e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(5); 229-234

Original Research Article

A Hospital Based Study to Determine the Role of Diabetes Mellitus in Causing Cataracts, Especially Posterior Subcapsular Cataracts

Kaushal Kishore Mishra[1], Bidisha Rani[2], Arun Kumar Sinha[3]

[1]Senior Resident, Department of Ophthalmology, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

[2]Senior Resident, Department of Ophthalmology, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

[3]Professor and HOD, Department of Ophthalmology, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

Received: 03-02-2023 / Revised: 02-03-2023 / Accepted: 05-04-2023

Corresponding author: Dr. Bidisha Rani

Conflict of interest: Nil

Abstract

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

Methods: The present study was conducted in Department of Ophthalmology, Bhagwan Mahavir Institute of Medical Sciences for one year and patients were included who were suffering from cataract eye diseases. The consecutive sampling method used in this study the overall data of cataract patients treated at Bhagwan Mahavir Institute of Medical Institute, Pawapuri, Nalanda, Bihar, India. This data was a medical record containing a history of diabetes mellitus and the types of cataracts suffered by 200 patients.

Results: There were 80 patients with a history of diabetes mellitus (40%) and history of non-diabetes Mellitus as many as 120 patients (60%). As for 200 patients who suffer from cataract eye disorders or diseases in this study, it was found that 40 patients or 20%, had PSC type cataracts, and 160 patients, or 80%, had non-PSC type cataracts. From the cross-section analysis results, it is known that as many as 38 patients or 19% had a history of diabetes mellitus and had PSC cataracts, while two patients or 1%, did not have a history of diabetes mellitus but had PSC cataracts. In addition, the results of the analysis also showed that there were 42 patients, or 21% had a history of diabetes mellitus and had non-PSC cataracts, while 118 patients or 59%, did not have a history of diabetes mellitus experiencing non-PSC cataracts. Overall, there were 80 patients, or 40% had a history of diabetes mellitus and had cataracts, and there were 120 patients or 60% who did not have a history of diabetes mellitus but had cataracts.

Conclusion: In conclusion, this study demonstrated that incidence rates of cataract diagnosis in patients with diabetes are higher than among diabetic-free patients, particularly at younger age. The overall approximately twofold increased risk of cataract diagnosis associated with diabetes increases with diabetes duration. Patients with diabetic macular edema are at an increased risk for a cataract diagnosis.

Keywords: Cataract; Diabetes Mellitus; PSC Cataract.

Introduction

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. [1] An aging population and longer patient life expectancy also means that the prevalence of DM will exceed 33% by 2050. [2] DM can lead to pathologies in many tissues in the eye structure, with both a systemic chronic metabolic disease and a microangiopathic character. [3] Cataract is one of the major causes of visual impairment in diabetic patients. [4] Patients with DM are reported to be up to five times more likely to develop cataract, in particular at an early age. [5,6]

Cataract is the primary cause of blindness worldwide. [7] It is defined as a decrease in the transparency of the crystalline lens and can be further differentiated into nuclear, cortical, or posterior subcapsular cataract (PSC). [8] Main risk factors in the developed world, besides advanced age, appear to be smoking [9], exposure to sunlight [10] and use of corticosteroids. [11,12]

Several important study groups have investigated cataract incidence in diabetic patients. The Wisconsin Epidemiologic Study of Diabetic Retinopathy investigated the incidence of cataract and factors associated with a higher risk of cataract surgery. [5] They found 8.3% of patients suffering from type 1 diabetes and 24.9% of those with type 2 diabetes had a 10-year cumulative incidence of cataract surgery. For type 1 diabetics, they found some risk factors, including age, severity of diabetic retinopathy (DR), and proteinuria; for Type 2 diabetics, risk factors included age and use of insulin. [13] The Beaver Dam Eye Study also reported an association between DM and cataract formation. [11] The study took place over five years and consisted of 3684 participants aged 43 and older. It showed an increased incidence and progression of cortical and posterior subcapsular cataracts for DM patients. It also found an increased risk of nuclear and cortical cataracts with increased levels of glycated hemoglobin. Further analysis of the study showed that diabetics had a higher rate of cortical lens opacities and previous cataract surgery than nondiabetics. [12] A longer duration of diabetes was also associated with increased frequency of both cortical cataracts and cataract surgery. Cataracts consist of four types: secondary cataracts, senile cataracts, complicated cataracts, and traumatic cataracts. [14] 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. [15]

The aim of the present study was to determine the role of diabetes mellitus in causing cataracts, especially posterior subcapsular cataracts. [16]

Materials and Methods

The present study was conducted in Department of Ophthalmology, Bhagwan Mahavir Institute of Medical Sciences India and patients were included who were suffering from cataract eye diseases. The consecutive sampling method used in this study the overall data of cataract patients treated at Bhagwan Mahavir Institute of Medical sciences, Pawapuri, Nalanda, Bihar, India. This data was a medical record containing a history of diabetes mellitus and the types of cataracts suffered by 200 patients.

The criteria set are:

1. Cataract patients over 45 years old.
2. Experiencing PSC cataract or Non-PSC cataract eye disease.
3. Have a history of diabetes mellitus or non-diabetes mellitus.

The hypotheses proposed in this study were 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. [17]

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.

Results

Table 1: Cataract and diabetes patients

History of Disease	Frequency	Percentage
Diabetes Mellitus	80	40%
Non-Diabetes Mellitus	120	60%
Total	200	100%
Types of Cataracts		
PSC	40	20%
Non-PSC	160	80%
Total	200	100%

There were 80 patients with a history of diabetes mellitus (40%) and history of non-diabetes Mellitus as many as 120 patients (60%). As for 200 patients who suffer from cataract eye disorders or diseases in this study, it was found that 40 patients or 20%, had PSC type cataracts, and 160 patients, or 80%, had non-PSC type cataracts.

Table 2: Types of cataract in diabetic patients

History of Disease	Types of Cataracts				Total	
	PSC		Non-PSC			
	n	%	N	%	n	%
Diabetes Mellitus	38	19	42	21	80	40
Non-Diabetes Mellitus	2	1	118	59	120	60
Total	40	20	160	80	200	100

From the cross-section analysis results, it is known that as many as 38 patients or 19% had a history of diabetes mellitus and had PSC cataracts, while two patients or 1%, did not have a history of diabetes mellitus but had PSC cataracts. In addition, the results of the analysis also showed that there were 42 patients, or 21% had a history of diabetes mellitus and had non-PSC cataracts, while 118 patients or 59%, did not have a history of diabetes mellitus experiencing non-PSC cataracts. Overall, there were 80 patients, or 40% had a history of diabetes mellitus and had cataracts, and there were 120 patients or 60% who did not have a history of diabetes mellitus but had cataracts. Thus, it can be concluded that diabetes mellitus has a relationship with cataracts, especially PSC cataracts. This condition was proven

by more patients with PSC cataracts who have a history of diabetes mellitus than patients who suffer from PSC cataracts but do not have a history of diabetes.

Table 3: Pearson Chi Square test

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi Square	90.50	1.0000	0.000

In this study, a confidence interval of 95% or α 0.05 was used. Thus, to accept hypothesis H1, the Pearson Chi-Square value on the resulting Chi-Square test must be less than the cut-off value of 0.05. Pearson Chi-Square value is 0.000 less than the cut-off value of 0.05. Thus, hypothesis H1 is accepted, which means that the history of diabetes mellitus causes PSC cataract eye disease.

Discussion

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 [18], 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. [19] 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. [20] Carefully performed cataract surgery in diabetic patients should yield optimal postoperative results. Patient follow-up should also be done carefully. Preoperatively, patients diagnosed with NPDR who have adequate retinal view should undergo detailed retinal examination within three months of cataract extraction. Patients with PDR or those with inadequate retinal view prior to cataract extraction should be examined closely after surgery in order to evaluate their DR status. [21] Endophthalmitis is the most serious complication of cataract surgery. The risk of postoperative endophthalmitis in diabetic patients has increased and is associated with a poor visual prognosis.

There were 80 patients with a history of diabetes mellitus (40%) and history of non-diabetes Mellitus as many as 120 patients (60%). As for 200 patients who suffer from cataract eye disorders or diseases in this study, it was found that 40 patients or 20%, had PSC type cataracts, and 160 patients, or 80%, had non-PSC type 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 RM [22] and Taskapili M [23], which states that anterior and subcapsular posterior are structural characteristics of cataracts in diabetic patients.

From the cross-section analysis results, it is known that as many as 38 patients or 19% had a history of diabetes mellitus and had PSC cataracts, while two patients or 1%, did not have a history of diabetes mellitus but had PSC cataracts. In addition, the results of the analysis also showed that there were 42 patients, or 21% had a history of diabetes mellitus and had non-PSC cataracts, while 118 patients or 59%, did not have a history of diabetes mellitus experiencing non-PSC cataracts. Overall, there were 80 patients, or 40% had a history of diabetes mellitus and had cataracts, and there were 120 patients or 60% who did not have a history of diabetes mellitus but had cataracts. Thus, it can be concluded that diabetes mellitus has a relationship with cataracts, especially PSC cataracts. This condition was proven by more patients with PSC cataracts who have a history of diabetes mellitus than patients who suffer from PSC cataracts but do not have a history of diabetes. 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. [24] 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. [25] 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. [24]

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. [26] 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. [27,28]

Conclusion

In conclusion, this study demonstrated that incidence rates of cataract diagnosis in patients with diabetes are higher than among diabetic-free patients, particularly at younger age. The overall approximately twofold increased risk of cataract diagnosis associated with diabetes increases with diabetes duration. Patients with diabetic macular edema are at an increased risk for a cataract diagnosis.

References

1. International Diabetes Federation. IDF Diabetes Atlas 7th Edition. Brussels, Belgium. 2015.
2. Boyle JP, Thompson TJ, Gregg EW, Barker LE, Williamson DF. Projection of the year 2050 burden of diabetes in the US adult population: dynamic modeling of incidence, mortality, and prediabetes prevalence. Population health metrics. 2010 Dec;8(1):1-2.
3. Skarbez K, Priestley Y, Hoepf M, Koevary SB. Comprehensive review of the effects of diabetes on ocular health. Expert review of ophthalmology. 2010 Aug 1;5(4):557-77.
4. Drinkwater JJ, Davis WA, Davis TM. A systematic review of risk factors for cataract in type 2 diabetes. Diabetes/metabolism research and reviews. 2019 Jan;35(1):e3073.
5. Klein BE, Klein R, Wang Q, Moss SE. Older-onset diabetes and lens opacities. The Beaver Dam Eye study. Ophthalmic epidemiology. 1995 Jan 1; 2(1):49-55.
6. Klein BE, Klein R, Lee KE. Diabetes, cardiovascular disease, selected cardiovascular disease risk factors, and the 5-year incidence of age-related cataract and progression of lens opacities: the Beaver Dam Eye Study. American journal of ophthalmology. 1998 Dec 1;126(6):782-90.
7. Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, Jonas JB, Keeffe J, Leasher J, Naidoo K, Pesudovs K. Causes of vision loss worldwide, 1990–2010: a systematic analysis. The lancet global health. 2013 Dec 1;1(6):e339-49.
8. Asbell PA, Dualan I, Mindel J, Brocks D, Ahmad M, Epstein S. Age-related cataract. The Lancet. 2005 Feb 12;365(9459):599-609.
9. Tan JS, Wang JJ, Younan C, Cumming RG, Rochtchina E, Mitchell P. Smoking and the long-term incidence of cataract: the Blue Mountains Eye Study. Ophthalmic epidemiology. 2008 Jan 1;15(3):155-61.

10. Hollows F, Moran D. Cataract-the ultraviolet risk factor. The Lancet. 1981 Dec 5;318(8258):1249-50.
11. Urban Jr RC, Cotlier E. Corticosteroid-induced cataracts. Survey of ophthalmology. 1986 Sep 1;31(2):102-10.
12. Delcourt C, Cristol JP, Tessier F, Leger CL, Michel F, Papoz L, POLA Study Group. Risk factors for cortical, nuclear, and posterior subcapsular cataracts: the POLA study. American journal of epidemiology. 2000 Mar 1;1 51(5):497-504.
13. Klein BE, Klein R, Moss SE. Incidence of cataract surgery in the Wisconsin Epidemiologic Study of Diabetic Retinopathy. American journal of ophthalmology. 1995 Mar 1;119(3):295-300.
14. Girsang RR, Fahmi H. Expert System for Diagnosing Cataract Eye Disease with Web-Based Certainty Factor Method. Matics. 2019 Oct 10; 11(1): 27-31.
15. Hasriani RD, Syahrizal S, Misti M. Hipertensi dengan Katarak pada Peserta Skrining Gangguan Penglihatan. HIGEIA (Journal of Public Health Research and Development). 2020 Oct 31;4(4):645-55.
16. Vaughan D, Asbury T. General ophthalmology. 17th (edtn). California: Lange Medical Publication; 2007.
17. Chin WW, Peterson RA, Brown SP. Structural equation modeling in marketing: Some practical reminders. Journal of marketing theory and practice. 2008 Sep 1; 16(4): 287-98.
18. Ilyas S. Ilmu penyakit mata. In: Yulianti SR, editor. Jakarta: Badan Penerbit Fakultas kedokteran Universitas Indonesia; 2014.
19. Gupta VB, Rajagopala M, Ravishankar B. Etiopathogenesis of cataract: an appraisal. Indian J Ophthalmol. 2014 Feb; 62(2): 103-10.
20. Nadyanti F, Himayani R, Putri GT, Yusran M. Hubungan durasi menderita diabetes melitus tipe 2 dengan kejadian katarak di RSUD DR. H. Abdul Moeloek Provinsi Lampung Tahun 2018. Essence of Scientific Medical Journal. 2019 Apr 18; 17(1): 1-4.
21. Jaffe GJ, Burton TC, Kuhn E, Prescott A, Hartz A. Progression of nonproliferative diabetic retinopathy and visual outcome after extracapsular cataract extraction and intraocular lens implantation. American journal of ophthalmology. 1992 Oct 1;114 (4):44 8-56.
22. Ehrlich RM, Kirsch S, Daneman D. Cataracts in children with diabetes mellitus. Diabetes Care. 1987 Nov 1; 10(6): 798-9.
23. Taskapili M, Gulkilik G, Ozsutcu M, Kucuksahin H. Acute bilateral dense cortical cataracts as a first manifestation of juvenile diabetes mellitus in a 12-year-old girl. Journal of Pediatric Ophthalmology & Strabismus. 2008;45(3):177-8.
24. Pollreisz A, Schmidt-Erfurth U. Diabetic cataract-pathogenesis, epidemiology and treatment. J Ophthalmol. 2010; 2010: 608751.
25. Kiziltoprak H, Tekin K, Inanc M, Goker YS. Cataract in diabetes mellitus. World J Diabetes. 2019 Mar 15; 10(3): 140-153.
26. Javadi MA, Zarei-Ghanavati S. Cataracts in diabetic patients: a review article. J Ophthalmic Vis Res. 2008 Jan; 3(1): 52-65.
27. Grzybowski A, Kanclerz P, Huerva V, Ascaso FJ, Tuuminen R. Diabetes and Phacoemulsification Cataract Surgery: Difficulties, Risks and Potential Complications. J Clin Med. 2019 May 20; 8(5): 716.
28. El Qabissi, oumaima, Libiad, Y., & Chaibi, Aicha. Evaluation of insulin injection techniques in young diabetics. Journal of Medical Research and Health Sciences, 2023; 6(4): 2513–2518.