Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

Assessing Cataract Prevalence in Rural Type 2 Diabetes Patients of Chamarajanagar

Dr. Snehal Ashok Chandanshive[1], Dr. (Major) N. Maheshwara[2]

[1]Postgraduate, Department of Ophthalmology, Chamarajanagar Institute of Medical Sciences(CIMS), Chamarajanagar, Karnataka, India.
[2]Associate Professor & HOD, Department of Ophthalmology, Chamarajanagar Institute of Medical Sciences (CIMS), Chamarajanagar, Karnataka, India.

Corresponding Author
Dr. N. Maheshwara, Associate Professor & HOD, Department of Ophthalmology, Chamarajanagar Institute of Medical Sciences(CIMS), Chamarajanagar, Karnataka, India.

Received: 02-08-2024 / Revised: 11-08-2024 / Accepted: 20-09-2024

ABSTRACT

Background
Lens clouding brought on by cataracts can result in poor vision and even blindness. According to WHO data from 2023, 2.2 billion individuals worldwide suffer from vision impairment, of which 1 billion cases may be avoided. Among the main causes are refractive defects (88.4 million) and cataracts (94 million). According to ICMR data, cataracts are the primary cause of the 23 million blindness cases worldwide, including 9 million instances in India.

Objective
To study prevalence of various types of cataract in patients with type 2 Diabetes mellitus.

Methods
The cross sectional study conducted on 100 Diabetic patients who presented to Department of Ophthalmology and medicine. Chamarajanagar Institute of Medical Sciences, Chamarajanagara. Study conducted between July 2022 to June 2024. The work up of the patients was started with detailed history regarding type, duration and treatment of DM; detailed anterior segment examination by slit lamp biomicroscopy with the help of lens opacification classification system, [LOCSIII]; biochemical tests for FBS, PPBS were conducted.

Results
In this study, Total 100 patients, the prevalence of cataract is 88%. monotype cataract is more prevalent than mixed cataract; among monotype cataract, cortical cataract [69%] was more prevalent subtype than other subtypes as nuclear [5%], posterior subcapsular [7%] and mixed [19%].

Conclusion
Prevalence of cataract is more in type 2 diabetic patients in rural population.

Keywords: Type 2 diabetes mellitus; Cataract; lens opacification classification system[LOCS III]; FBS and PPBS.

INTRODUCTION

Cataracts cause lens clouding, leading to blurred vision and potential blindness. WHO data from 2023 indicates 2.2 billion people globally have vision impairment, with 1 billion cases

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

preventable. Key causes include cataracts (94 million), refractive errors (88.4 million), and others.[1] ICMR research shows a global blindness burden of 23 million, with 9 million cases in India, primarily due to cataracts.[2]

Diabetes is a major global issue, affecting 537 million adults (1 in 10) as per the IDF Diabetes Atlas 2021. Additionally, 541 million adults have impaired glucose tolerance, heightening their risk for type 2 diabetes.[3] ICMR guidelines from 2019 indicate a 66% cataract prevalence among diabetic patients in India.[4] It is contributing to significant economic burdens in developing countries.[5]

Diabetes and cataracts are linked through uncontrolled hyperglycemia, which accelerates cataract onset.[6] Key mechanisms include lens protein glycation, oxidative stress, and the polyol pathway.[7] Factors such as prolonged diabetes, advanced age at diagnosis, microvascular changes, diuretic use, and poor blood sugar control heighten cataract risk in diabetics compared to non-diabetics.

Understanding the link between diabetes and cataracts in India's rural population—65% of the country (PIB 2021)—is crucial.[8] Strategies can lower economic impact.[9]

AIM & OBJECTIVE

Aim of the study was to Implementing targeted strategies to prevent and delay these diseases can alleviate economic burdens and enhance the healthcare system. And objective was to study prevalence of cataract and it's subtypes among type 2 Diabetes Mellitus patients.

MATERIALS & METHODS

A Cross sectional study was conducted on 100 diabetic patients from August 2022- August 2023, in the department of Ophthalmology and Medicine of Chamarajanagar Institute of Medical Sciences, Chamarajanagar to investigate prevalence of cataract in type 2 Diabetes mellitus.

Inclusion Criteria

- The Type 2 diabetic patients of aged 35 -70 years
- The patients who are willing to give consent for the study
- The Type 2 diabetic patients who will come to department t of Ophthalmology and Medicine.

Exclusion Criteria

- type 1diabetic patients
- Hazy media or corneal opacity which can interfere in anterior segment examination
- any other systemic diseases other than DM which causes cataract
- hypertensive patients
- patients on drugs which causes cataract

Method of collection of data

The study involved 100 diabetic patients at Chamarajanagar Institute of Medical Sciences, with informed consent obtained in their local language and ethical committee approval.

Initial patient assessment included demographic data (name, age, sex, occupation, addiction) and detailed ocular history, focusing on previous surgeries, symptoms like blurred vision, light intolerance, colored halos, and black spots, as well as blood sugar monitoring frequency. Visual acuity was measured using Snellen charts.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

Examinations included general and systemic assessments, and detailed ophthalmic evaluations with a slit lamp to classify cataract types using the Lens Opacification Classification System (LOCSIII). For patients with bilateral cataracts, the eye with the higher grade cataract was chosen for study inclusion. Fundus examinations followed pupil dilation with tropicamide and phenylephrine, and biochemical tests, including fasting and postprandial blood sugar levels, were conducted.

SAMPLE SIZE ESTIMATION

Based on the previous study conducted by Farhat Fatima[2], prevalence was 65%.

$$n = \frac{Z^2PQ}{d^2}$$

n = sample size
Z = Standard score corresponding to 95% confidence interval
P = prevalence
d = proportion of the sampling error absolute allowable - 10%
so, P = 0.65
Q = 0.35
d = 0.1
Formula:

$$N = \frac{1.96 \times 1.96 \times 0.65 \times 0.35}{0.1 \times 0.1}$$

N = 87.39

Drop Out Rate -10%
Total sample size = N + 10 % of N
= 87.39 + 8.7
= 96.09
TOTAL SAMPLE SIZE= 96, Approximately, we will take 100.

RESULTS

The following findings were observed in our study regarding the prevalence of cataract among type 2 diabetes, conducted in Chamarajanagar Institute of Medical Sciences. Totally 100 such patients were included in the study and the result being analysed as follows.

1. **Age distribution**

Sl. No	Age Group (in years)	No of Patients (N=100)
1	≤ 40	4
2	41 – 50	26
3	51 – 60	28
4	61 – 70	32
5	≥ 70	10

Table 1: Age distribution of the study participants (N=100)

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

Out of the 100 patients studied 4 patients belonged to <40 years, 26 belonged to 41-50 years, 28 belonged to the age group 51-60 years, 32 belonged to 61-70 years and 10 were from the age group more than 70 years from which it is evident that as the age increases, the incidence of Type 2 diabetes also increases.

2. Sex distribution

Sl. No	Gender	No of Patients (N=100)
1	Male	45
2	Female	55
Table 2: Sex Distribution of the study participants (N=100)		

Out of 100 patients, 55% patients are female and 45% patients are males indicating females are most commonly affected.

3. Prevalence of cataract

Sl. No	Cataract	No of patients (n=100)
1	Present	88
2	Absent	12
Table 3: prevalence of cataract of the study participants (N=100)		

Out of 100 type 2 diabetic patients, prevalence of cataract was found to be 88%. Among 100 diabetic patients, 88 were found to be having cataract

4. Types of cataract

Sl. No	Types of cataract	No of patients (n=88)	Percentage (%)
1	Cortical	61	69%
2	Nuclear	4	5%
3	Posterior subcapsular	6	7%
4	Mixed	17	19%
Table 4: Types of cataract among study participants (N=88)			

Among 100 diabetic patients, 88 were found to be having cataract. Among 88 patients, 69% had cortical cataract, 19% had mixed type of cataract, 7% were having PSC cataract and only 5% had nuclear type of cataract.

5. FBS levels

Sl. No	FBS level	No of patients (n=100)
1	Controlled (<130 mg/dl)	29
2	Uncontrolled (>130 mg/dl)	71
Table 5: FBS Levels of diabetic participants (n=100)		

Among 100 diabetic patients, 29% had controlled diabetes with FBS < 130 mg/dl and rest were having uncontrolled diabetes levels of >130 mg/dl

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

6. PPBS levels

Sl. No	PPBS level	No of patients (n=100)
1	Controlled (<180 mg/dl)	15
2	Uncontrolled (≥180 mg/dl)	85

Table 6: PPBS levels of the study participants (n=100)

Among 100 diabetic patients, 15% had controlled diabetes with PPBS <180 mg/dl and rest were having uncontrolled diabetes with PPBS levels of ≥180 mg/dl.

7. Diminution of vision

Sl. No	Diminution of vision	No of patients (n=100)
1	Yes	94
2	No	6

Table 7: Diminution of vision of study participants

Among 100 diabetic patients, majority presented with diminution of vision (94%) and rest with no diminution of vision (06%).

8. Diminution of vision in day

Sl. No	DOV in day	No of patients (n=100)
1	YES	88
2	NO	12

Table 8: Diminution of vision in day among study participants

Majority of study participants presented diminution of vision in day (88%)

9. Bright light intolerance

Sl. No	Bright light intolerance	No of patients (n=100)
1	Yes	88
2	No	12

Table 9: bright light intolerance among study participants (n=100)

Among 100 diabetic patients, intolerance to bright light was seen among majority of the study participants i.e., 88%.

10. Normal light as coloured

Sl. No	Normal light as coloured	No of patients (n=100)
1	Yes	88
2	No	12

Table 10: Perception of normal light as coloured among study participants (n=100)

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

Perception of normal light as coloured among study participants was seen in 88%. Bright light intolerance and perceive normal light as colored light is important early indicator for early diagnosis of cataract in diabetic patient.

11. Black spots

Sl. No	Black spots	No of patients (n=100)
1	Yes	88
2	No	12

Table 11: Perception of black spots among study participants (n=100)

Among 100 diabetic patients, Perception of black spots was seen among majority of the study participants i.e., 88%.

In our study of 100 type 2 diabetes patients, we found that 88% had cataracts, with a higher prevalence among females (55%) and those aged 51-70 years (60%). Monotype cataracts are more prevalent than mixed cataracts. Within monotype cataracts, cortical cataracts was the most common subtype, comprising 69% of cases, compared to nuclear cataracts (5%), posterior subcapsular cataracts (7%), and mixed cataracts (19%). Most patients had uncontrolled fasting (71%) and postprandial blood sugar levels (85%). Vision issues were prevalent, with 94% reporting diminished vision, 88% experiencing daytime vision problems, intolerance to bright light, and altered perception of normal light as colored, and 88% also seeing black spots. The duration of diabetes played a role, with 77% of patients having diabetes for less than 10 years. Symptoms such as bright light intolerance and altered light perception were also significant indicators for early detection of cataract in diabetic patients. Regular eye examinations and effective diabetes management are crucial in mitigating cataract development and related complications.

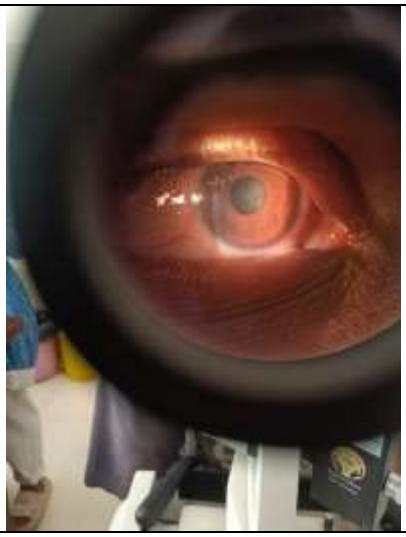

Fig 11: Cortical Immature cataract

Fig 11: Near mature cataract

DISCUSSION

Cataract surgery in diabetic patients can lead to complications like macular edema and worsening diabetic retinopathy, making preoperative evaluations crucial.There are several

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 10, 2024

studies shown the hypothesis that increased accumulation of sorbitol creates hyperosmotic effect this as a biochemical changes in the lens of diabetic patient results in hydration of lens increased osmotic stress in the lens.(10)

If we take age into consideration, summer singh et al, did study on prevalence and risk factors for cataract in diabetic patient in rural and urban area, increasing age and HbA1C are came significant in rural and age, lower socioeconomic status in urban. Inclusion criteria for age was 60 yrs and above which was significant risk factor for cataract in diabetes in rural and urban population.(11)

In healthy eye, patient can regain excellent vision and correct ametropia. But in diabetic eye, cataract surgery contribute to enhance stress on the eye and lead to postoperative complications like macular edema, limited vision, progression in diabetic retinopathy.(12)

If we take treatment of diabetes into consideration, farhat Fatima et al, concluded that oral hypoglycemic agents was one of the risk factor for cataractogenesis in diabetic patients.(13)

Managing hyperglycemia before and after surgery is essential for optimal recovery. Patients often experience transient Diabetes mellitus (DM) significantly increases the risk of cataract development due to biochemical changes in the lens, primarily from sorbitol accumulation, leading to lens hydration and osmotic stress. Our study found an 88% prevalence of cataracts among the rural diabetic population, highlighting the urgent need for regular blood sugar monitoring, which many neglect.

Cataract prevalence in diabetic patients varies, with studies reporting rates from 44% to over 65%. Key risk factors include age, uncontrolled blood sugar levels, and the duration of diabetes. In our research, age over 50 and unstable fasting and postprandial blood sugar levels were identified as significant risk factors.

While some literature suggests a link between oral hypoglycemic agents and cataract formation, our findings did not show such an association, likely due to effective blood sugar control among most participantschanges in refractive error due to fluctuations in lens hydration, which complicates the surgical process. Moreover, pre-existing conditions such as proliferative diabetic retinopathy (PDR) need careful management to minimize postoperative risks.

In summary, maintaining stable blood sugar levels and proactive eye care are vital strategies to reduce cataract incidence and improve surgical outcomes in diabetic patients. Enhanced awareness and education regarding blood sugar monitoring can significantly impact overall eye health in this population.

CONCLUSION

- The multifaceted relationship between diabetes mellitus and cataract development was significant, and found higher prevalence of cataract in type 2 DM patients in rural area.
- In individuals with diabetes, monotype cataracts are observed more frequently than mixed cataracts. Within monotype cataracts, cortical cataracts are the predominant subtype
- Intolerance to bright light and alterations in light perception served as early indicators of cataract formation in diabetic patients.
- Increased age and poor glycemic control were identified as pivotal risk factors, with implications for both the onset and progression of cataracts.

- We substantiated that Biochemical processes involving aldose reductase and sorbitol accumulation contribute to cataractogenesis through lens osmotic stress because of uncontrolled blood sugar levels in diabetic patients.
- Additionally, Effective management of diabetes, including strict glycemic control gained significance to prevent early cataract development and crucial for improving surgical outcomes and minimizing risks; macular oedema and progression of diabetic retinopathy after Cataract surgery in diabetic patients. Thus, a comprehensive approach addressing these multifactorial influences is essential for optimal patient care and outcome.

BIBLIOGRAPHY

1. World Health Organization. Blindness and vision impairment [Internet]. World Health Organization. 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment
2. OPHTHALMIC RESEARCH IN ICMR [Internet]. [cited 2024 Jul 22]. Available from: https://main.icmr.nic.in/sites/default/files/reports/oph_icmr.pdf
3. International Diabetes Federation. Diabetes around the World in 2021 [Internet]. IDF Diabetes Atlas. 2022. Available from: https://diabetesatlas.org/
4. Gilbert C, Gordon I, Mukherjee C, Govindhari V. Guidelines for the prevention and management of diabetic retinopathy and diabetic eye disease in India: A synopsis. Indian Journal of Ophthalmology. 2020;68(13):63.https://phfi.org/wp-content/uploads/2019/09/2019-Guidelines-for-the-Prevention-and-Management-of-Diabetic-Retinopathy.pdf
5. cataract among adults (40 years and above) in rural jammu, india [Internet]. www.bookswagon.com. [cited 2024 Jul 22]. Available from: https://www.bookswagon.com/book/cataract-among-adults-40-years/9783659442261
6. Pék A. Relationship between diabetes mellitus and cataract in Hungary. International Journal of Ophthalmology. 2020 May 18;13(5):788–93.
7. Javadi MA, Zarei-Ghanavati S. Cataracts in diabetic patients: a review article. Journal of Ophthalmic & Vision Research [Internet]. 2008 Jan 1;3(1):52–65. Available from: https://pubmed.ncbi.nlm.nih.gov/23479523/
8. ECONOMIC SURVEY HIGHLIGHTS THRUST ON RURAL DEVELOPMENT [Internet].pib.gov.in. Available from:https://pib.gov.in/PressReleasePage.aspx?PRID=1894901
9. Kiziltoprak H, Tekin K, Inanc M, Goker YS. Cataract in diabetes mellitus. World Journal of Diabetes [Internet]. 2019 Mar 15;10(3):140–53. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6422859/
10. Pollreisz A, Schmidt-Erfurth U. Diabetic Cataract—Pathogenesis, Epidemiology and Treatment. Journal of Ophthalmology. 2010;2010:1–8.
11. Singh S, Pardhan S, Kulothungan V, Swaminathan G, Ravichandran JS, Ganesan S, et al. The prevalence and risk factors for cataract in rural and urban India. Indian Journal of Ophthalmology [Internet]. 2019 Apr 1;67(4):477–83. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6446631/
12. http://fyra.io. Cataract Surgery in Diabetic Patients [Internet]. Retina Today. Available from:https://retinatoday.com/articles/2010-july-aug/cataract-surgery-in-diabetic-patients.

13. Fathima F, B R, P KS. Prevalence and Risk Factors For Cataract In Type 2 Diabetes Mellitus. RGUHS Journal of Medical Sciences [Internet]. 2016 ;6(4). Available from: https://journalgrid.com/view/article/rjms/1008.