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Characteristics of Diabetic Cataract Patients at Siti Rahmah Padang Hospital, 2018-2019

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ARTICLE INFO

Keywords:

Age,
Gender,
Blood Glucose Levels,
Long Suffering From Diabetes Mellitus

ABSTRACT

Diabetic cataracts appear as a result of diabetes mellitus. A person's likelihood of developing cataracts is 25 times higher for people with diabetes mellitus compared to healthy people. Diabetic cataracts are caused by changes in the pathway of sorbitol in the lens of the eye. This change in trajectory will then injure the osmotic cells to cause an image of opacity in the lens of the eye. The purpose of this study was to determine the characteristics of diabetic cataract patients who were at the Siti Rahmah Islamic Hospital Padang in 2018-2019. The population of this study were cataract patients who had a history of type 2 diabetes mellitus at the Islamic Hospital Siti Rahmah Padang in 2018-2019. Meanwhile, the sample used was 37 people. Univariate analysis is shown in the form of a frequency distribution table. The results of this study found that the most characteristic of cataract patients were the age group 56-65 years as many as 16 people (43.2%), female sex as many as 22 people (59.5%), blood glucose levels when <300 mg/dl as many as 22 people (59.5%), and had suffered from diabetes mellitus for >5 years as many as 20 people (54.1%). Based on the results of the study, it can be concluded that the highest age is 56-65 years, the most gender is female, the highest blood glucose level is <300 mg/dl, and the duration of diabetes mellitus is <5 years.

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1. Introduction

The eye is a highly developed and complex organ that is sensitive to light. The eye has a function to be able to analyze the intensity, shape and color of light that is successfully reflected by an object so that it can provide a visual sensation. The location of the eye is in the protective structure of the human spine in the skull, precisely in the orbital cavity, where this location also has adipose tissue cushion. To be able to maintain its shape, each eyeball has a fibrous eyeball that is strong. In addition, the eyeball also has a network system that is transparent and can refract light and serves to focus shadows. Then there is also a layer of photosensitive cells, and a system of neurons whose job is to collect, process, and transmit the visual information obtained to the brain (Mescher, 2011).

Because of its useful function to absorb visual information in carrying out daily activities, the eye is one of the most important senses possessed by humans. Unfortunately there are many disorders of the eye that reduce the ability to see. These disorders can range from mild to severe disorders that can cause blindness. There needs to be sufficient attention to be able to prevent and overcome visual disturbances and blindness (Karim, 2015). The estimation results carried out by WHO serve as data on visual impairments that exist throughout the world. Visual acuity is used as the basis for classifying visual impairments. When the sharpness is only <6/18 to 3/60 then this condition is referred to as low vision. Meanwhile, blindness can occur when the visual acuity is only 3/60 (Agasi, 2021). Based on data obtained from the WHO, it is estimated that 285 million people have visual impairments with 246 million people having low vision problems while the remaining 39 million people are blind in 2010 (Ridha et al, 2017).

The most common causes of visual impairment globally are 43% of uncorrected fractional disorders and 33% of cataracts. Then other causes of cataracts are 2% glaucoma, 1% aged – Related Macular Degeneration (AMD), opacities in the cornea, trachoma and diabetic retinopathy. Then the remaining 18% failed to

determine. Meanwhile, blindness is caused by 51% cataracts, 8% glaucoma, 5% AMD, 4% due to blindness at an early age and clouding of the cornea, 3% refractive errors that cannot be corrected and trachoma, 1% diabetic retinopathy and the remaining 2% is unknown. the cause (Fan et al, 2019).

Based on data obtained from the Basic Health Research Report (Riskesdas), the prevalence of cataracts in Indonesia is 1.8%. The prevalence of cataracts in West Sumatra is 2.3%. Based on data from the Padang City Health Office, the prevalence of cataract cases in 2016 was 13%. When the eye lens that was initially clear or clear turns cloudy, then this condition can then be called a cataract. The average number of people who experience cataracts is 0.1% per year or new cataract sufferers will appear out of every 1000 existing people (Sumiyati et al, 2021). The most common cause of cataracts is aging. However, there are various other factors that contribute to cataracts such as trauma, systemic diseases such as diabetes or heredity.

Diabetes mellitus (DM) is a chronic disease in the form of failure of the human body to be able to metabolize fats, proteins and carbohydrates. This will then cause an increase in blood sugar levels (hyperglycemia) (Wahyuni et al, 2020). When the blood sugar level is >126 (mg/dl) when fasting or 200 (mg/dl) when not fasting, then the glucose level is considered to be above the normal limit so that it can be diagnosed with DM. Long-term diabetes can cause failure in body organs such as blood vessels, heart, nerves, kidneys and eyes (Venkat et al, 2017).

The occurrence of various problems in the body such as swelling of the eye lens, decreased vision and bleeding in the retinal nerve can occur as a result of uncontrolled blood glucose up to > 200 md/dl. Damage to multiple organs can occur as a result of chronic hyperglycemia. Hyperglycemia can cause cell damage to nerve tissue, the lens of the eye and also the retinal vasculature as a result of the biochemical processes that occur (Ahmad & Ahsan, 2020).

The risk of cataracts is 25 times greater for people with diabetes than healthy people (Lu et al, 2020). Diabetic cataracts are cataracts that occur as a result of DM disease. Alello argues that 40% of people who suffer from DM also suffer from diabetic cataracts (Grzybowski et al, 2019). Based on research from the Wisconsin Epidemiological Study of Diabetic Retinopathy, cataracts were found in DM patients (Dewi et al, 2019). Then in a cohort study by the Beaver Dam Eye Study, it was found that there was cataract formation in DM patients. In this study, it was stated that diabetes was associated with posterior subscapsular and cortical cataracts (Kanakamedala et al, 2021). Based on the UK Prospective Diabetes Study Group, it was stated that at the time of diagnosis, 15% of people with type 2 DM also had cataracts (Davis et al, 2019).

From the results of the Basic Health Research (Riskesdas) conducted in 2013 through interviews, 1.5% of people were diagnosed by doctors with DM and 2.1% had symptoms of DM (Setyaji et al, 2018). Based on the doctor's diagnosis, it was found that there was an increase in symptoms with increasing age, but there was a decrease starting from age 65 years. Then it was found that there was a tendency for women to suffer from DM compared to men, and was higher in urban areas than in rural areas, and tended to be higher in people who had a high ownership index quintile and a high level of education (Ekaningrum, 2021). The prevalence of DM in West Sumatra is 1.3%. The prevalence of DM in Padang City is 1.4%. Through the explanation above, the researchers wanted to know about the characteristics of cataract patients who were in the Siti Rahmah Islamic Hospital.

2. Methods

The population in this study were cataract patients with a history of type 2 diabetes at the Siti Rahmah Islamic Hospital. Quantitative descriptive research was used in this study using a cross-sectional design through medical records as research data. Total sampling is then used as a sampling technique with a minimum number of 27 people. The independent variables were diabetic cataracts and the dependent variables were age, gender, duration of suffering from DM and blood glucose levels. The data used is secondary data that comes from medical records at the Siti Rahmah Islamic Hospital.

3. Results and discussion

3.1 Characteristics of Diabetic Cataract Patients Based on Age

The frequency distribution of diabetic cataract patients by age at the Siti Rahmah Islamic Hospital in 2018-2019 is as follows:

Table 1
Frequency Distribution of Diabetic Cataract Patients
by Age in the Eye Clinic of Siti Rahmah Islamic Hospital in 2018-2019

Age	***Frequency (f)***	***Percentage (%)***
<46 year	0	0

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Age	*Frequency (f)*	*Percentage (%)*
46-55 year	8	21,6
56-65 year	16	43,2
>65 year	13	35,1
Amount	**37**	**100**

It can be seen in table 1 that out of a total of 37 diabetic cataract patients, most of them are in the 56-65 year age group with 16 patients (43.2%). Furthermore, there were 13 patients (35.1%) in the >65 year age group and 8 patients (21.6%) in the 46-55 year age group. There were no diabetic cataract patients in the <46 years age group.

The results of this study indicate that diabetic cataract patients are a category of late elderly. In a study by Tamansa regarding the relationship of the incidence of cataracts with age and gender, it was found that 120 (60.9) cataract patients were elderly with the age group of 53-68 years.

Increasing age will cause cataracts. This is because a normal lens has a thickness of 4 mm and is as clear as glass. However, at the age of more than 45 years, there will be damage to the protein and lens cells, causing progressive clouding of the lens.

The aging process will increase the lens' ability to scatter sunlight. Intraocular distribution of sunlight will occur and increasing age also increases this exponentially. Changes can first be felt when the age reaches 40 years. Then at the age of 65 years, it has doubled and at the age of 77 years, it has tripled.

Lens proteins will undergo non-enzymatic modifications with increasing age so that this will cause changes in molecular structure, increase light scattering and increase susceptibility to oxidation. In the long term the lens nucleus will be affected as the human lens grows, but it is in the fourth decade that oxidative damage will increase. This will lead to reduced transparency of the lens and the less elastic the lens core in resisting changes in shape with age.

In Mamangkey's research, it was found that there was a relationship between the incidence of DM and a person's age. Mamangkey's results showed that there was an eight-fold risk of developing DM for people who were over 45 years old. This is because the function of human organs will decrease as age increases so that the risk of disease is also higher.

Through the explanation above, the researcher argues that cataracts can occur due to an increase in age. This is caused by the aging process in all organs of the body, but age is not the main factor for cataracts, but rather the presence of DM which accelerates the occurrence of cataracts more quickly. This study also shows that the 56-65 year age group dominates as the most diabetic cataract patients.

3.2 Characteristics of Diabetic Cataract Patients by Gender

The frequency distribution of cataract patients by gender at the Siti Rahmah Islamic Hospital in 2018-2019 is as follows:

Table 2.
Frequency Distribution of Diabetic Cataract Patients by Gender
in the Ophthalmology Clinic of Siti Rahmah Islamic Hospital in 2018-2019

Gender	*Frequency (f)*	*Percentage (%)*
Male	15	40,5
Female	22	59,5
Amount	**37**	**100**

It can be seen in table 2 of a total of 37 diabetic cataract patients, most of them were female patients as many as 22 patients (59.5%). Meanwhile, 15 patients (40.5%). These results found that the majority of diabetic cataract patients were female patients with 22 people (59.5%). The results of this study were then supported by research conducted by the state in 2016 at the Jember clinic with 16 female diabetic cataract patients (53.3%). Then this study is also in accordance with the research conducted by Raman et al in 2020 with the results of a higher number of female patients (51.4%) compared to male patients (44.8%).

Ilyas argues that the influence of gender is caused by menopause in women which occurs at the age of 45 years. This will then lead to a reduced ability of the body to metabolize and damage to body tissues. Zetterberg and Celojevic stated that there is evidence that cataracts are more common in women than men. No relationship was found in lifestyle with this gender difference. Hence the focus has been on the role of estrogen in cataract formation. Decreased estrogen at menopause causes an increased risk of cataracts in women. This is because estrogen has a protective effect on the lens.

In another study by Sylvia, it was found that the majority of DM sufferers were women as many as 16 people (53.3%). A higher risk is accepted by women as a result of the presence of menopausal forced monthly cycle syndrome. This process can cause the accumulation of fat in the body to be easier due to

hormonal processes so that the risk of developing DM is higher. Through the explanation above, the researchers concluded that the risk of developing diabetic cataracts was higher for women than men. This occurs as a result of the decrease in estrogen in women during menopause which can increase the risk of DM for women so that the risk of diabetic cataracts also increases for women.

3.3 Characteristics of Diabetic Cataract Patients Based on Blood Glucose Levels

The frequency distribution of diabetic cataract patients based on blood glucose levels while at the Siti Rahmah Islamic Hospital in 2018-2019 is as follows:

Table 3

Frequency Distribution of Diabetic Cataract Patients Based on Blood Glucose Levels at the Ophthalmology Clinic of Siti Rahmah Islamic Hospital Year 2018-2019

Blood Glucose Levels While	*Frequency (f)*	*Percentage (%)*
<300 mg/dll	22	59,5
>300 mg/dll	15	40,5
Amount	**37**	**100**

It can be seen in table 3 of a total of 37 diabetic cataract patients, most of them were patients with blood glucose levels when <300 mg/dll as many as 22 patients (59.5%). Meanwhile, 15 patients (40.5%). These results indicate that the majority of diabetic cataract patients are patients with current blood glucose levels <300 mg/etc. DM can cause diabetic cataracts as one of its complications. Research conducted by Wulandari in 2013 showed that the average random blood sugar level suffered by DM patients with complications was >300 mg/etc.

Accumulation of sorbitol and fructose that occurs in the lens will cause cloudiness in the lens so that eventually diabetic cataracts are formed. The increase in blood sugar levels that occurs in the aqueous humor is caused by a state of hyperglycemia. Through the diffusion process, glucose in the aqueous humor will enter the lens so that glucose is converted into sorbitol due to the aldose reductase enzyme through the polyol pathway. Glucose that is not converted into sorbitol will continue to be in the lens. This accumulated sorbitol will produce osmotic changes so that the lens will enter water and cause swelling of the lens fibers.

Diabetes is a major factor in the development of cataracts. In animals cataracts develop within days or weeks after diabetes in which case it has been shown that osmotic stress from sorbitol accumulation causes cataract development. This mechanism may explain cases of acute cataracts that are occasionally found in patients with sustained uncontrolled hyperglycemia but cannot account for the majority of cataracts that develop after years of diabetes. However, it was found that chronic oxidative stress impairs lens osmoregulation. This model of osmoregulatory dysfunction may explain why diabetic patients who control their blood glucose well are still prone to cataracts.

Through the explanation above, the researcher believes that DM patients have a greater risk of suffering from cataracts. This study found that patients who had blood glucose levels when <300 mg/etc were more than patients who had blood glucose levels when >300 mg/etc. This can happen because of the awareness of DM patients to be able to control their blood sugar levels because cataracts can occur in DM patients even though their blood sugar is still controlled. This causes the importance of controlling blood sugar for people with diabetes in order to avoid complications such as diabetic cataracts. Examination of blood sugar in cataract patients aims as a basis for nursing. The recommended blood sugar level if the patient has a history of diabetes mellitus then the blood sugar level ranges between 180-220 mg/dl while continuing to carry out glucose management to be more tolerant.

3.4 Characteristics of Diabetic Cataract Patients Based on Length of Suffering from Diabetes Mellitus

The frequency distribution of diabetic cataract patients based on the length of time suffering from DM at the Siti Rahmah Islamic Hospital in 2018-2019 is as follows

Table 4

Frequency Distribution of Diabetic Cataract Patients Based on Length of Suffering from Diabetes Mellitus at the Ophthalmology Clinic of Siti Rahmah Islamic Hospital in 2018-2019

Long Suffering from Diabetes Mellitus	*Frequency (f)*	*Percentage (%)*
<5 Year	17	45,9
>5 Year	20	54,1
Amount	**37**	**100**

It can be seen in table 4 of a total of 37 diabetic cataract patients, most of them were patients with DM history > 5 years as many as 20 patients (54.1%). Meanwhile, patients with a history of DM <5 years were 17 patients (45.9%).

This finding is in accordance with research conducted by Wahyuni regarding the relationship between a

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history of diabetes, a history of hypertension and a history of smoking with cataracts at Dr. Hospital. Soedarso Pontianak. It was found that patients who had a history of DM 5 years were 63.6% more. Meanwhile, Fauzi's research explained that people with type 2 DM have a risk of cataracts if they have had it for 5 years. With uncontrolled blood glucose for 5 years while suffering from DM, this will increase the risk of complications such as cataracts. This means that cloudiness in the lens of the eye will occur as a result of chronic hyperglycemia and can cause cataracts.

Later in Becker's study it was shown that there was an approximately twofold increase in the risk of a cataract diagnosis as the duration of diabetes also increased. Riordan and Whitcher argue that damage to various organs can be caused by chronic hyperglycemia. In the biochemical process there is cell damage as a side effect of hyperglycemia to the retinal, lens and vascular nerve tissue.

Through the explanation above, the researchers concluded that DM patients > 5 years had a greater risk of developing diabetic cataracts. Therefore, it is quite important for DM patients to carry out health checks and prevention for DM patients so that they can keep their blood glucose normal. In addition, it is also necessary to take care of the eyes and consume a variety of foods that can be antioxidants such as fruits that have high vitamin C, vitamin E, selenium, and copper. A person will have a lower risk of cataracts when they have two or three types of antioxidants compared to people whose antioxidants are lower.

4. Conclusions

Through the research above regarding the characteristics of diabetic cataract patients at Siti Rahmah Islamic Hospital in 2018-2019, it was found that the number of diabetic cataract patients was the most from the age group was 16 people (43.2%) in the 56-65 age group. year. Then based on gender, diabetic cataract sufferers are women with a total of 22 people (59.5%). Then seen through blood glucose levels when diabetic cataract patients were <300 mg/etc with a total of 22 people (59.5%). Last seen from the length of suffering from DM, diabetic cataract patients with >5 years old were 20 people (54.1%).

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