

Presenile cataract and its risk factors: A case control study

Gopal K. Das¹, Krutika Boriwal¹, Pragti Chhabra¹, Pramod K. Sahu¹,
Sabitabh Kumar¹, Nitish Kumar¹

¹UCMS and Guru Teg Bahadur Hospital, Dilshad Garden, New Delhi, India

ABSTRACT

Purpose: Early onset opacification of the lens (cataract) has been observed to be on the rise globally. This study was conducted to determine the various types of presenile cataract and to determine the probable risk factors associated with the occurrence of presenile cataract. **Materials and Methods:** Patients in the age group of 18–40 years attending the Out-Patient Clinic of the Ophthalmology Department who were found to have presenile cataract were recruited as cases. An equal number of consecutive patients of the same age group were included in the control group. Those who gave consent to participate in the study were interviewed through a preformed questionnaire and underwent a complete ocular examination and set of blood investigations. The type of cataract was noted, data obtained were compiled, and examination and investigations done were documented and analyzed using frequency distribution and Chi-squared test. **Results:** In total, 90 cases and 90 controls that fulfilled the inclusion criteria were recruited. Most common type of cataract was found to be posterior subcapsular cataract. Presenile cataract was observed to be significantly associated with tobacco intake ($P = 0.035$), hypercholesterolemia ($P = 0.002$), fuel exposure ($P = 0.004$), and lower socioeconomic status ($P = <0.001$). **Conclusions:** Tobacco chewing, hypercholesterolemia, and excessive fuel exposure are risk factors for early development of cataract.

Keywords: Fuel exposure, hypercholesterolemia, posterior subcapsular cataract, presenile cataract, tobacco

Introduction

Cataract is the clouding of the lens in the eye leading to decrease in vision. Cataract is primarily a disease of older age groups. Age-related senile cataract is the commonest eye disorder causing visual impairment and preventable blindness worldwide, accounting for nearly 48% of all blindness.^[1,2]

The prevalence of cataract is higher in females than males in the developed and developing countries.^[3,4] In developing countries, cataract occurs at an earlier age.^[5,6] Population-based studies have reported high prevalence rates of cataract in India^[7-9] compared with western populations. Environmental, nutritional, and genetic factors may be important explanatory factors of these

high rates, but till date, there is limited information on these in the Indian setting.^[10]

Presenile cataract is defined as the opacification of lens and/or its capsule before the age of 40 years when all other known causes of cataract have been ruled out. This will definitely add on to the already existing burden of age-related cataract in India and worldwide. Some of the landmark studies have clearly established several factors contributing to both age related as well as presenile cataract formation.^[5,7,10-16]

The Beaver Dam Study^[11] in Wisconsin concluded significant association of cigarette smoking with cataract. A population-based cohort study in Australia identified the association of cigarette smoking and dietary deficiencies in vitamins and proteins with cataract.^[12,13] Brown^[14] observed the relationship between

Address for correspondence: Dr. Krutika Boriwal,
H. No. 105 Block E1 Sector-11, Faridabad, Haryana - 121 006, India.
E-mail: krutikaboriwal@gmail.com

Received: 31-03-2019 **Revised:** 31-03-2019 **Accepted:** 22-04-2019

Access this article online

Quick Response Code:



Website:
www.jfmipc.com

DOI:
10.4103/jfmipc.jfmipc_267_19

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How to cite this article: Das GK, Boriwal K, Chhabra P, Sahu PK, Kumar S, Kumar N. Presenile cataract and its risk factors: A case control study. *J Family Med Prim Care* 2019;8:2120-3.

vitamin D deficiency and posterior subcapsular cataract. Rahman^[15] observed that risk factors like diabetes mellitus, high myopia, occupational exposure to metal work, atopic dermatitis, and smoking were responsible for presenile cataract. In another study,^[16] risk factors like steroid use, alcohol use, cigarette smoking, and exposure to sunlight were identified.

This study is a case control study conducted to identify the risk factors attributable to the occurrence of cataract in patients in the age group of 18–40 years and also to determine the types of cataracts in these individuals in this part of India. Identification and early detection of these risk factors in the younger population will allow health care professional to formulate a preventive strategy to decrease the already existing burden of age-related cataract in the society.

Materials and Methods

The study was conducted in the Ophthalmology Outpatient Department (OPD) of a tertiary hospital of East Delhi catering to patients from Delhi and adjoining states. Institutional ethical clearance was obtained before conducting the study and the study conformed to the declaration of Helsinki. Cases were defined as patients in the age group of 18–40 years having visual symptoms due to cataract and/or diagnosed as having cataract based on slit lamp examination. Controls were defined as patients in the same age group attending the OPD for other ocular complaints. The next patient after the case coming to the OPD and meeting the inclusion criteria was included as control. All the patients attending the ophthalmology clinic and who met with the definition of presenile cataract and who gave consent to participate in the study were included. Patients who had congenital, developmental, traumatic, drug induced, and complicated cataracts were excluded from the study. The cases and controls were interviewed using a questionnaire to record the information about occupation, sociodemographic profile, amount of fuel exposure per day, smoking, use of smokeless tobacco, alcohol use, dietary pattern, any systemic disorders, long-term drug therapy, ocular trauma, and hair dye use. Following this, weight and height were recorded to calculate the body mass index (BMI) and then complete ocular examination was done to look for any evidence of intraocular inflammatory conditions that predispose the individual to cataract formation like chronic uveitis. The eye having cataract was documented and the type of cataract was categorized as nuclear, intumescent, cortical, posterior subcapsular, and posterior polar cataract based on the morphological appearance of the lenticular opacity.

The data were tabulated using Microsoft Excel software (version 2010). Statistical analysis was done using SPSS (Statistical Package for the Social Sciences, IBM Corporation) software. As this was an exploratory study and no previous data were available, it was decided to include as many patients for the study as possible. During our study period of 18 months, we could find 90 patients with presenile cataract, so 90 each of cases and controls were included. Crude odds ratio was calculated for all

possible risk factors for presenile cataract by bivariate analysis using the Chi-squared test. The continuous variables were analyzed using the student *t*-test.

Results

The study included 90 cases and 90 controls that fulfilled the inclusion criteria. Among these, 78 were males (35 cases, 43 controls) and 102 were females (55 cases, 47 controls) [Table 1]. The mean age of the cases was 35.09 ± 5.78 years and that of controls was 30.41 ± 6.81 years. The odds of cataract was five times more in persons of age 34–40 years as compared to 18–25 years ($P < 0.001$) [Table 1]. Out of the 90 cases, 51 had unilateral cataract and 39 had bilateral involvement. The most common type of cataract was posterior subcapsular cataract (38.9%). The majority of cases belonged to the lower middle socioeconomic status as compared to the controls, majority of which were from upper socioeconomic group. The odds of cataract were highest in those belonging to the lower middle socioeconomic class. This difference was statistically significant between the two groups ($P = <0.001$) [Table 1].

Use of tobacco was found to be associated with early cataract formation ($P = 0.035$), those with tobacco use were 2.2 times more likely to have cataract. Although smoking was higher in cases it did not show any significant association [Table 2]. In this study, we observed that odds of cataract were eight times more with 2 and more hours of outdoor and/or indoor fuel exposure per day in comparison to less than 30 min ($P = 0.004$) [Table 2].

Hypercholesterolemia was defined as total cholesterol >200 mg/dl. 92.2% cases and 74.4% controls had hypercholesterolemia and this difference was statistically significant ($P = 0.002$) [Table 2]. The difference in mean serum vitamin D was not significant and severe deficiency was observed in both cases and controls [Table 2].

Table 1: Sociodemographic details of the participants

Category gender	Cases	Controls	P	Odds ratio
Male (n=78)	35 (38.9%)	43 (47.8%)	0.292	
Female (n=102)	55 (61.1%)	47 (52.2%)		
Age group (years)				
18-25 (n=34)	9 (10%)	25 (27.8%)		1
26-33 (n=50)	18 (20%)	32 (35.6%)	<0.001	1.5
34-40 (n=96)	63 (70%)	33 (36.7%)		5.3
Socioeconomic status				
Upper (n=54)	7 (7.8%)	47 (52.2%)		1
Upper middle (n=28)	15 (16.7%)	13 (14.4%)	<0.001	7.75
Lower middle (n=59)	45 (50%)	14 (15.6%)		21.58
Upper lower (n=39)	23 (25.6%)	16 (17.8%)		9.65
BMI (kg/m ²)				
Underweight (<18.5)	3 (3.3%)	0		1
Normal (18.5-22.9)	55 (61.1%)	58 (64.4%)		0.79
Overweight (23-24.9)	19 (21.1%)	24 (26.7%)	0.183	1.62
Obese (>25)	13 (14.4%)	8 (8.9%)		1.28

Table 2: Comparison of various risk factors in cases and controls

	Cases (n=90)	Controls (n=90)	P	Odds ratio (95%CI)
Smoking	24 (26.7%)	14 (15.6%)	0.099	1.97 (0.95-4.13)
Tobacco intake	19 (21.1%)	8 (8.9%)	0.035*	2.24 (1.13-6.65)
Alcohol intake	7 (7.8%)	12 (13.3%)	0.332	0.55 (0.21-1.46)
Anemia	62 (68.9%)	52 (57.8%)	0.164	1.61 (0.88-3.0)
Dyslipidemia (total cholesterol >200 mg/dl)	83 (92.2%)	67 (74.4%)	0.002*	4.07 (1.65-10.06)
Dyslipidemia (HDL <35 mg/dl)	69 (76.7%)	78 (86.7%)	0.122	0.50 (0.23-1.1)
Dyslipidaemia (Triglycerides >150 mg/dl)	38 (42.2%)	46 (51.1%)	0.296	0.70 (0.39-1.26)
Fuel exposure/day				
30 min	3 (3.3%)	15 (17%)		1
1 h	18 (20%)	25 (28.4%)		3.6
2 h	36 (40%)	28 (31.8%)	0.004	6.42
>2 h	33 (36.7%)	20 (25%)		8.25
Serum vitamin D (Mean value in ng/ml)	11.68±6.02	11.93±7.56	1.000	

*P<0.05

Discussion

Presenile cataract is becoming a common occurrence leading to cataract surgery at an earlier age. Some cases may result from trauma, metabolic, chromosomal, endocrine, and systemic disorders; yet a sizeable percentage is of unknown cause. In this study, we aimed to explore this disease cause relationship by studying an association between presence of presenile cataract with multiple epidemiological, social, and personal agents. Various authors have attributed different factors in the possible causation of presenile cataract. These included occupation, social factors like fuel and smoke exposure, personal factors like tobacco and alcohol intake, vitamin D levels, hypertriglyceridemia, etc.

To our knowledge, this is the first case control study conducted in North India to report an association between various risk factors and presenile cataract. Vasudevan^[16] had conducted a prospective observational study in South India to analyze the causes and types of presenile cataract.

The most common type of cataract observed in this study was posterior subcapsular cataract, which is in congruity with the study conducted by Vasudevan.^[16] This could be because posterior subcapsular cataract causes early impairment of vision, significant enough to hamper daily activities of an individual, which prompts them to report to the ophthalmologist early.

Female preponderance was observed in this study for presenile cataract, whereas male preponderance was reported by Chen *et al.*^[17] [Table 1]. This higher prevalence of cataract in women may be related to gender-based differences in socioeconomic factors like low level of literacy, low income, behavioral factors like poor health seeking behavior, indoor cooking, exposure to smoke from cooking fuels, and/or to biological factor such as hormonal influences possibly due to some effect of estrogen and progesterone.

Cases mainly belonged to lower middle socioeconomic status, in contrast to the controls, majority of whom belonged to upper socioeconomic class [Table 1]. These associations could be related

to poor health seeking behaviors, poor compliance, less finances to seek medical help, and overall poor general health status in low social income groups.

Earlier studies have reported that use of tobacco is harmful to the eye as it contains toxic substance cyanide that leads to early cataract development.^[18] Tobacco intake was observed as one of the risk factors for presenile cataract in this study [Table 2].

It was observed that participants with 2 or more than 2 h of fuel exposure per day had preponderance for cataract formation with higher prevalence among women [Table 2]. Pokhrel *et al.*^[5] confirmed that the risk of cataract is increased by indoor exposure to smoke from solid cooking fuel combustion and poor kitchen ventilation. Prolonged exposure to this smoke (particularly in ill-ventilated spaces) could serve as an additional and cumulative source of oxidative damage to the eye.

Dyslipidemia has been associated with an increased risk of cataract formation. Hiller *et al.*^[19] have focused on the contribution of dietary fat and serum lipids to risk of developing cataract. Scientific research on lens has confirmed a cytotoxic effect of these and other unsaturated, cis-configured fatty acids on lens epithelial cells leading to cataractogenesis. Similar findings were observed in this study also.

This study has few limitations. First, it was conducted on a small sample. Second, because of the inability to fully adjust for various confounders, the risk factors for early cataractogenesis may be attributed to other unmeasured confounders. Third, the data collection was based on recall basis; there may be a potential for recall bias that might have affected the results.

As tobacco use, hypercholesterolemia, and fuel exposure were associated with presenile cataract, lifestyle modifications at personal level such as refraining from use of tobacco, lowering cholesterol, and prevention of fuel exposure may help us in delaying/preventing the early onset of cataract. A better standard of living as well as access to cleaner fuels may play a major role in delaying the onset of age-related cataract.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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