

Original Article

A Comparative Study of Cataract Occurrence and Visual Impairment in Diabetic and Non-Diabetic Individuals

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Abstract

Objective: To compare cataract occurrence and visual impairment in diabetic and non-diabetic individuals.

Study design: It was a Descriptive Hospital based study.

Place and duration of study: The study was conducted at Holy Family Hospital in Rawalpindi from from July to December 2023.

Material and Methods: 50 patients of different age groups visited the outdoor patient's department of Allied Hospitals Rawalpindi from July 2023 to Dec 2023 and were included in my study. Patients were exposed to various diagnostic procedures to confirm cataract and diabetes prevalence.

Results: Results are drawn based on selected variables i.e. gender, age, patients presenting with and without diabetes and cataract, visual impairment resulting from cataracts in both diabetic and non-diabetic patients. A sample population of 50 patients was studied in a hospital-based study. Out of 50 patients, 28 were male and 22 were female. Among them, 30 had diabetes, while 20 did not have diabetes. Before the refraction, a detailed fundus and lens examination was carried out. As a result, out of 30 diabetic patients, 23 had cataract and out of 20 non-diabetic patients, 12 had cataract. Fundus of most patients was normal. After that objective and subjective refraction was carried out to estimate visual impairment in these patients. Results were drawn on charts.

Conclusion: This hospital-based study highlights the increased prevalence of cataracts among diabetic patients and the greater severity of visual impairment associated with the condition. The results emphasize the critical need for regular eye examinations in diabetic individuals to enable early detection and intervention for cataract-related complications. These findings contribute to the growing body of evidence on the intricate relationship between diabetes, cataracts, and vision health. Future studies with larger sample sizes and extended follow-up periods are recommended. Future studies with larger sample sizes and extended follow-up periods could provide deeper insights into these relationships and support the development of more effective prevention and treatment strategies in clinical practice.

Keywords: Cataract, Diabetes, Diabetic patient, visual acuity.

1. Introduction

A cataract is a condition marked by the clouding or opacity of the eye's natural lens, located behind the iris and pupil. This clouding obstructs the flow of light to the retina, resulting in blurred or distorted vision. Over time, cataracts can worsen, leading to severe visual impairment and, if left untreated, may eventually cause blindness. As the cataract progresses, the lens opacity becomes increasingly dense.⁽¹⁾

Cataracts often develop in both eyes, though the progression may vary between them. One eye might be more affected than the other, leading to differences in vision. Various factors can elevate the risk of cataract development, such as aging, diabetes, and extended exposure to sunlight, obesity, high blood pressure,

previous eye surgeries, and extended use of corticosteroid medications. Modern treatments are available to effectively manage cataracts, helping individuals maintain clear vision and a high quality of life. As you get older or if eye conditions run in your family, it becomes increasingly important to protect your eyesight and prioritize eye health. Without treatment, cataracts can progress and may eventually result in blindness in the affected eye.⁽²⁾ Cataracts impair both near and distance vision. Diabetes mellitus is a long-term metabolic condition defined by consistently elevated blood sugar levels. It arises from insufficient insulin production, reduced effectiveness of insulin, or a combination of both.

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Insulin, a hormone secreted by the pancreas, is essential for maintaining proper blood glucose balance.⁽³⁾ When insulin is either insufficient or ineffective, glucose cannot be absorbed by cells for energy, resulting in high blood sugar levels. Diabetes is categorized into two primary types: Type 1 diabetes, typically emerging in childhood or adolescence and requiring insulin treatment, and Type 2 diabetes is more common and is frequently associated with factors like obesity, physical inactivity, and an unhealthy diet.

Diabetes symptoms can develop suddenly, particularly in Type 1 cases. In contrast, diabetes symptoms in Type 2 diabetes may progress slowly and might remain unnoticed for years. Typical symptoms include excessive thirst, frequent urination, blurred vision, fatigue, and unexpected weight loss. If left unmanaged, diabetes can lead to complications over time, including damage to blood vessels that affects the heart, eyes, kidneys, and nerves.⁽⁴⁾ Individuals with diabetes face a higher likelihood of developing severe health issues, such as heart attacks, strokes, and kidney failure. Diabetes can also lead to irreversible vision loss by damaging the eye's blood vessels. Eye conditions pose a major concern for people living with diabetes. Conditions like diabetic retinopathy, cataracts, glaucoma, and diabetic macular edema (DME) have a significant impact on their quality of life. Diabetic retinopathy, in particular, damages the retina, the light-sensitive tissue at the back of the eye, by harming its blood vessels. This can occur in individuals with both Type 1 and Type 2 diabetes patients must remain vigilant, as the risk of these complications grows with the duration of the condition.⁽⁵⁾ Early signs of diabetic retinopathy include abnormal blood vessel leakage and swelling in the retina. Regular eye check-ups with a specialist, at least annually, are essential for early detection of these issues. These exams are generally painless and include vision assessments, eye pressure measurements, and the use of dilating drops to examine the inside of the eye.

Glaucoma occurs when elevated fluid pressure within the eye damages the optic nerve, is twice as likely to occur in people with diabetes. Pregnant women with

diabetes need to take extra precautions and undergo more frequent eye evaluations. It is vital to promptly consult a doctor if you notice any changes in vision. Symptoms to monitor include difficulty seeing in dim light, blind spots, double vision or floaters, blurred vision, eye pain or headaches, and reduced peripheral vision.⁽⁶⁾ It is essential to recognize that eye diseases can advance without obvious symptoms. Although the connection between diabetes and cataracts is well recognized, the precise mechanisms linking the two conditions remain unclear. Prolonged high blood sugar levels, referred to as hyperglycemia, are thought to contribute to the onset and progression of cataracts in individuals with diabetes. Hyperglycemia promotes the production of advanced glycation end-products (AGEs) and enhances oxidative stress, which can damage the proteins in the lens and impair its clarity.⁽⁷⁾ Numerous clinical studies have demonstrated that individuals with diabetes are more prone to developing cataracts at a younger age compared to those without the condition. In diabetics under the age of 65, the risk is considerably higher, with cataract occurrence being 3 to 4 times more frequent. For those over 65, the risk of cataracts is doubled.⁽⁸⁾

In individuals with type 1 diabetes, risk factors for cataracts include age, the severity of diabetic retinopathy, and proteinuria. For those with type 2 diabetes, age and insulin use are associated with an increased risk. The Beaver Dam Eye Study, a five-year research project involving participants aged 43 and older, reported a higher incidence and progression of posterior cortical and sub capsular cataracts among people with diabetes. The study also found that elevated glycated hemoglobin levels were linked to an increased risk of nuclear and cortical cataracts. Participants with diabetes were more likely to develop cortical lens opacities and undergo cataract surgery than those without diabetes. Additionally, a longer duration of diabetes was connected to a greater prevalence of cortical cataracts and more frequent cataract surgeries.

A study by Srinivasan et al. revealed a higher cumulative incidence of cataracts in diabetics, as well as faster progression. Age is a significant risk factor for

both the development and progression of most types of cataracts, with older individuals showing a higher frequency of cataracts. Phacoemulsification is the preferred method for cataract surgery today, as it offers benefits such as reduced inflammation, minimal astigmatism, quicker vision recovery, and fewer complications compared to older techniques. Diabetic patients often have cataracts removed earlier to allow for a thorough examination of the retina before lens opacity worsens. While cataract surgery generally yields excellent outcomes, people with diabetes may experience poorer vision than those without the condition.

The development of cataracts is significantly influenced by factors such as the duration of diabetes and poor metabolic control. However, in younger individuals with diabetes, maintaining good metabolic control can potentially reverse the early stages of cataract formation. Several large-scale studies have examined cataract development in individuals with diabetes. For instance, the Wisconsin Diabetic Retinopathy Epidemiology Study reported that over a 10-year period, 8.3% of individuals with type 1 diabetes and 24.9% of those with type 2 diabetes underwent cataract surgery. Identified risk factors for cataracts in type 1 diabetes included age, the severity of diabetic retinopathy, and proteinuria, while in type 2 diabetes, age and insulin use were linked to an increased risk.

The Beaver Dam Eye Study, a five-year investigation involving participants aged 43 and older, observed a higher incidence and progression of posterior cortical and subcapsular cataracts in individuals with diabetes. It also found a correlation between elevated glycated hemoglobin levels and an increased risk of nuclear and cortical cataracts. People with diabetes were more likely to exhibit cortical lens opacities and have a history of cataract surgery compared to those without diabetes. Additionally, a study by Srinivasan et al. highlighted a greater cumulative incidence of cataracts in diabetics compared to the rate of progression. Age remains a critical risk factor for the cumulative incidence and progression of most cataract types, with older patients showing a higher frequency.

Phacoemulsification is currently the preferred technique for cataract surgery because it offers advantages such as less inflammation, less astigmatism, faster vision recovery, and lower complication rates than previous surgical methods. There is a tendency for diabetics to have cataracts removed early to allow a detailed examination of the retina before the lens opacity worsens. Cataract surgery generally produces excellent results, but people with diabetes may have poorer vision than people without diabetes.⁽¹⁰⁾ Surgery can exacerbate diabetic retinopathy, trigger rubeosis (abnormal blood vessel growth), or cause macular changes, such as macular edema or cystic macular edema. Poor surgical outcomes are more common in cases of active proliferative retinopathy or pre-existing macular edema. Individuals with diabetes, regardless of the presence of diabetic retinopathy, face a higher risk of postoperative inflammation and visually impairing macular edema due to impaired blood-water barrier function.

A study led by Khalid Mohammad Alabdul Wahhab, published in the *Journal of Epidemiology and Global Health* in 2021, investigated cataract incidence among individuals with diabetes in Saudi Arabia. This was the first study in the region to examine the impact of diabetic retinopathy and explore new factors like the age of diabetes onset alongside established risk factors. The research utilized a community-based, cross-sectional design, involving 334 randomly selected individuals with type 2 diabetes from a diabetic registry. Participants underwent thorough patient history reviews and comprehensive eye examinations at a specialized clinic. Data on BMI, blood pressure, and glycosylated hemoglobin (HbA1c) levels were also collected.

Among the 668 eyes studied, cataracts were detected in 35.5% of cases, and diabetic retinopathy was present in 32.2%. The analysis identified diabetic retinopathy, age, diabetes duration, and systolic blood pressure as independent risk factors for cataracts. However, no significant associations were found with gender, BMI, HbA1c, insulin use, or diastolic blood pressure.

Additionally, participants with cataracts were found to have a significantly later onset of diabetes. Cortical cataracts were the most common type observed, followed by posterior subcapsular cataracts (PSC), with nuclear cataracts being less prevalent.

In summary, diabetic retinopathy is a key independent risk factor for cataract formation in people with diabetes. Other contributing factors include age, duration of diabetes, and hypertension. Notably, this study identified the age of diabetes onset as a significant new factor associated with cataract development.

2. Materials & Methods

50 patients of different age groups visited the outdoor patient’s department of Allied Hospitals Rawalpindi from July 2023 to Dec 2023 and were included in my study. All the patients were referred to the refraction room of eye OPD of Holy Family Hospital Rawalpindi for a regular checkup for vision. These patients with decreased vision and cataract were samples of my study. The patients having the above-mentioned anomalies were exposed to diagnostic criteria. Data was collected using a standard questionnaire and eye examination. The questionnaire has questions about personal information, medical history, how long they have had diabetes (for people with diabetes), and vision problems-related questions. The eye examination included measuring vision, examining the lens, and looking at the back of the eye. A detailed examination was done of the patient starting with a slit lamp examination, examining the lens, and looking at the back of the eye, assessment of visual acuity, and objective and subjective refraction.

3. Results

Diabetic patients from various age groups visited the eye outpatient department (OPD), where they were first screened for cataracts. After the cataract examination, they underwent an assessment for visual impairment. This evaluation generally involves measuring the best-corrected visual acuity (BCVA) in the better-seeing eye, typically using the Snellen Eye Chart at a 20-foot distance, with auto refractors also being used. BCVA

reflects a person’s optimal distance vision with corrective lenses, such as glasses or contacts. While there is no universally accepted definition of visual impairment, different levels are categorized based on BCVA thresholds: mild impairment is defined as 20/40 to 20/63, moderate impairment as 20/80 to 20/160, and severe impairment as 20/200 or worse. These categories assist in understanding and classifying varying degrees of vision challenges.

Among the 23 diabetic cataract patients, the results showed that 3 had no visual impairment, 8 had mild visual impairment, 3 had moderate visual impairment, and 9 had severe visual impairment. In the non-diabetic cataract group, 3 had no visual impairment, 7 had mild visual impairment, and 2 had severe visual impairment.

A total of 50 patients, including both diabetic and non-diabetic cataract patients, were examined at Holy Family Hospital in Rawalpindi. Of these, 28 were male and 22 were female.

Graph 1: Diabetic patients with cataract

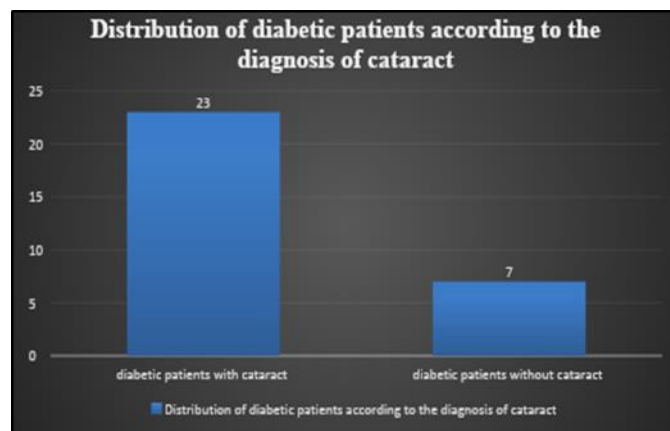


Table 1: Non-diabetic patients with cataract

Non-diabetic patients	Number	Percentage
With cataract	12	60%
Without cataract	08	40%
Total	20	100%

4. Discussion

The study provides important insights into the relationship between diabetes and cataracts, particularly their prevalence and impact on vision. It involved 50 patients, with 30 diagnosed with diabetes and 20 without, serving as the foundation for understanding how these conditions relate to cataract development and visual impairment. The gender distribution of the sample showed a slight male majority, with 28 males and 22 females, highlighting the need to consider gender differences in future research on this topic.

The findings indicate that cataracts are more common among diabetic patients, with 23 out of 30 diabetic individuals affected, compared to 12 out of 20 in the non-diabetic group. This supports existing research that links diabetes to a higher risk of cataract formation, likely due to factors like prolonged hyperglycemia. Furthermore, the severity of visual impairment in diabetic patients with cataracts is more severe. Among the diabetic group, a significant number experienced moderate (3) to severe (9) visual impairment, whereas non-diabetic patients mainly had no (3) to mild (7) visual impairment, with only 2 cases of severe impairment. This difference suggests that diabetes may intensify the effects of cataracts on vision, emphasizing the importance of regular eye screenings and timely treatment for diabetic patients.

Conclusion:

This hospital-based study highlights the increased prevalence of cataracts among diabetic patients and the greater severity of visual impairment associated with the condition. The results emphasize the critical need for regular eye examinations in diabetic individuals to enable early detection and intervention for cataract-related complications. These findings add to the existing body of evidence on the complex relationship between diabetes, cataract, and vision health. Future research, involving larger sample sizes and long-term follow-up, could offer further insights into these

associations and help develop more effective preventive and treatment strategies in clinical settings.

Conflict of interest:

Authors declared no conflict of interest.

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