Early Onset of Senile Cataract among Type II Diabetes Mellitus

Ragni Kumari[1], Kavindra Pratap Singh[2], Salai Dhavamathi Janarthananan[3], Aanchal Anant Awasthi[4], Mrinal Ranjan Srivastava[5]*, Pragati Garg[6] and Rajiv Janardhanan[7]

[1]*Assistant Professor, Department of Optometry, Era University, Lucknow, India*

[2]*Lecturer, Department of Radio Imaging, Era University, Lucknow, India*

[3]*Assistant Professor, Manipal Academy of Higher Education, Mangalore, Karnataka, India*

[4]*Assistant Professor, Institute of Public Health, Amity University, Noida, India*

[5]*Assistant Professor, Department of Community Medicine, Dumka Medical College, Dumka, India*

[6]*Professor and Head, Department of Ophthalmology, Era Lucknow Medical College and Hospital, Era University, Lucknow, India*

[7]*Professor and Head, Institute of Public Health, Amity University, Noida, India*

*Corresponding Author: Mrinal Ranjan Srivastava, Assistant Professor, Department of Community Medicine, Dumka Medical College, Dumka, India.

Abstract

Background: Worldwide, cataracts remain the leading cause of blindness, affecting approximately 18 million people. Study shown that cataracts occur in young age and 2 - 5 times more frequently in patients with diabetes, thus the visual loss has a significant impact on the working population. With going through literature, it has been confirmed that cataracts are the most common cause of visual impairment in older-onset diabetic patients and the rate of cataract surgery is correspondingly high. This study aims to analyze the onset cataract in patients with or without diabetes.

Methods: A comparative cross-sectional study was carried out in health camp organized by department of optometry Era University, Lucknow between 2017 and 2018. Within the context of this survey, 1066 eligible patients at least 30 years were randomly selected for interview. Demographic data including age and gender were obtained from all participants. Eligible subject referred to Rural Health Center of Era Lucknow Medical College for ophthalmic examination.

Results: There were 1066 individuals included in the study. 5.1% in the age group 35 - 40 and 100% in 41 - 50 age group diabetics were having cataract but in the same age group, there was not a single healthy person diagnosed with cataract. The risk of cataract increased with increasing diabetes duration ≥ 5 years vs. diabetes < 2 years.

Conclusion: As per the study, the early onset of cataracts in diabetes compared to nondiabetic. The risk of cataract associated with diabetes is highest at younger ages. Patients with diabetes are at an increased risk for cataracts.

Keywords: Cataract; Vision; Diabetes; Hypertension; Onset; Sugar

Introduction

Diabetes may be a chronic disease that happens, either, when the pancreas doesn't produce adequate insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar. So many studies have been done to estimate the prevalence of Diabetes, in India, in the past few decades. In India, the number of individuals with Diabetes increased from 26.0 million to 65.0 million in 2016 [1]. The prevalence of Diabetes in India increased from 5.5% to 8.7% in 2016 (WHO). The prevalence of Diabetes in Uttar Pradesh is 8.03% and it was higher in females than male [2]. The prevalence of diabetics has been rising more rapidly in middle- and low-income countries. The major complication of diabetes blindness, kidney failure, heart attacks, stroke, and lower limb amputation. Increasing population, aging, urbanization, sedentary lifestyles and increasing prevalence of obesity are increasing the number of people with diabetes mellitus. The

universal prevalence of diabetes was estimated to be 2.8% in 2000 and is expected to reach 4.4% by 2030. The total number of people having diabetes mellitus worldwide is projected to rise from 171 million in 2000 to 366 million in 2030 [3]. Internationally, cataracts remain the leading cause of blindness, affecting approximately 18 million people [4]. Cataracts occur at an earlier age and 2 - 5 times more frequently in patients with diabetes, thus the visual loss has a significant impact on the working population [4,5]. Epidemiologic studies have demonstrated that cataracts are the most frequent cause of visual impairment in older-onset diabetic patients [6,7] and the rate of cataract surgery is correspondingly high. It has also been suggested that rapid glycemic control can irreversibly increase lens opacities [8]. Cataracts are among the most basic complications of diabetes mellitus. Even impaired fasting glucose (IFG), a pre-diabetic condition, has been considered as a risk factor for the event of cortical cataracts [9]. Schafer., *et al.* [10] reported a better percentage of cortical opacities in diabetics as documented by Scheimpflug photography and densitometry can analysis. An unusual sort of lens opacity, true diabetic cataract or snowflake cataract consists of widespread bilateral subcapsular lens opacities of abrupt onset and acute progression, typically in young people with uncontrolled diabetes mellitus. This is rare and maybe the initial presentation of diabetes [11]. In north India, there was not a sufficient study that correlates the cataract formation with systemic illness. This study will help future researchers to find out the correlation of cataract formation among patients with systemic illness.

Methods

A comparative cross-sectional study was carried out in health camp organized by Department of Optometry, Era University, in rural area of Lucknow between 2017 and 2018. The aim of this study was to determine the correlation between the onset of cataract in type II diabetes. Within the context of this survey, 1066 eligible patients at least 30 years were randomly selected for interview. Demographic data including age and gender were obtained from all participants. Eligible subject referred to Rural Health Center of Era Lucknow Medical College for ophthalmic examination that included visual acuity (VA), best corrected visual acuity (BCVA), relative afferent pupillary defect (RAPD), slitlamp biomicroscopy, tonometry and dilated funduscopy was mandatory. The data collected were analyzed using SPSS program with SPSS version 23 with P < 0.05.

The detail information about history of diabetes from these cases were obtained by interview technique on a pre-designed questionnaire, which contained questions such as age, sex, education socioeconomic status, duration of cataract and Diabetes. All the questions were asked in the local language.

Results
Demographic profile

1066 participants were included in present study. Of those 47.9% were female and 52.1% were male. People were aged between 30 and 95 years (Figure 1). Among all groups irrespective to diabetic and non-diabetic the male subjects were either farmer or house worker and factory worker. Female workers were maximum housewife. Among 1066 majority participants (46.8%) belong from lower class socioeconomic status (Table 1). The majority participant was illiterate (46.8%) followed by primary (31.2%), intermediate (11.4%), graduation (9.3%) and high school (1.3%) (Table 2).
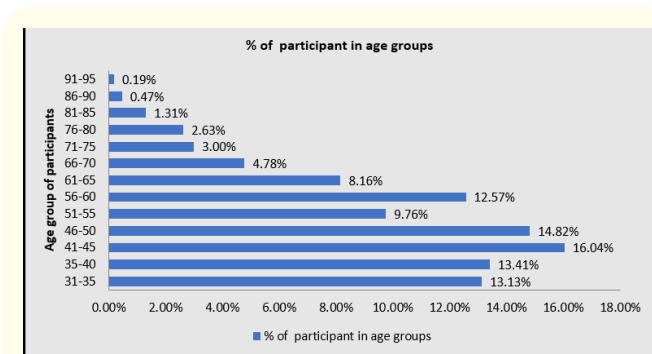
Figure 1: Age distribution.

Socioeconomic status		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lower Class	499	46.8	46.8	46.8
	Middle class	339	31.8	31.8	78.6
	Upper Class	228	21.4	21.4	100.0
	Total	1066	100.0	100.0	

Table 1: Socioeconomic status.

Level of Education		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Graduation	99	9.3	9.3	9.3
	High School	14	1.3	1.3	10.6
	Illiterate	499	46.8	46.8	57.4
	Intermediate	121	11.4	11.4	68.8
	Primary	333	31.2	31.2	100.0
	Total	1066	100.0	100.0	

Table 2: Level of education.

Case profile

Out of all of participant 34.4% were healthy. Majority participant were suffering from diabetic mellitus (DM) (52.6%), followed by obesity (5%), diabetics and hypertension both (4.1%) and hypertension (3.9%) (Table 3). Apart from healthy person the maximum duration of systemic illness were 10 years (31.7%) followed by 5 years (10.8%), 4 years (9.8%), 3 years (5.7%) and 2 years (3.6%) (Table 4). Individual who were enroll in current study were having different kind of ocular diseases, but significant diagnosis was cataract. Cataract were may or may not associated with other ocular co morbidities. 6.7% (71) were having only cataract and 63% (672) having myopia, presbyopia and cataract together. Rest of person either ametropic or emmetropic and some of them having ocular inflammation (Table 5).

Duration of having Systemic illness		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10	338	31.7	31.7	31.7
	2	38	3.6	3.6	35.3
	3	61	5.7	5.7	41.0
	4	105	9.8	9.8	50.8
	5	115	10.8	10.8	61.6
	Not Applicable (Healthy)	392	38.4	38.4	100
	Total	1066	100.0	100.0	

Table 4: Duration of having systemic illness.

Apart from non-cataract person (28.2%) maximum age of cataract were 5 years (22.9%) followed by 3 years (16.9%), 2 years (10.1%), 4 years (9.7%) and 1 years (7.9%). Only 3.8% (40) patients were not aware about exact period of cataract (duration of diminished vision) (Table 6).

The prevalence of cortical cataract was more in present location (65.3%) and 5.4% were nuclear followed by 1% of traumatic (Table 7).

History of systemic illness	Frequency	Percent	Valid Percent	Cumulative Percent
Obesity	53	5.0	5.0	5.0
DM	561	52.6	52.6	57.6
DM, HT	44	4.1	4.1	61.7
Healthy	392	34.3	34.3	96
HT	42	3.9	3.9	100
Total	1066	100.0	100.0	

Table 3: History of systemic illness.

	Ocular Diagnosis	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Allergy	2	.2	.2	.2
	Amblyopia	2	.2	.2	.4
	Astigmatism	1	.1	.1	.5
	Blepharitis	10	.9	.9	1.4
	Blepharitis, cataract	1	.1	.1	1.5
	Cataract	71	6.7	6.7	8.2
	Emmetropia	63	5.9	5.9	14.1
	Emmetropia, cataract	2	.2	.2	14.3
	Esophoria	46	4.3	4.3	18.6
	Esophoria, cataract	1	.1	.1	18.7
	Glaucoma	2	.2	.2	18.9
	Hypermetropia	25	2.3	2.3	21.2
	Hypermetropia, cataract	2	.2	.2	21.4
	Low vision	5	.5	.5	21.9
	Meibomitis	3	.3	.3	22.1
	Myopia	64	6.0	6.0	28.1
	Myopia, cataract	2	.2	.2	28.3
	Myopia, presbyopia	6	.6	.6	28.9
	Myopia, presbyopia, cataract	672	63.0	63.0	91.9
	Presbyopia	72	6.8	6.8	98.7
	Presbyopia, cataract	14	1.3	1.3	100.0
	Total	1066	100.0	100.0	

Table 5: Ocular diagnosis.

Duration of Cataract history (yrs)		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	84	7.9	7.9	7.9
	10	6	.6	.6	8.4
	2	108	10.1	10.1	18.6
	3	180	16.9	16.9	35.5
	4	103	9.7	9.7	45.1
	5	244	22.9	22.9	68.0
	Do not know	40	3.8	3.8	71.8
	Non-Cataract person	301	28.2	28.2	100.0
	Total	1066	100.0	100.0	

Table 6: Duration of cataract history (yrs).

Types of cataract		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cortical	696	65.3	65.3	65.3
	Non cataract	301	28.2	28.2	93.5
	Nuclear	58	5.4	5.4	99.0
	Traumatic	11	1.0	1.0	100.0
	Total	1066	100.0	100.0	

Table 7: Types of cataract.

Case analysis

Out of 1066 individuals in 31 - 35 years and 90 - 95 years age groups 99.3% and 100% participants were healthy (Figure 2). There were strong association between cataract and health status with age group in diabetics and hypertensive patients (Figure 3). 19.7% and 18.5% cataract were in 41 - 45 years and 46 - 50 years age group. This association is significant with age groups and p value were < 0.05 (p 0.000) (Figure 4).

Figure 2: Percentage of health status in age groups.
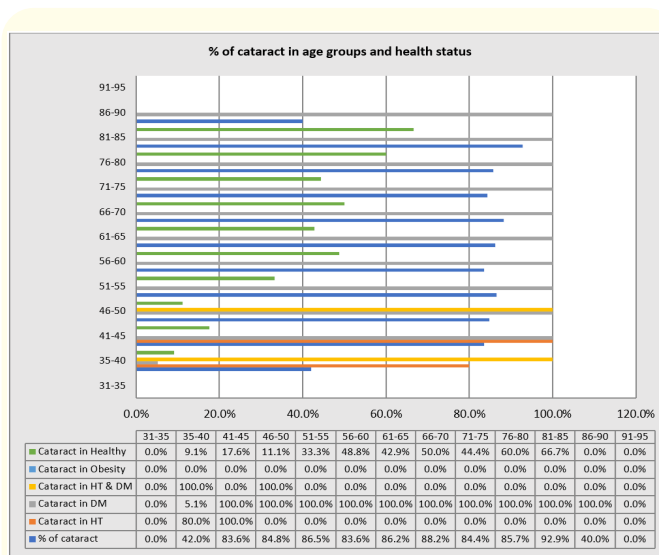
Figure 3: Percentage of cataract in age groups and health status.

Discussion

TThis cross-sectional study provides evidence for an increased risk of cataract diagnosis in patients with diabetes compared to a diabetes-free. This study, however, used data collected at an eye screening camp. The current study was carried out in the geographical area of Lucknow district, Uttar Pradesh. The utmost participant reported in the study were 40-50 years aged group.

Figure 4: Total no of cataract.

The participant of the current study belong to lower socioeconomic background and percentage of the illiterate population were higher in the study. The individual who participated in the study were having complaints of blurring of distance and near vision also. The present study sample presumably encompassed only individuals with type 2 diabetes. The study observed increased rates of cataract within the subgroup of diabetic patients. Furthermore, the study found a statistically significant positive trend for the association between diabetes duration and risk of cataract. Present data are in line with findings from previous studies reporting that cataract development occurs more frequently at an earlier age in diabetes patients compared to diabetes-free controls. Cataracts are among the earliest complications of DM. The present study supported Klein *et al*. [6] study that demonstrated, patients with DM are 2–5times more likely to develop cataracts than their non-diabetic counterparts; this risk may reach 15-25 times in diabetics less than 40 years of age [12]. The present study also in line with Saxena., *et al.* [13] that found a 2-fold higher incidence of cortical cataracts in subjects with DM over 5 years. In their study, posterior subcapsular cataracts were more frequent in diabetic patients and therefore the result was almost like the present study. Though impaired fasting glucose (IFG), a pre-diabetic condition, has been considered as a risk factor for the development of cortical cataracts. Janghorbani and Amini [13] in Iran evaluated 3,888 types 2 diabetic patients who were freed from cataracts at the initial visit and reported a rate of cataract formation of 33.1 per 1000 person-years of observation after a mean follow-up of three-six years. The molecular mechanism involved within the development of diabetic cataracts is non-enzymatic glycation of lens proteins, oxidative stress, and activated polyol pathway.

The present study has numerous strengths. The data source may be a well-established primary care database of top quality and completeness. The knowledge on drug exposure and diagnoses was recorded prospectively and independent of a study hypothesis, thereby recall bias couldn't have influenced present results.

The present study has several limitations. Because cataract is escalating slowly throughout your time, the date of the initial recording of cataract or cataract surgery, i.e., the index date, doesn't equal the actual cataract onset. Therefore, assessing the link of cataract with previous exposure to diabetes medication or with diabetes duration up to the index date remains somewhat random. Additionally, diabetic patients receive regular eye checks from the hospital eye service whereas, within the general population, detection of early cataracts with no impact on the vision might not necessarily be fed back to the general practitioner by the optometrist if mild and not requiring intervention. Thus, there could also be a small 'over-reporting' within the diabetes group compared to the overall population who aren't having regular eye checks. Additionally, the authors didn't perform a case validation on cataract diagnosis cases for this study. To extend the likelihood of studying true diabetes patients, authors only included diabetic patients who received medical treatment within a predefined timeframe round the diabetes diagnosis.

Conclusion

As per the study, the early onset of cataracts in diabetes compared to non-diabetes. The risk of cataract associated with diabetes is highest at younger ages. Patients with diabetes are at an increased risk for cataracts.

Conflict of Interest

None.

Funding

None.

Author Contributions:

Conception and design: Ragni Kumari, Dhavamathi Janarthanan

Data collection: Ragni Kumari

Analysis and interpretation: Aanchal Anant Awasthi

Clinical Correlation: Dr Kavindra Pratap Singh

Final Review: Dr. Mrinal Ranjan Srivastava, Dr. Pragati Garg, Dr. Rajiv Janardhanan

Key Points

- The results of this study demonstrate a trend in increased development of cataract in younger population suffering from diabetes.
- It indicates that practitioner need to screen rural population.
- It is public health problem to having non communicating diseases but less awareness about management.

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