ORIGINAL ARTICLE

Frequency of Diabetes Mellitus in Cataract Patients Visiting Civil Hospital, Karachi

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Abstract:

Objective: To determine the prevalence of diabetes mellitus among cataract surgery patients. It aimed to explore the relationship between elevated blood sugar levels and cataract formation, assess the impact of diabetes on surgery outcomes, and recommend strategies for integrating diabetes management into ophthalmic care.

Methods: This cross-sectional study was conducted at a tertiary care hospital over period of six months, involving 163 participants aged 30 to 70 years, recruited through non-probability consecutive sampling. Patients with cataracts in one or both eyes were included, while those with secondary or congenital cataracts were excluded. Informed consent was obtained, assessments included visual acuity tests, slit lamp exams, and blood glucose measurements. Descriptive and inferential statistics were analyzed using SPSS version 22.

Results: Of the 163 patients, 54.6% were female and 45.4% male, with a mean age of 56.36 years. Bilateral cataracts were present in 65% of cases, with Nuclear Sclerosis being the most common (63.2%), followed by Posterior Subcapsular cataracts (18.4%). Blood sugar levels varied, and 14.1% had levels exceeding 200 mg/dL, indicating diabetes mellitus. While no significant correlation was found between demographics and high blood sugar, the study showed a significant link between diabetes and accelerated cataract formation.

Conclusion: The study suggests that diabetes mellitus accelerates cataract development, emphasizing the need to integrate diabetes management into ophthalmic care. Future research should focus on longitudinal studies and advanced tools like OCT for better early detection and management of diabetic eye complications. *Al-Shifa Journal of Ophthalmology 2025; 21(3): 135-140.*

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Introduction:

Cataract remains the leading global cause of blindness, with 15.2 million cases reported in 2020 among individuals aged 50 years and older[6]. Multiple studies have identified diabetes mellitus as a significant risk factor for cataract development [1, 2]. In the developed world, besides advanced age, primary risk factors for cataracts include prolonged sunlight exposure, smoking, and the use of corticosteroids[1]. Patients with diabetes mellitus exhibit a higher incidence and accelerated progression of cataracts, making cataracts the predominant cause of visual impairment in diabetic populations2. Among the various systemic diseases associated with cataract formation, diabetes mellitus is the most prevalent.

Cataracts are morphologically classified into nuclear sclerosis, polar, cortical, posterior subcapsular, and mixed types, with nuclear sclerosis being the most common[3]. However, in diabetic patients, the frequency of cortical and posterior subcapsular cataracts is significantly

higher compared to nuclear sclerosis[4]. Both the duration of diabetes and poor glycemic control are critical factors influencing the development and progression of cataracts, serving as independent predictors for cataract formation[5]. Identification of all risk factors is necessary for the treatment and prevention of blindness.

Globally, cataracts accounted for more than half of all blindness cases, according to Pakistan's National Blindness and Visual Impairment Survey 2002-03, where cataracts alone were responsible for 51.5% of blindness cases[3].

Diabetes mellitus is recognized as a higher risk factor for the formation of visually significant cataracts[7]. Diabetes mellitus is a pervasive chronic condition affecting individuals of all genders and a wide age range worldwide. The International Diabetes Federation reports that 463 million people aged 20-79 years were affected by diabetes in 2021, with projections increasing to 700 million by 20458. In Pakistan, the prevalence of diabetes mellitus type 2 was 13.7% in individuals aged 20 years and above[9], with many diabetic patients being unaware of their condition.

Individuals with diabetes mellitus are approximately 2-5 times more susceptible to developing cataracts, often at an earlier age[2]. The pathophysiology of diabetes-induced cataracts involves significant oxidative stress, as the lens and retina are particularly vulnerable due to their limited antioxidative defenses[10]. The economic and health burdens of diabetes and cataract are substantial, especially in developing countries where diabetes management is often inadequate and access to cataract surgery is limited[12]. Furthermore, diabetic patients tend to experience poorer visual outcomes following cataract surgery[11]. In India, a study found that approximately 18.77% of patients presenting to eye care centres for poor vision were diabetic[13]. Similarly, an Italian study screening patients undergoing cataract surgery identified a diabetes prevalence of 20.4% 14. Research conducted in teaching hospitals in Karachi, Pakistan, revealed that 29.4% of patients undergoing cataract surgery were diabetic[3]. Despite the well-established association between diabetes mellitus and cataract formation, there is limited data on the specific prevalence and characteristics of diabetic cataracts in the local population of Karachi. Understanding the frequency and clinical patterns of cataracts in diabetic patients at a tertiary care hospital can help improve early detection, management strategies, and surgical outcomes, addressing a critical gap in regional ophthalmic healthcare research for targeted interventions aimed at reducing cataract-related blindness, particularly in diabetic populations.

Methodology:

The cross-sectional study was conducted at the Department of Ophthalmology and Visual Sciences, Civil Hospital, Karachi, a tertiary care facility. Spanning six months, from 1st March 2024 to 30th September 2024, the research commenced following the approval of the study synopsis by the IRB, Dow University of Health Sciences. Data collection was initiated following ethical approval from the CPSP Ethical Review Committee and the Ethical Review Board of Dow University of Health Sciences, in accordance with the principles of the Declaration of Helsinki. A total of 163 participants were recruited using a non-probability consecutive sampling technique, ensuring that every eligible patient visiting the eye clinic during the study period was enrolled until the desired sample size was reached. The sample size was determined using OPEN EPI Version 3 software, based on an estimated population of one million, a diabetes mellitus prevalence of 29.4% among cataract surgery patients, a 95% confidence level, a confidence interval of ±7%, and a design effect of 1. Inclusion criteria encompassed patients aged between 25 and 80 years of both genders who presented with cataract Grade 2 or more on LOCS III cataract grading system in one or both eyes. Exclusion criteria eliminated individuals with known Hypertension and cataracts secondary to intraocular trauma, a history of radiation exposure to the head and neck, prolonged oral steroid use exceeding six months, other syndromes or eye diseases like uveitis associated with cataract development, and congenital cataracts. Data collection adhered to the Declaration of Helsinki principles, with informed written consent obtained from all eligible participants. Assessments included best-corrected visual acuity measurements for both eyes using the Snellen chart and slit lamp examinations using the standardized LOCS III cataract grading system. Grade 2 or more was conducted by the supervisor and the Principal Investigator (PI) to ensure diagnostic accuracy and minimize bias. Additionally, participants underwent random

blood glucose tests, which were provided free of charge as part of the hospital's baseline assessments, with results obtained either directly from the laboratory or from the patients themselves. The prevalence of diabetes mellitus is defined by a blood sugar level greater than 200 mg/dL. All information was meticulously recorded on standardized patient assessment forms by a PI knowledgeable about the study protocols. Participants' right to decline participation was considered, ensuring the data is only accessible to the research team and authorized analysts. For data analysis, SPSS version 22.0 was utilized to perform descriptive statistics, presenting qualitative variables such as gender and diabetes prevalence as frequencies and percentages, and calculating the mean and standard deviation for patient age. Effect modifiers such as age and gender were managed through stratification and subsequently analyzed using Chi-square tests to assess the relationships between variables, with statistical significance determined by a p-value of ≤0.05. Potential biases arising from factors such as age and gender were addressed through stratification and statistical adjustments.

Results:

This study analyzed 163 cataract patients undergoing surgery. The gender distribution revealed a higher prevalence of cataract surgery among females (54.6%) than males (45.4%). The age range of patients was 25 to 80 years, with a mean age of 56.36 years (SD = 10.92), reinforcing the age-related nature of cataracts. . Overall, 94.5% had no findings in right eye and 93.3% in left eyes with the remaining being hazy or not visible. Bilateral cataracts were most common (65%), followed by right-eye involvement (16%). Among cataract types, Nuclear Sclerosis was predominant (63.2%), followed by Posterior Subcapsular (18.4%). Random blood sugar levels varied significantly, ranging from 68 mg/dL to 461 mg/dL, and 14.1% of patients had blood sugar levels above 200 mg/dL, indicating diabetes mellitus. Chi-square tests showed no significant association between diabetes mellitus and age or gender (p = 0.898), though blood sugar levels exhibited high skewness and kurtosis, suggesting extreme variability. The findings highlight the need for early screening programs to detect cataracts and integrated diabetes management within ophthalmic settings to improve surgical outcomes. Future research should explore additional risk factors, including genetic and lifestyle influences.

Table 1: Demographic characteristics

Parameter	Frequency	Mean	Standard Deviation
Age (Years)	163	56.36	10.92
Blood Sugar Levels (mg/dL)	163	135.05	63.4

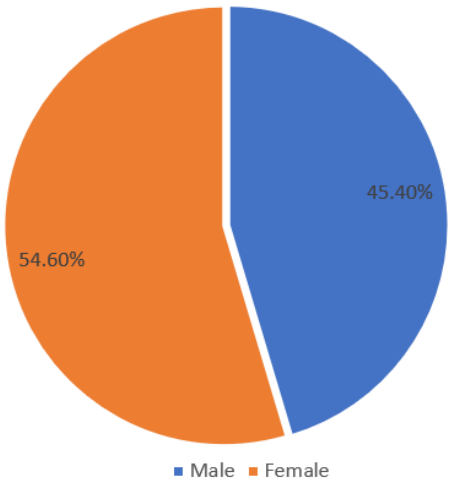

Figure 1: Gender Distribution of Cataract Patients

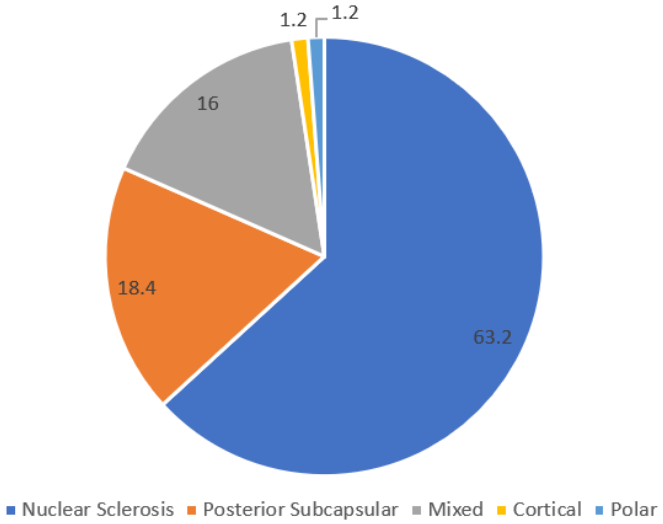

Figure 2: Distribution of Types of Cataract among patients

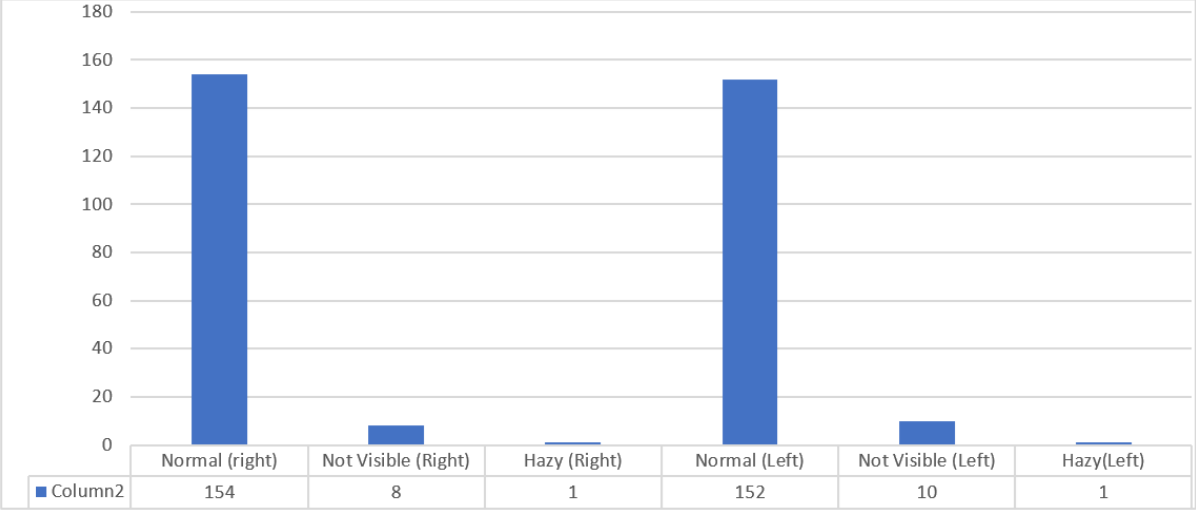

Table 3: Chi-square test of association

Variables Compared	Chi-Square Value	df	p-value	Interpretation
Age vs Diabetes	29.133	1	0.898	Not Significant
Gender vs Diabetes	0.234	1	0.629	Not Significant

Discussion:

This study explores the relationship between diabetes and cataracts, highlighting important public health and clinical aspects. Key findings show that most cataracts are bilateral, with Nuclear Sclerosis being the most common type (63.2% of cases). This aligns with the understanding that systemic conditions like diabetes contribute to cataract formation due to metabolic changes caused by chronic high blood sugar, such as oxidative stress, sorbitol accumulation, and lens protein glycation10. Elevated blood sugar levels (>200 mg/dL) were found in 14.1% of participants, further supporting the link between diabetes and cataracts.

These results align with previous studies showing diabetes as a significant risk factor for cataracts. For example, a UK-based study found a twofold higher cataract risk in people with diabetes compared to non-diabetics, especially in younger individuals[1]. Similarly, the Diabetes and Cataract (DICAT) study in Italy reported that 20.4% of cataract surgery patients had diabetes, along with a high prevalence of diabetic macular oedema[14]. However, studies from Eswatini and South India suggest regional differences, with hypertension playing a more decisive role in cataract development in those areas [12,13].

Diabetic patients tend to have poorer visual outcomes after cataract surgery compared to non-diabetics. Data from the Malaysian Cataract Surgery Registry showed that fewer diabetic patients achieved good postoperative vision (BCVA ≥6/12), likely due to complications like diabetic retinopathy, older age, and surgical issues such as posterior capsular rupture[11]. Also, a systemic review suggested that managing diabetic retinopathy before surgery is crucial for better outcomes[2].

Innovations in imaging technologies, including OCT (optical coherence tomography) and artificial intelligence, play a crucial role in overcoming these challenges. These tools significantly enable the early identification of complications such as diabetic macular oedema, facilitating timely interventions and enhancing surgical outcomes [8,14]. The use of these tools is becoming increasingly advised for diabetic patients undergoing cataract surgery.

Integrating eye care into broader healthcare systems is essential to reduce the impact of diabetes-related cataracts, particularly in resource-limited settings, as suggested by decentralized, integrated care models to improve access and outcomes [12]. Similarly, research from South India emphasized the need for comprehensive screening programs for diabetes and hypertension in eye clinics [13].

The study has several limitations. Firstly, the sample population may not adequately represent diverse demographic groups or geographic regions, which restricts the generalizability of the findings. Secondly, differences in methodologies, such as varying definitions of diabetic macular oedema or variations in surgical procedures, and lastly, the absence of modern imaging tools like OCT, may have compromised diagnostic precision.

This study contributes to the increasing quantity of research that studies the complicated link between diabetes, cataracts. The study acknowledges the need for future research to explore other potential effect modifiers, including hypertension, dyslipidemia, and lifestyle factors, to provide a more comprehensive understanding of cataract risk factors. It also reveals the scope of the disease and the need for integrating the management of strategies.

Future studies that address the identified weaknesses and longitudinal effects will help further improve our knowledge of and aid in the treatment of these interrelated diseases.

Conclusion:

This study underscores a strong link between diabetes mellitus and cataract formation, with 14.1% of 163 patients showing high blood sugar levels. Nuclear sclerosis was the most common cataract type, and bilateral cataracts were significantly more frequent in diabetics. The findings suggest a need for routine diabetes screening in ophthalmic care. Pre-surgical retinal evaluations, including OCT and AI tools, can improve outcomes in diabetic patients. With diabetes rising in Pakistan, integrated care and technology-driven screening are vital to prevent vision loss.

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