

Association of Diabetes Mellitus II and Hypertension with Types of Cataract

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Ophthalmol Pak. - Official Journal
of College of Ophthalmology &
Allied Vision Sciences



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ABSTRACT

Purpose: The purpose of this study was to determine the association of diabetes mellitus and hypertension with types of cataract.

Methodology: After ethical approval, this cross-sectional study involved 61 patients, age between 40 to 85 years who were advised cataract surgery with phacoemulsification at Department of Ophthalmology, Fatima Memorial Hospital. Proper informed consent was obtained from participants. Those who did not give consent were excluded. The type of cataract and the presence of two systemic diseases—hypertension and diabetes mellitus II—that have been identified as risk factors for the development of cataract were investigated in the patients. Data was entered and analysed in SPSS.

Results: Out of 61 patients, who were involved in this study, there were 26 (42.6%) males and 35 (57.4%) females. In this study the most presented systemic disease was combination of both hypertension and diabetes mellitus II and most occurring type was nuclear cataract. DM II had very low incidences in all groups. There was insignificant difference and association ($p=0.784$) between cataract (All types) and system diseases (Hypertension and Diabetes Mellitus) in the age group 40-85 years.

Conclusion: There was no association of types of cataract with hypertension and diabetes mellitus type II.

Key words: Cataract, Diabetes Mellitus, Hypertension.

How to Cite this Article: Nadeem A, Najam MH, Ayoub N, Zulifqar N, Iqbal S. Association of Diabetes Mellitus II and Hypertension with Types of Cataract. *Ophthalmol Pak.* 2024;14(2):52-57.

DOI: <https://doi.org/10.62276/OphthalmolPak.13.04.145>

INTRODUCTION

Cataract stands as the primary reason for the blindness in both developed and developing world. About 50% of blindness worldwide is caused by cataracts. According to the WHO, population growth and ageing will also raise the likelihood that more people will develop vision impairment.¹ Finding the risk factors for cataracts is extremely important for public health since the prevalence of vision loss caused by lens opacities will keep increasing as the population ages.² Finding the cataract risk factors has significant public health relevance since the prevalence of vision loss from lens opacities would raise with aging.³ According to the Beaver Dam Eye Study, nuclear cataracts, cortical cataracts, and posterior sub-capsular cataracts all

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Received: 16-02-2024

Accepted: 27-02-2024

become more common as people aged.⁴ Many cataract risk factors have been clarified. The most prevalent of them are arterial hypertension (AH) and diabetic mellitus (DM), or their combined effects.⁵

Cataract surgery is the most popular ocular surgical operation among the general population.^{6,7} The results of cataract surgery might be significantly impacted by variations in the patients' preoperative co-morbidities. Up to 80% of patients may have systemic co-morbidities.⁸

Diabetes mellitus (DM) is a common and serious chronic disease and affects millions of people globally. Age, the severity of hyperglycaemia, and the length of diabetes all raise the relative risk of cataract development.⁹ According to some research, those under 65 who have diabetes are three to four times more likely to develop cataracts. Cataracts are twice as common in patients over the age of 65.¹⁰

The development of cataract in diabetes mellitus patients is linked to long-term hyperglycaemia, variations in glucose blood glucose levels and sorbitol deposition in the lens.¹¹ The lens experiences hyperosmotic change, a fluid inflow, the production of superoxide radicals and hydrogen peroxide, lens fiber degeneration, and the development of lens opacification as a result of elevated sorbitol levels and hyperglycaemia.¹²

Among the world's most prevalent diseases, hypertension is becoming more common as people gets older.¹³ Certain investigations have yielded equivocal results about the correlation between cortical cataract and hypertension.¹⁴

Arterial hypertension has been shown in a recent meta-analysis to increase the risk of cataracts, particularly the posterior sub-capsular subtype.¹⁵

The aim of study was to determine the association of diabetes mellitus and hypertension with types of cataract in patients who underwent cataract surgery. Diabetes mellitus and hypertension are the most common systemic diseases. Cataract surgery with systemic diseases carries a high risk of both intraoperative and postoperative complications. This study helped in managing any surgical and

post-surgical complications which can be caused by these untreated systemic diseases i.e.; diabetes mellitus and hypertension.

METHODOLOGY

This observational, cross-sectional study conducted at the Department of Ophthalmology, Fatima Memorial Hospital Lahore, focused on individuals aged 40 to 85 years who were advised to undergo surgery for senile cataract removal via phacoemulsification. Over a six-month period from August, 2022 to January, 2023, 61 patients were sampled using a non-probability consecutive sampling technique. Exclusion criteria included a history of glaucoma or glaucoma surgery, traumatic or secondary cataract, and ophthalmic comorbidities predisposing to cataract formation. Patient who were advised to undergo senile cataract surgery via phacoemulsification were included. A detailed history including data on demographics, ocular history and medical history was obtained from all patients. A clinical examination was done, encompassing an evaluation of visual acuity and a slit lamp examination for the purpose of assessing cataracts. After tropicamide 1% drops were used to dilate the pupils, the cataracts were graded under a slit lamp and compared to standard photos from the Lens Opacities Classification System III (LOCS III). The type of cataract was categorized according to LOCS III as nuclear, cortical, posterior sub-capsular cataract (PSC) or mixed cataract. Presence of two main pathologies Diabetes Mellitus Type II and Hypertension were recorded for each patient. Patients were only identified as possessing single or more of the aforementioned conditions when they had undergone a medical examination more than six months prior and were being treated for that particular condition. All data were recorded on self-designed questionnaire. The data was entered and analyzed using IBM-SPSS V-23. Continuous variable like age was expressed as Mean \pm SD, whereas categorical variable were expressed as frequency and percentage. Bar charts were used to display the data. Chi-Square test was used to investigate the association. Statistical significance has been characterized as a p-value of less than 0.05.

RESULTS

The study included 61 cataract patients, the mean age was 58.25 (SD=9.520) years with a range of 40 and 82 years. There were 26 (42.6%) males and 35 (57.4%) females. The male and female were found in frequency and percentages which were not far from each other.

Table -1: Frequency Distribution of Patients by Gender

	Frequency	Percent
Male	26	42.6
Female	35	57.4
Total	61	100.0

Figure -1: Frequency Distribution of Gender

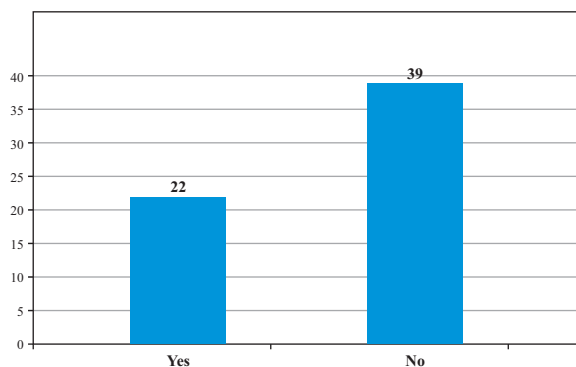
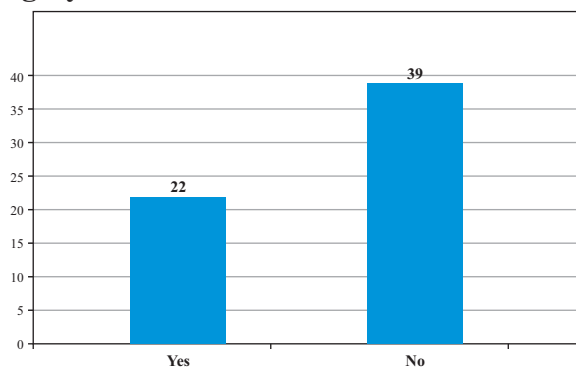


Table -2: Frequency Distribution of Patients by Previous Surgery

	Frequency	Percent
No	39	63.9
Yes	22	36.1
Total	61	100.0

Figure -2: Frequency Distribution of Previous Surgery



There were 43 (70.5%) patients who had medical history of systemic co-morbidity and 18 (29.5%) patients had no medical history. The most common co-morbidity was combination of diabetes mellitus type II and hypertension (both) in 22 (36.1%), followed by hypertension in 13 (21.3%), diabetes mellitus type II in 8 (13.1%). [Table 3 and Figure 4.3].

Table -3: Frequency Distribution of Patients by Medical History

	Frequency	Percent
Diabetes Mellitus II		13.1
Hypertension	13	21.3
None	18	29.5
Both	22	36.1
Total	61	100.0

Figure -3: Frequency Distribution of Medical History

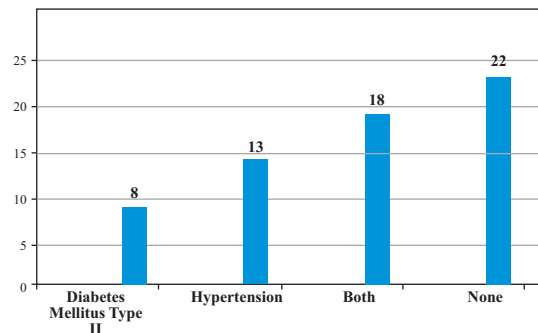
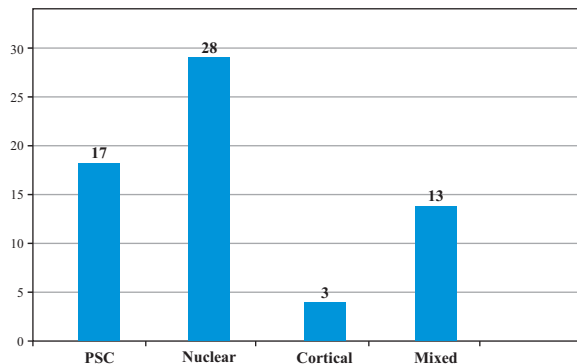


Table 4 and Figure 4.4 present the distribution of type of cataract in patients who participated in this study. Cataract types were mostly nuclear cataract in 28 (45.9%), followed by posterior subcapsular cataract in 17 (27.9%), mixed cataract in 13 (21.3%), cortical cataract in 3 (4.9%).

Table -4: Frequency Distribution of Patients by Types of Cataract

	Frequency	Percent
Posterior Subcapsular Cataract	17	27.9
Nuclear Cataract	28	45.9
Cortical Cataract	3	4.9
Mixed Cataract	13	21.3
Total	61	100.0

Figure -4: Frequency Distribution of Types of Cataract



The classification of cataract types in each gender is provided according to the respective comparisons in Table 5 and Figure 4.5. There was statistically insignificant association between gender and type of cataract.

Table -5: Type of Cataract in the Sample by Gender

		Types of Cataract					Chi-Square Value	P-value
		Posterior Subcapsular Cataract	Nuclear Cataract	Cortical Cataract	Mixed Cataract	Total		
Male	Count	6	13	1	6	26	0.711	0.871
	% within Types of Cataract	35.3%	46.4%	33.3%	46.2%	42.6%		
Female	Count	11	15	2	7	35		
	% within Types of Cataract	64.7%	53.6%	66.7%	53.8%	57.4%		
Total	Count	17	28	3	13	61		
	% within Types of Cataract	100.0%	100.0%	100.0%	100.0%	100.0%		

Figure -5: Type of Cataract in the Sample by Gender

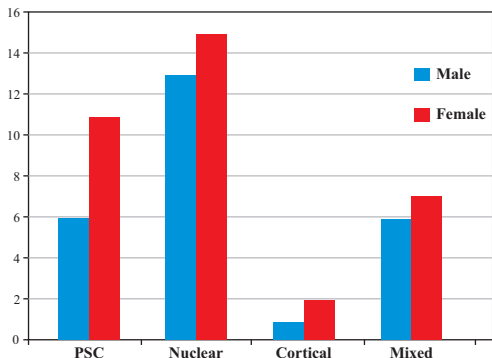
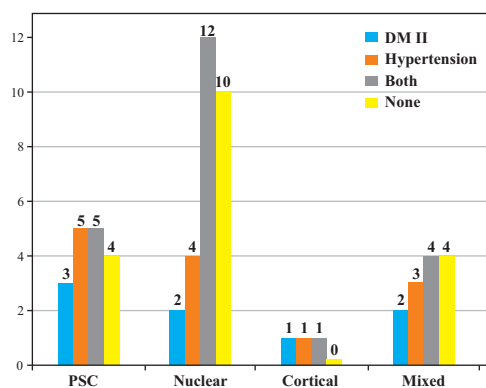


Table 6 and Figure 4.6 present the association of systemic disease by type of cataract (as the majority of patients possessed one or more risk factors).

Table -6: Frequency of Medical History per Type of Cataract.

Types of Cataract		Medical History					Chi-Square Value	P-value
		Diabetes Mellitus	Hypertension	None	Both	Total		
Posterior Subcapsular Cataract	Count	3	5	5	4	17	5.546	0.784
	% within Types of Cataract	17.6%	29.4%	23.5%	29.4%	100%		
Nuclear Cataract	Count	2	4	10	12	28		
	% within Types of Cataract	7.1%	14.3%	35.7%	42.9%	100%		
Cortical Cataract	Count	1	1	0	1	3		
	% within Types of Cataract	33.3%	33.3%	0.0%	33.3%	100%		
Mixed Cataract	Count	2	3	4	4	13		
	% within Types of Cataract	15.4%	23.1%	30.8%	30.8%	100%		
Total	Count	8	13	18	22	61		
	% within Types of Cataract	13.1%	21.3%	29.5%	36.1%	100.0%		

Figure -6: Association of Medical History per Type of Cataract



DISCUSSION

In this study 61 cataract patients included were almost of equal sexes. The frequency of patients presented only with hypertension 5(29.4%) in cases with posterior subcapsular cataract to nuclear cataract in 4(14.3%). Diabetes mellitus type II alone had very low occurrences in all groups; there was 1(1.6%) case with cortical cataract, 3(4.9%) cases with posterior subcapsular cataract, 2 (3.3%) cases with nuclear cataract and with mixed cataract. This is nevertheless not anticipated outcome, even though one could argue that the prevalence of simple diabetes mellitus could typically be lower in the general population than diabetes mellitus with accompanied arterial hypertension. The adverse effects of diabetes mellitus on the development of diabetic cataract may be made worse by hypertension. The high quantity of glucose in the aqueous humour during the initial phases of diabetes mellitus diffuses into the lens and is

transformed into advanced end products of glycation, which accumulate inside the lens and play a critical role in the development of cataracts. Patients with diabetes are more likely to develop cataracts than people without diabetes, and cataracts often progress more quickly in diabetics.

Recruitment of 6617 people both from countryside and urban places was done for the study on the frequency, contributing causes, and subtypes of cataract. Of the respondents in the urban population, 649 had cataracts, while 1094 had rural ones. The rural group had the following rates of monotype cataract prevalence: PSC (15.2%), hypermature cataract (6.3%), nuclear cataract (14.5%), and Cortical Cataract (1.6%). Furthermore, the urban group's three most prevalent monotype cataracts were nuclear cataract (15.2%), Cortical Cataract (6.1%), and PSC (5.5%). Both the rural and urban groups had a high prevalence of nuclear cataract.

Research on the association between different forms of cataracts and various metabolic disorders (hypertension, diabetes mellitus) was conducted in Greece with duration of 1 year. A cross-sectional study of 834 cataract patients over the age of 18 years included. In their research, hypertension was determined to be the main risk factor in patients with subcapsular cataracts (43.8%), nuclear cataracts (24.3%), cortical cataracts (286.6%), and mixed type cataracts (276.6%).

In a study of Yemen, Muthahar Y. Al-Shaer et al. reported that systemic hypertension (30.1%) was the most common systemic disease, followed by diabetes mellitus (13.8%) in those who were diagnosed with cataracts and were listed for cataract surgery. There is established data linking hypertension and the medications used to treat it to cataracts. Most people who get cataracts have been using either Lisinopril or atenolol to treat high hypertension.

A study carried out at the University Hospital Aleksandrovska's Ophthalmology Clinic to determine the prevalence of diabetes and AH in cataract patients. The study included 126 cataract patients, with an average age of 66.2 years (43 men and 73 women). Half of the patients with cataracts

(50%), had hypertension. DM was found to be prevalent in 19.9% of them.

The number of cataract procedures carried out nowadays has increased as a result of longer lifespans and higher life expectancies. Alongside this, there is an increase in systemic co-morbidities such as blood dyscrasias, cancer, diabetes, hypertension, stroke, and CABGs.

A large-scale epidemiological study conducted in Korea with 11,591 participants indicated that hypercholesterolemia, diabetes mellitus, Age, education level, and lower monthly family income all identified separately as risk factors for the formation of pure cortical cataracts. In this study, pure nuclear cataracts were associated with independent risk variables for diabetes, metabolic syndrome, aging, and low educational attainment. Age and diabetes mellitus were also independent risk variables for the occurrence of posterior subcapsular cataracts. The results of this study indicate that there are distinct risks associated with the emergence of mixed cataracts, including diabetes mellitus, aging, lower monthly household income, and lower levels of education. Small sample size and data collection from a single centre are major limitations of this study.

CONCLUSION

There is no association found with type of cataract with hypertension and diabetes mellitus type II.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board No. FMH-12-08-2022-IRB-1083.

Author Contributions: Aleena Nadeem: Concept, Literature Review, Data Collection.

Muhammad Hamza Najam: Data Collection, Article Draft.

Nimra Ayoub: Literature Search, Data Collection.

Nabila Zulfiqar: Data Collection and Analysis.

Sara Iqbal: Data Collection, Critical Review.

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