



## Blepharitis Disease Diagnosis Expert System using the Fuzzy Mamdani Method

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### ABSTRACT

The high cost of consultations and eye examinations has made people reluctant to have their eyes checked by a doctor who specializes in eye diseases, especially blepharitis. The community needs a system that can diagnose blepharitis that they are currently suffering from so that they can have their eyes checked without having to go to a specialist in eye diseases, especially blepharitis first. The number of people suffering from blepharitis in humans is increasing from year to year. Therefore, it is necessary to take action to anticipate the increasing number of people with blepharitis. This is due to the delay in diagnosing the disease. Patients with this disease usually experience blindness due to a lack of proper maintenance. Expert systems are computer-based systems that use knowledge, facts, and techniques, and reasoning to solve problems that normally only an expert in the field can solve. The Fuzzy Mamdani method is quite efficient to use in diagnosing blepharitis disease. This system can provide an early diagnosis of blepharitis in the human eye based on the symptoms and intensity of symptoms that are visible from the outside or experienced by humans. Patients (Users) only need to go to the Web to take the first steps in solving blepharitis and choose the symptoms of the disease they are experiencing without having to ask the expert directly. This system is made web-based with the PHP programming language.

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## 1. INTRODUCTION

Following the development of the times both in terms of science and information technology today[1], [2]. The development of information technology that is increasingly rapid nowadays encourages humans to use this technology in diagnosing disease, one of which is Blepharitis.

Blepharitis is an inflammation of the eyelids that usually occurs in the area where the eyelashes grow and can affect both eyelids[3]. This condition generally occurs when the small oil glands located near the base of the lashes become blocked. Blockage of these tiny oil glands can then cause irritation and redness of the eyes[4]. Blepharitis is often a chronic condition that is difficult to treat. Blepharitis makes the sufferer feel uncomfortable and uncomfortable with dressing.

The public, in general, does not know much about Blefaritis so to treat Blepharitis in detail that is experienced by sufferers, the help of an expert is needed to obtain an accurate and reliable diagnosis of Blepharitis which is experienced especially for people who come from rural areas who have minimal knowledge of what is meant. with Blefaritis disease.

An expert system is a software package that can be used as a problem-solving tool aimed at providing advice and aids in solving problems in certain specialties such as science, mathematical engineering, medicine, education, and so on[5].

## 2. RESEARCH METHOD

The fuzzy Mamdani method (Fuzzy Mamdani Logic) is often known as the MAX-MIN method. this method was introduced[6]–[8]. State that the fuzzy Mamdani method is one part of the Fuzzy Inference System which is useful for drawing conclusions or the best decisions in uncertain problems[9]–[12].

Argue that Mamdani fuzzy logic is a method of drawing conclusions that are easiest for humans to understand because it is most compatible with human instincts. So that using the fuzzy Mamdani method will produce the best decision for a problem[13], [14]. The fuzzy Mamdani method in the process uses linguistic principles and has a fuzzy algorithm that can be analyzed mathematically, making it easier to understand.

## 3. RESULTS AND DISCUSSION

The analysis is a problem-solving technique by breaking the system into components with the aim of studying these components work and interacting to complete their goals. System design is a complement to system analysis into a complete system with the aim of getting a better system.

Data analysis is an effort or way to process data into information so that the characteristics of the data can be understood and are useful for solving problems, especially problems related to research.

**Table 1.** Blefaritical Disease

No	Code	Disease
1	P1	<i>Blepharitis Superfisial</i>
2	P2	<i>Blepharitis Seboroik</i>
3	P3	<i>Blepharitis Skuamosa</i>
4	P4	<i>Blepharitis Ulseratif</i>
5	P5	<i>Blepharitis Angularis</i>
6	P6	<i>Blepharitis Meibomianitis</i>

**Table 2.** Symptoms of Blepharitis Disease

No	Code	Symptoms
1	G001	Itchy Eyelids
2	G002	The eyes can appear watery or they can appear dry
3	G003	Eyes Feeling Hot and Sandy
4	G004	Exfoliation Around the Eyes
5	G005	Eyelashes Become Crusty Or Oily
6	G006	Eyelid Edges Look Swollen
7	G007	Eyelids Become Sticky.
8	G008	The Eyes Become Sensitive To Sunlight
9	G009	Vision Looks Blurry
10	G010	Abnormal Eyelash Growth
11	G011	Without realizing it, the eyes blink frequently
12	G012	Uncomfortable When Wearing Eyepiece
13	G013	Loss of Eyelashes (In Case of Severe Blepharitis)

**Table 3.** Definition Of Blepharitical Disease And Symptoms

No	P	G	Solution
1	P1	G001	Treatment includes cleaning the eyelids, using antibiotics or steroid eye drops, and treating the underlying condition. Unfortunately, blepharitis tends to return.
		G004	
		G005	
		G008	
		G010	
2	P2	G011	
		G002	

3	P3	G003	The patient may experience a burning
		G006	sensation due to antibiotic ointment, but this
		G009	sensation does not last long. Eat foods
		G012	containing omega 3 fatty acids such as
		G013	sardines and tuna.
4	P4	G005	Taking antibiotics can make the patient more
		G007	sensitive to sunlight, so as much as possible
		G010	avoid sun exposure and consumption of
		G011	salmon and nuts.
		G012	
5	P5	G001	Be aware of the side effects of using
		G006	antibiotics, such as vomiting, diarrhea, and
		G007	stomach pain, and eating soy foods and green
		G011	vegetables.
		G004	Always keep your hands clean to avoid
6	P6	G005	bacterial infection and don't scratch your eyes
		G009	with dirty hands and eat tuna, salmon, and
		G012	nuts.
		G003	
		G004	Ask for a special shampoo from an eye
		G005	specialist to reduce dandruff, especially in
		G008	patients with severe dandruff conditions, and
		G009	avoid using antibiotics in the form of eye
		G011	ointments or drops and consuming tuna,
		G012	sardines, nuts, seeds, and green vegetables.
		G013	

**Table 4.** Weight of Fuzzy Mamdani's Value

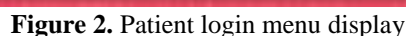
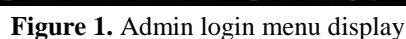
No	Value Weight	Description
1	0	There is no
2	0,3	Usual Symptoms
3	0,6	Moderate Symptoms
4	1	Dominant Symptoms

**Table 5.** Types of Diseases And Symptoms

Symptom Code	Disease Code					
	P1	P2	P3	P4	P5	P6
G001	0,6	0	0	0,3	0	0
G002	0	0,6	0	0	0	0
G003	0	0,6	0	0	0	1
G004	0,6	0	0	0	0,3	1
G005	0,6	0	0,3	0	0,3	1
G006	0	0,6	0	0,3	0	0
G007	0	0	0,3	0,3	0	0
G008	0,6	0	0	0	0	1
G009	0	0,6	0	0	0,3	1
G010	0,6	0	0,3	0	0	0
G011	0,6	0	0,3	0,3	0	1
G012	0	0,6	0,3	0	0,3	1
G013	0	0,6	0	0	0	1

Implementation of the system or research results is the final result in making an expert system for diagnosing blepharitis using the fuzzy Mamdani method, the following are the results of the implementation in each form.

#### 1. Login Form Menu



This form is a display of the diagnosis of blepharitis.

**Figure 3.** Diagnosis Results Display

This form is a data report display of blepharitis diagnosis


LAPORAN HASIL ANALISA DIAGNOSA PENYAKIT PASIEN

**Figure 4.** Display Diagnostic Data Report

This form is a display of information on the type of blepharitis data report

**LAPORAN JENIS PENYAKIT BLEFARITIS**  
**RUMAH SAKIT MATA SMEC (SABANG MERAUKE EYE CENTER) MEDAN**  
Jl. Iskandar Muda No.279-280, Petisah Tengah, Kec. Medan Petisah, Kota Medan, Sumatera Utara 20112, Indonesia

NO	KODE	NAMA PENYAKIT
1	P1	Blefaritis Superfisial
2	P2	Blefaritis Seborok
3	P3	Blefaritis Skumosa
4	P4	Blefaritis Ulseratif
5	P5	Blefaritis Angulus
6	P6	Blefaritis Meibomianitis

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**Figure 5.** Display Report Type Blepharitis

#### 5. Display Disease Symptoms Data Report

This form is for displaying data on reports of blepharitis symptoms

**LAPORAN GEJALA PENYAKIT BLEFARITIS**  
**RUMAH SAKIT MATA SMEC (SABANG MERAUKE EYE CENTER) MEDAN**  
Jl. Iskandar Muda No.279-280, Petisah Tengah, Kec. Medan Petisah, Kota Medan, Sumatera Utara 20112, Indonesia

NO	KODE	NAMA GEJALA & PENYAKIT (S.0748070)
1	0001	Kedapukan Mata Terasa Panas
2	0002	Mata Merah Terlihat Benar Atau Salah Terlihat Merah
3	0003	Mata Benar Benar dan Panas
4	0004	Pengeluaran Kaki Kotoran Mata
5	0005	Salu Mata Keras Benar Atau Benar Keras
6	0006	Terasa Keras Mata Terlihat Benar
7	0007	Kedapukan Mata Keras Angulus
8	0008	Mata Keras Benar Terlihat Benar Keras
9	0009	Pengeluaran Keras Benar
10	0010	Mata Keras Benar Yang Tidak Normal
11	0011	Panas Terlihat Mata Keras Benar
12	0012	Tidak Terlihat Mata Keras Benar
13	0013	Kedapukan Mata Keras Benar

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**Figure 6.** Display Disease Symptoms Data Report

#### 6. Display Patient Data Report

This form is to display data from patients who have been diagnosed with blepharitis.

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**RUMAH SAKIT MATA SMEC (SABANG MERAUKE EYE CENTER) MEDAN**  
Jl. Iskandar Muda No.279-280, Petisah Tengah, Kec. Medan Petisah, Kota Medan, Sumatera Utara 20112, Indonesia

No	Tgl. Registrasi	Nama Pasien	Kelamin	Umur (Tahun)	Alamat Pasien	Email
1	2020-05-16 09:56:36	Roni	Laki-laki	54	Jln. Pembangunan	roni@yahoo.com
2	2020-05-16 09:56:19	Rini	Wanita	20	Jln. Jember Gading	rini@yahoo.com
3	2020-05-16 07:25:05	Kisman Lathu	Laki-laki	33	Jln. Menteng 7 Gang Nasional No. 3	kisman@yahoo.com

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**Figure 7.** Display Patient Data Report

## 4. CONCLUSION

The application can be used to assist the public (patients) in diagnosing blepharitis, allowing the admin to add data on diseases, symptoms, and relationships (rules) for blepharitis disease. The application can provide information on the results of analysis and calculation results of the fuzzy Mamdani method, an expert system for diagnosing blepharitis for patients who have registered and have been diagnosed with blepharitis.

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