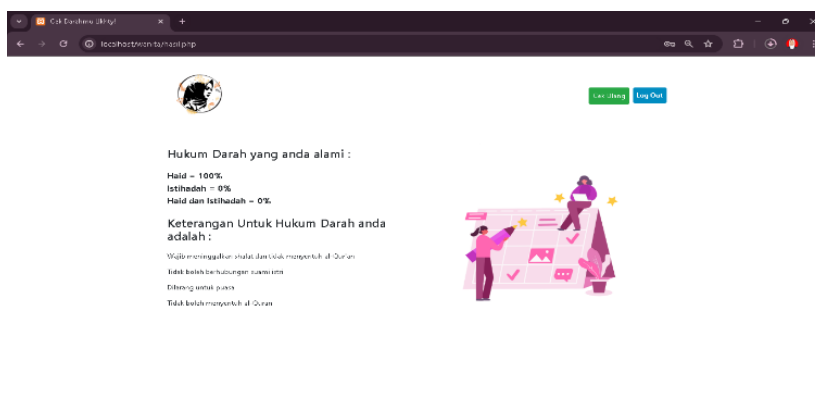
Figure 6. Question Page of Expert System

CONCLUSION

Based on the implementation and analysis conducted in this research, a software application was developed: an expert system for detecting menstrual and abnormal bleeding using the forward chaining method. The conclusion is that the system functions well and has an interface that is user-friendly and easy to understand. It provides accurate information regarding the detection of menstrual and abnormal bleeding. Additionally, the expert system is accessible via a web browser, facilitating users to identify the type of blood discharge and perform an initial diagnosis without being hindered by distance and time. This research can be further developed and adapted to add more features and enhance the application's benefits, providing even greater value in the future.

BIOGRAPHIES OF AUTHORS

Sinta Nuriyah Putri is a student at Ibrahimy University in the faculty of science and technology. She is a final semester student in the information technology study program. You can contact her at email : Sh1nt4nuriy4hputr1@gmail,com