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Original Research Article

A Study to Determine the Role of Diabetes Mellitus in Causing Cataracts, Especially Posterior Subcapsular Cataracts in Outpatients: An Observational Study

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Abstract

Aim: The aim of the present study was to determine the role of diabetes mellitus in causing cataracts, especially posterior subcapsular cataracts in outpatients.

Methods: The present study was conducted in the Department of Ophthalmology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India the sample used in this study were patients who treated by Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from August 2018 to February 2020 who suffers from cataract eye diseases.

Results: In this study, 229 patients' data were used; it is known that there were 79 patients with a history of diabetes mellitus (34.5%) and history of non-diabetes Mellitus as many as 150 patients (65.5%). As for 229 patients who suffer from cataract eye disorders or diseases in this study, it was found that 44 patients or 19.2%, had PSC type cataracts, and 185 patients, or 80.8%, had non-PSC type cataracts. 42 patients or 18.3% had a history of diabetes mellitus and had PSC cataracts, while two patients or 0.8%, did not have a history of diabetes mellitus but had PSC cataracts. In addition, the results of the analysis also showed that there were 37 patients, or 16.2% had a history of diabetes mellitus and had non-PSC cataracts, while 148 patients or 64.6%, did not have a history of diabetes mellitus experiencing non-PSC cataracts. Overall, there were 79 patients, or 34.5% had a history of diabetes mellitus and had cataracts, and there were 150 patients or 65.6% who did not have a history of diabetes mellitus but had cataracts. The resulting Pearson Chi-Square value is 0.000 less than the cut-off value of 0.05.

Conclusion: It can be concluded that diabetes mellitus can cause PSC cataracts by 39.1%. These results support previous studies which say that PSC cataracts can be caused by diabetes mellitus. In addition, the effect of diabetes mellitus on cataracts which is only 39.1%, also supports other studies which say that the cause of PSC cataracts is multifactorial with other factors that are not discussed in this study.

Keywords: cataract, diabetes mellitus, PSC cataract

Introduction

The eye is an essential visual organ for humans [1]. With the eye, human beings can get a variety of visual information transmitted to the brain properly to be processed as a basis for decision-making in carrying out daily activities. Every organ in the eye has a vital function for humans because if one of the eye functions is problematic, it will affect the function of other organs. Eyes need lenses that are clear, transparent, and flexible or elastic. If the lens in the eye loses its translucency or clarity, the vision will become foggy and even cause a person unable to see at all [2] , this is because the cloudiness that occurs in the lens makes the amount of incoming light decrease and causes a person unable to see correctly. [3]

Turbidity or loss of translucency that occurs in the lens is called a cataract. Turbidity in the lens or cataracts can occur due to hydration of the lens fluid, denaturation of the lens protein, or a result of both. [4] In a population over 50 years old, most people suffered from senile cataracts consisting of nuclear cataracts, cortical cataracts, and Posterior Subcapsular Cataracts (PSC) caused by lens degeneration. [5] Diabetic retinopathy is the most well-known ocular complication of diabetes and the leading cause of blindness among people 20–64 years of age in the U.S. [6]. Up to 4 million Americans with diabetes, 40 years of age and older, have retinopathy, and nearly 1 million have sight-threatening retinopathy. [7]

In major clinical trials, tight control of blood glucose and blood pressure has been demonstrated to reduce the risk of retinopathy and associated blindness. [8] A range of ocular diseases is also associated with diabetes, which may lead to vision loss. However, some of these ocular conditions may not be familiar to non eye clinicians. [9-11] Diabetes mellitus is a disease in which the body doesn't make enough insulin or use it properly. This leads to high blood sugar and problems with how proteins, fats, and carbs are broken down. There are 366 million people with diabetes mellitus in the world right now, and that number is expected to rise to 552 million by 2030. In developing countries, more than 82 million people aged 64 and up will have diabetes by 2030. In wealthy countries, more than 48 million people will have diabetes by the same year. [12-14] The number of people with diabetes around the world is forecast to rise from 2.8% in 2000 to 4.4% by 2030, and it will affect people of all ages. People with diabetes are mostly found in low- and middle income countries. Over the next 19 years, the disease is also projected to become more common in these countries the most. Type 2 Diabetes Mellitus makes up about 90% of all cases of diabetes. The main things that describe it are insulin resistance and relative insulin insufficiency. [15-17] A cataract is a disease in which the crystalline lens gets cloudy and makes it hard to see. It causes about 42% of all blindness and is the main reason people go blind around the world. About 17 million people are blind because of cataracts, and 28,000 new cases are reported every day around the world. About a quarter of people aged 65 and up and fifty percent of people aged 80 and up have cataracts, which make it very hard to see. [18-20]

The aim of the present study was to determine the role of diabetes mellitus in causing cataracts, especially posterior subcapsular cataracts in outpatients.

Materials and Methods

The present study was conducted in the Department of Ophthalmology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India the sample used in this study were patients who treated by Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from August 2018 to February 2020 who suffers from cataract eye diseases. The sampling technique used in this study is a consecutive sampling technique which is classified as non-probability sampling. Consecutive sampling is a sample selection technique by selecting all samples that meet the criteria set by the researcher. The criteria set are:

1. Cataract patients over 45 years old at the Anugrah Narayan Magadh Medical College and Hospital

2. Experiencing PSC cataract or Non-PSC cataract eye disease

3. Have a history of diabetes mellitus or non-diabetes mellitus

4. Treated by Pasuruan Hospital from August 2017 to February 2022

The consecutive sampling method used in this study the overall data of cataract patients treated by the Pasuruan eyes hospital from February 2020 to February 2021. This data is a medical record containing a history of diabetes mellitus and the types of cataracts suffered by 229 patients. The data obtained in this study were then processed and analyzed with a cross-sectional design and chi-square test using IBM SPSS 26 software to determine the proportion of data distribution and the relationship between the independent and dependent variables. In this study, the independent variable was diabetes mellitus, while the dependent variable was PSC cataract. The analysis results will then be recorded in a 2x2 table. The hypotheses proposed in this study are as follows.

H0 : History of diabetes mellitus does not cause PSC cataract eye disease

H1 : History of diabetes mellitus causes PSC cataract eye disease In addition to the cross-sectional analysis, a regression test was also conducted to determine the value of the determinant coefficient (R2), which shows the magnitude of the influence of Diabetes Mellitus disease history (independent variable) in causing PSC cataract (dependent variable). If the R2 value shows a value of 0.67 or more, then the independent variable significantly influences the dependent variable. Meanwhile, if the R2 value shows a value of 0.33 or 0.19, then each independent variable has a moderate or weak influence on the dependent variable.

Results

Table 1: Number of Cataract Patients

History of Disease	Frequency	Percentage
Diabetes Mellitus	79	34.5 %
Non-Diabetes Mellitus	150	65.5 %
Total	229	100 %

In this study, 229 patients' data were used; it is known that there were 79 patients with a history of diabetes mellitus (34.5%) and history of non-diabetes Mellitus as many as 150 patients (65.5%).

Table 2: Number of Diabetes Patient

Types of Cataract	Frequency	Percentage
PSC	44	19.2%
Non-PSC	185	80.8%
Total	229	100.0%

As for 229 patients who suffer from cataract eye disorders or diseases in this study, it was found that 44 patients or 19.2%, had PSC type cataracts, and 185 patients, or 80.8%, had non-PSC type cataracts.

Table 3: Cross-Section Test Results

History of Disease	Types of Cataract				Total	
	PSC		Non-PSC			
	n	%	N	%	n	%
Diabetes Mellitus	42	18.3	37	16.2	79	34.5
Non Diabetes Mellitus	2	0.8	148	64.6	150	65.6
Total	44	19,1	185	80,8	229	100

42 patients or 18.3% had a history of diabetes mellitus and had PSC cataracts, while two patients or 0.8%, did not have a history of diabetes mellitus but had PSC cataracts. In addition, the results of the analysis also showed that there were 37 patients, or 16.2% had a history of diabetes mellitus and had non-PSC cataracts, while 148 patients or 64.6%, did not have a history of diabetes mellitus experiencing non-PSC cataracts. Overall, there were 79 patients, or 34.5% had a history of diabetes mellitus and had cataracts, and there were 150 patients or 65.6% who did not have a history of diabetes mellitus but had cataracts.

Table 4: The Result of Chi-Square Test

	Value	df	Asymptotic Significance (2sided)
Pearson Chi Square	89.560	1.000	0.000

The resulting Pearson Chi-Square value is 0.000 less than the cut-off value of 0.05.

Discussion

The prevalence of diabetes mellitus (DM) is increasing on a daily basis, with the International Diabetes Federation estimating that there will be 439 million DM patients by 2030. [21] An aging population and longer patient life expectancy also means that the prevalence of DM will exceed 33% by 2050. [22] DM can lead to pathologies in many tissues in the eye structure, with both a systemic chronic metabolic disease and a microangiopathic character. [23] Cataract is one of the major causes of visual impairment in diabetic patients. [24]

In this study, 229 patients' data were used; it is known that there were 79 patients with a history of diabetes mellitus (34.5%) and history of non-diabetes Mellitus as many as 150 patients (65.5%). As for 229 patients who suffer from cataract eye disorders or diseases in this study, it was found that 44 patients or 19.2%, had PSC type cataracts, and 185 patients, or 80.8%, had non-PSC type cataracts. 42 patients or 18.3% had a history of diabetes mellitus and had PSC cataracts, while two patients or 0.8%, did not have a history of diabetes mellitus but had PSC cataracts. In addition, the results of the analysis also showed that there were 37 patients, or 16.2% had a history of diabetes mellitus and had non-PSC cataracts, while 148 patients or 64.6%, did not have a history of diabetes mellitus experiencing non-PSC cataracts. From these results, it can be seen that diabetes mellitus has a relationship with the occurrence of PSC cataracts. This situation is in line with research conducted by Ehrlich R [25] and Taskapili M [26] which states that anterior and subcapsular posterior are structural characteristics of cataracts in diabetic patients.

Overall, there were 79 patients, or 34.5% had a history of diabetes mellitus and had cataracts, and there were 150 patients or 65.6% who did not have a history of diabetes mellitus but had cataracts. The resulting Pearson Chi-Square value is 0.000 less than the cut-off value of 0.05. The results of this study also support several studies that have shown that diabetes mellitus can cause cataracts to occur more frequently than non-diabetics. Framingham and other eye studies showing a three to fourfold increase in cataract prevalence in patients with diabetes under 65 years old and a two-fold increase in patients over 65 years old. [27] These findings also support the Beaver Dam Eye Study, which explains the relationship between diabetes mellitus and cataract formation in a population of 3,684 people over the age of 43, showing an increased incidence and development of posterior and cortical subcapsular cataracts for diabetes mellitus patients. [28] Then, the study conducted by Blue Mountains

Eye Study with a cross-sectional method on 3,654 cataract patients shows the known harmful effect of diabetes on the lens as evidenced by posterior subcapsular cataract (PSC), which is statistically significant with diabetes mellitus. [27] So that PCME prophylaxis should be done immediately depending on the stage of diabetic retinopathy. However, if diabetic retinopathy is found, patients with PSC cataracts should delay surgery or cataract extraction. [29] The Royal College of Ophthalmology recommends using topical non-steroidal anti-inflammatory drugs (NSAIDs) in patients with elevated PCME, e.g. patients with diabetes, previous cystoid macular edema (CME), and previous retinal vein occlusion. [30]

Conclusion

It can be concluded that diabetes mellitus can cause PSC cataracts by 39.1%. These results support previous studies which say that PSC cataracts can be caused by diabetes mellitus. In addition, the effect of diabetes mellitus on cataracts which is only 39.1% also supports other studies which say that the cause of PSC cataracts is multifactorial with other factors that are not discussed in this study.

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