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ASSOCIATION OF TYPE 2 DIABETES MELLITUS AND HYPERTENSION WITH CATARACT SUBTYPES: A CROSS-SECTIONAL STUDY

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Abstract

Purpose: *To examine whether type 2 diabetes mellitus (DM II) and hypertension are linked to particular subtypes of cataract.*

Methods: *This cross-sectional study enrolled 61 patients aged 40–85 years who had been advised to undergo phacoemulsification at the Ophthalmology Department of Lady Reading Hospital (LRH), Peshawar, between November 2025 and July 2026, after ethical approval and written informed consent. Cataract type was graded on the slit lamp, and each patient's history of DM II and hypertension was recorded. Data were analysed in SPSS using the chi-square test.*

Results: *The sample comprised 26 men (42.6%) and 35 women (57.4%). Nuclear cataract was the commonest type, and the commonest systemic condition was the coexistence of DM II and hypertension. DM II alone was uncommon in every cataract group. No statistically significant association was found between cataract type and systemic disease ($p = 0.784$).*

Conclusion: *In this sample, the type of cataract was not associated with DM II or hypertension.*

INTRODUCTION

Cataract is the leading cause of blindness worldwide, accounting for roughly half of all cases. With populations growing and ageing, the WHO expects the number of people with visual impairment to rise, so identifying modifiable risk factors for lens opacity is a public health priority [1,2]. Data from the Beaver Dam Eye Study showed that nuclear, cortical and posterior subcapsular cataracts all become more frequent with age. Among the many suggested risk factors, arterial hypertension and diabetes mellitus, alone or together, are the most widely cited [3].

Diabetes is a common chronic disease affecting millions of people. The risk of cataract increases with age, the degree of hyperglycaemia and the duration of diabetes. Some reports suggest that diabetic patients under 65 are three to four times

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as likely to develop cataract, and that the risk is about double in those over 65. Persistent high blood glucose, glucose fluctuation and the accumulation of sorbitol in the lens draw water into the lens, generate oxidative stress and damage lens fibres, eventually causing opacity [4,5].

Hypertension is also very common and becomes more so with age. Its link with cortical cataract has produced mixed findings, whereas a meta-analysis found that hypertension raises the overall risk of cataract, especially of the posterior subcapsular type [6].

Because cataract surgery is one of the most frequently performed operations, and because up to 80% of patients may carry systemic co-morbidities that influence outcomes [7], understanding these links has practical value. Untreated diabetes or hypertension can raise the risk of complications during and after surgery. This study therefore aimed to determine whether DM II and hypertension are associated with specific cataract subtypes in patients scheduled for surgery.

2. METHODOLOGY

Design and setting. An observational, cross-sectional study was carried out in the Ophthalmology Department of Lady Reading Hospital (LRH), Peshawar, over nine months (November 2025 to July 2026). Approval was obtained from the hospital's Institutional Review Board.

Participants. Sixty-one patients aged 40–85 years who had been advised phacoemulsification for senile cataract were recruited by non-probability consecutive sampling. Patients with a history of glaucoma or glaucoma surgery, traumatic or secondary cataract, or other eye conditions predisposing to cataract were excluded, as were those who declined consent.

Data collection. A self-designed questionnaire captured demographic, ocular and medical history. Visual acuity was measured and, after pupil dilation with 1% tropicamide, cataracts were graded at the slit lamp against the standard photographs of the Lens Opacities Classification System III (LOCS III) [8]. Each cataract was classed as nuclear, cortical, posterior subcapsular (PSC) or mixed. DM II and hypertension were considered present only if the patient had been medically assessed more than six months earlier and was under treatment for the condition.

Analysis. Data were analysed with IBM SPSS Statistics version 26. Age was summarised as mean ± standard deviation, and categorical variables as frequencies and percentages. Associations were tested with the chi-square test, with $p < 0.05$ regarded as significant.

3. RESULTS

Participants. The mean age of the 61 patients was 58.25 years (SD 9.52; range 40–82). Women made up 57.4% (n = 35) and men 42.6% (n = 26), so the sexes were fairly evenly represented.

Systemic disease. Forty-three patients (70.5%) had at least one systemic co-morbidity and 18 (29.5%) had none. The commonest pattern was DM II together with hypertension (22 patients, 36.1%), followed by hypertension alone (13, 21.3%) and DM II alone (8, 13.1%).

Cataract subtypes. Nuclear cataract was most frequent (28 patients, 45.9%), then PSC (17, 27.9%), mixed (13, 21.3%) and cortical (3, 4.9%).

Cataract subtype by sex. Men accounted for 6 PSC, 13 nuclear, 1 cortical and 6 mixed cases, and women for 11, 15, 2 and 7 respectively. The distribution did not differ significantly between the sexes ($\chi^2 = 0.711$, $p = 0.871$).

Cataract subtype by systemic disease. The breakdown is shown in Figure 1 and summarised below.

- **SC (n = 17):** DM II alone 3 (17.6%), hypertension alone 5 (29.4%), none 4 (23.5%), both 5 (29.4%).
- **uclear (n = 28):** DM II alone 2 (7.1%), hypertension alone 4 (14.3%), none 10 (35.7%), both 12 (42.9%).
- **ortical (n = 3):** one patient each with DM II, hypertension and both; none without disease.
- **ixed (n = 13):** DM II alone 2 (15.4%),

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hypertension alone 3 (23.1%), none 4 (30.8%), both 4 (30.8%).

Overall, no significant association emerged between cataract subtype and DM II or hypertension ($\chi^2 = 5.546$, $p = 0.784$).

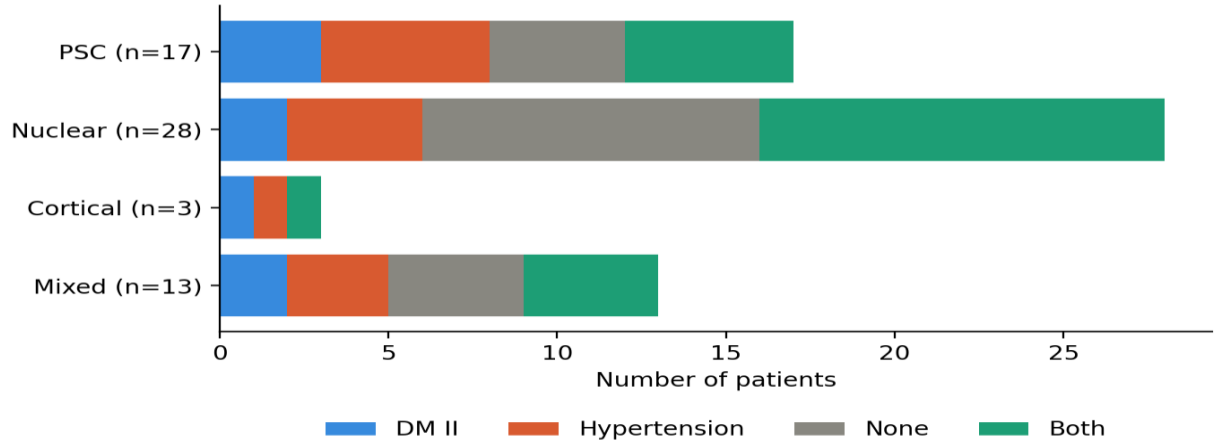


Figure 1. Number of patients with DM II, hypertension, both or neither, by cataract subtype.

4. DISCUSSION

This study found no statistically significant relationship between cataract subtype and either DM II or hypertension. Most patients (70.5%) did have at least one systemic disease, and the combination of both was the most frequent pattern, particularly among nuclear cataracts. DM II alone was rare in all cataract groups. This is not surprising, since isolated diabetes is generally less common than diabetes accompanied by hypertension, and hypertension may amplify the damaging effects of diabetes on the lens. Early in diabetes, excess glucose in the aqueous humour enters the lens and is converted into advanced glycation end-products that accumulate and promote cataract; cataracts also tend to progress faster in diabetic patients [5].

Other studies describe a stronger role for these diseases. A Greek cross-sectional study of 834 cataract patients identified hypertension as the main risk factor across subtypes [9]. In Yemen, hypertension (30.1%) and diabetes (13.8%) were the commonest systemic diseases among patients listed for cataract surgery [10], and a Bulgarian study found hypertension in half of cataract patients and diabetes in about one in five [11]. Antihypertensive drugs such as lisinopril and atenolol have also been linked to cataract. A large Korean survey of 11,591 participants found diabetes to be an independent risk factor for nuclear, posterior subcapsular and mixed cataract, with additional contributions from age, income, education, metabolic syndrome and hypercholesterolaemia, although it was limited to a single centre [12]. In a population study of 6,617 people in India, nuclear cataract was highly prevalent in both rural and urban groups [2].

The disagreement with those reports may reflect this study's small sample (61 patients), single-centre design, the very small cortical group (n = 3) and the use of surgical candidates only, which limits statistical power and generalisability. Because longer life expectancy is increasing the number of cataract operations, and with it the burden of co-morbidities such as diabetes, hypertension, stroke and cardiac disease, preoperative assessment of systemic health remains important regardless of cataract subtype [7,14].

5. CONCLUSION

Among 61 patients undergoing cataract surgery, nuclear cataract was the commonest subtype and the coexistence of DM II and hypertension the

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commonest systemic pattern, but cataract subtype was not significantly associated with either disease. Larger, multi-centre studies with controls are needed to confirm these results. Meanwhile, patients with diabetes and hypertension should be identified and optimised before surgery to reduce complications.

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