Ophthalmology

Research

PREVALENCE AND RISK FACTORS OF AGE-RELATED CATARACT AMONG SIXTY-PLUS POPULATION IN A COASTAL VILLAGE IN SOUTH INDIA

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Received : 04/10/2022
Received in revised form : 05/11/2022
Accepted : 16/11/2022

Keywords:
Prevalence of cataract, risk factors, sociodemographic factors, facilitating factors.

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DOI: 10.47009/jamp.2022.4.5.88

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2022; 4 (5); 427-431

Abstract

Background: The present study was carried out to estimate the prevalence and risk factors associated to cataract among people above 60 years in a rural Panchayat in Kerala. Design- Community(field)-based, cross-sectional study. **Materials and Methods:** A total of 340 subjects of 60 years and above included using multi stage cluster sampling. Participants were interviewed with pre-tested questionnaire to collect information on demographics, prevalence of cataract. Using appropriate bivariate and multivariate methods and gender analysis of the determinants of cataract was done. **Result:** Prevalence of cataract blindness was 47.4 percent, (women 57 percent, and men 36.8 percent). The most important risk factors significantly associated with cataract were found to be age (OR 0.3 (CI 0.20- 0.50) and hypertension, OR-1.9 (CI 1.2 - 3.0)). The cataract burden was higher (twice) for women (p value 0.016) compared to men. Those aged 75+ were 3 times at higher risk compared to 60-74 years (p value 0.0001). The illiterate have higher risk (p value 0.005) Prevalence of cataract surgery in persons operated in one or other eye was 59.6 percent (women 58.7 percent, men 62.9 percent). There was association between sex and most of the socio-economic and access related factors. **Conclusion:** Gender disparities and poorer access to services in rural areas are still a challenge. We found high rates of un-operated cataract in older people in south India. Women had higher rates of cataract, which was not explained by differential access to surgery.

INTRODUCTION

Cataract is opacity or clouding of the crystalline lens which prevents light rays from reaching the retina. Cataract is the main cause (47.8%) of low vision and blindness globally and seen among 17.7 million of the blind population. Most cataracts (85%) are senile or age-related with uncertain aetiology, and are the causes of blindness curable by surgery. Most of those living with blindness due to cataracts are in the developing world.[1,2,3]

The study aims to estimate the prevalence of cataracts and to assess the risk factors associated with it among the 60 and above population in a rural setting in Kerala. The age group is selected for the following reasons. First, they are more likely to be available at their home during the field survey, compared to those below 60 years. Second, cataract is more prevalent in them. Third, they are likely to be suffering from low vision, loneliness, and age-related morbidities and the low vision adds to their suffering. The identification of cataracts, advising, and helping them to get cataract surgery would promote more independence and self-reliance in their daily chores. An increase in life expectancy and the consequent higher occurrence of cataracts also leads to an increasing prevalence of cataracts among populations all over the World.

World Health Organisation (WHO) in 2022 reported that among the one billion cases of vision impairment, 94 million are due to cataracts excluding refractory errors, especially among elderly people.[4,5] Most of the people with blindness due to cataracts live in developing countries.[2,3] India is the first country to launch a National Program for the control of blindness and devised Rapid Assessment of Blindness and Cataract Surgical Services (RABCSS).[6] According to International Classification of Diseases 11 (2018) blindness is redefined as (vision <3/60). In India, Mohan M reported 80% blindness is caused by cataracts.[3] Sumeer Singh et al also conveyed that limited number field based studies in India regarding the occurrence of cataract in people over 60 years. Vashist et al reported 53% in South India.[7] The

ISSN (O): 2687-5365; ISSN (P): 2753-6556

prevalence of blindness is observed to be 1.34 times higher in females compared to males.[8,9,10] Kerala state-reported blindness to be 78% of the population 50 years and above. The age-adjusted prevalence of cataracts in India is three times that of the US with 82% of Indians 75 to 85 years old having visually significant cataracts or aphakia compared to 46% of the same group in the US.

No effective means of preventing cataracts and few articles are available on risk factors for cataracts from Kerala. The only cost-effective intervention available is cataract surgery and it reduces the major burden of blindness. The State of Kerala has the highest life expectancy at birth among Indian states and longevity is comparable to many developed countries. The proportion of the elderly population in the state is 12.5%.[11] Coverage of cataract surgery is expected to be high because of the increase in healthcare access, increased women's literacy, and more private-sector participation.[12] The higher prevalence of diabetes and hypertension are also known risk factors for cataracts present in the state.[13,14] Knowing the risk factors, their strength of association and if modifiable could help prevent the disease severity and loss of vision by appropriate intervention including surgery. This information can help in the strategies and policies regarding the intervention (surgery).

MATERIALS AND METHODS

A cross-sectional survey was conducted in a coastal village in central Kerala. The study population is subjects with age 60 and above in 17 wards of the Panchayat. Those who are unable to respond due to physical disability were excluded. We assumed a prevalence of 18% and a confidence interval of 95%, precision to be 20%. The sample size was taken as 340 accounting for the design effect. Random cluster sampling is used to select samples. Two clusters from each of the 17 wards make a total of 34 clusters. 3 random day blocks of Junior Public Health Nurses were selected in each ward in case of any difficulty for any of the clusters selected. From each day block, 10 persons aged 60 and above were examined. The tool used for data collection is a proforma containing demographic data, socioeconomic status, risk factors, and eye examination details. Detection of cataracts was done by using a pen torch and confirmed by an Ophthalmologist.

The variables are defined including operational definitions.

Cataract
Cloudiness or loss of clarity in the crystalline lens of the eye (RACSS, WHO prevention of blindness and deafness, Geneva)

A Household
A single person living isolated, or a collection of individuals (not essentially related) living under the same roof with a shared kitchen with either a common living room or sitting room, or a minimum of one meal a day (2001 NHFS-3)

Normal lens: spotlessly clear lens

Cataract
A pupil that looks grey or white when observed with oblique light by a pen torch in a covered or dark room associated with some level of vision loss or occurrence of aphakia or pseudo-aphakia in one or both eyes.

Aphakia (Absent Lens)
Absence of lens from the central pupil or after an evident history of cataract extraction, or displacement of a lens with a history of trauma.

Pseudophakic:
(Aphakia + history of cataract extraction with IOL)
Other risk factors as self-reported or verifying the treatment records at home

Data Validation Process
The age-sex distribution shows that most of those were women (72.1%). We examined the sampling frame in terms of dropouts to the study and found that 19 men had not participated in the study. If these men were included, the proportion of men in the study would have been 32.2%, which still falls short of 44.8% which represents the proportion of men aged 60 and above in the rural district according to the 2001 Census. This could be a result of a deficit of elderly men in the Panchayat or selection bias in the survey due to most men being out of their homes during day time.

A camp was conducted at the PHC and nearly a quarter of the study population attended the camp and so more than10% of the samples were validated by an Ophthalmologist

Expected outcomes: Estimation of the prevalence of cataracts and. The factors related to the development of cataracts.

Ethical considerations: Ethical clearance was obtained from Institutional Ethics Committee. Written informed consent was obtained from all participants of the study.

RESULTS

A sample survey including 340 people aged 60 and above was completed in a coastal village in Ernakulam district. The demographic and socio-economic characteristics were noted.

The age-sex distribution shows that 72.1% were women, 50.3% were Hindus, 6% were Muslims and the remaining were Christians. 80% of subjects belonged to the backward class and only 5% were Scheduled caste. Among the survey subjects, only 48% were living with their spouse and others were single, widowed, or separated. 44% did not have any children living with them.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The summary of the process of recruitment of participants

No. of wards	No. of clusters	Houses visited	No. of day blocks	No. eligible to participate	No. willing to participate	No. examined	No. missed
17	34	282	34	359	340	340	19*

Table 1: Distribution of sample population aged 60 and above by prevalence of cataract and socio-economic and demographic characteristics

Characteristics		Cataract present n(%)	Cataract absent n(%)	Total	Chi-square	**OR	#CI/p value
Sex	Female	126 (57.4%)	119 (42.6%)	245	5.842	1.815	1.116-2.952 /0.016
	Male	35 (36.8%)	60 (63.2%)	95			
Age group	60-64	21 (23.1%)	70 (76.9%)	91	39.520	0.290	0.178 - 0.471 / 0.0001
	65-69	32 (47.1%)	36 (52.9%)	68			
	70-74	36 (48.0%)	39 (52.0%)	75			
	>75	72 (67.9%)	34 (32.1%)	106			
Level of Education	No schooling	25 (67.6%)	12 (32.4%)	37	10.726	1.886	1.134 – 3.139 /0.005
	Primary	106 (48.4%)	113 (51.6%)	219			
	> High school	30 (35.7%)	54 (64.3%)	84			
Previous occupation	White collar	26 (38.2%)	42 (61.8%)	68	7.120	0.0628	0.365 – 1.082 /0.068
	Agriculture	22 (51.2%)	21 (48.8%)	43			
	Blue collar	66 (55.9%)	52 (44.1%)	118			
	No work	47 (47.0%)	64 (53.0%)	111			
SLI*	Low	21 (51.2%)	20 (48.8%)	41	1.943	1.296	0.811 - 2.071
	Middle	121 (48.6%)	128 (51.4%)	249			
	High	18 (38.3%)	29 (61.7%)	47			

*3 people were not able to furnish information on SLI. CI: 95% confidence interval. **OR Odds ratio, # CI: 95%confidence interval.

Table 2: Percentage distribution of sample population aged 60 and above by prevalence of cataract and specific risk factors.

Risk factor		Cataract present	Cataract absent	Total	Chi-square	OR	CI	P value
Exposure to sunlight	Yes	93 (48.7%)	98 (51.3%)	191	0.313	0.437	0.239 – 0.800	0.576
	No	68 (45.6%)	81 (54.4)	149				
Smoking	Yes	18 (31.0%)	40 (69.0)	58	7.470	0.437	0.239 – 0.800	0.006
	No	143 (50.7%)	139 (49.3%)	282				
Alcohol consumption	Yes	21 (35.0%)	39 (65.0%)	60	4.460	0.538	0.302 – 0.0.962	0.035
	No	140 (50.0%)	140(50.0%)	280				
Vitamin intake	Yes	12 (37.5%)	20(62.5%)	32	1.376	0.640	0.303 – 1.355	0.241
	No	149 (48.4%)	159 (51.6%)	308				
Hypertension	Yes	87 (56.1%)	68 (43.9%)	155	8.801	0.919	1.245 - 2.958	0.003
	No	74 (40.0%)	111 (60.0%)	185				
Diabetes mellitus	Yes	34 (47.9%)	37 (52.1%)	71	0.010	1.027	0.609 – 1.734	0.919
	No	127(42.7%)	142(57.3%)	269				
Asthma	Yes	25(62.5%)	15(37.5%)	40	4.096	1.998	1.013 – 3.941	0.043
	No	136 (45.5%)	164 (64.5%)	300				
Ischemic heart disease	Yes	21 (46.7%)	24 (53.3%)	45	0.010	0.969	0.517 – 1.816	0.921
	No	140 (47.5%)	155 (52.5%)	295				
Diarrhea	Yes	35 (62.5%)	21 (37.5%)	56	6.170	2.090	1.159 - 3.768	0.013
	No	126 (44.4%)	158 (55.6%)	284				

OR: Odds ratio, CI: 95% confidence interval

Only men were found to smoke and drink alcohol

Table 3. Multivariate analysis of the dependent variables of cataract prevalence with the identified predictor variables

Sl. No	Predictor variables	Binary odds (CI)	Multivariate odds (CI)
1	Sex (male)	1.8 (1.1 – 2.9)	1.7 (1.0 – 2.0)
2	Age group (>75)	0.3 (0.2 – 0.5)	0.3 (0.2 – 0.5)
3	Education (>8th class)	1.9 (1.1 – 3.1)	1.2 (0.7 – 2.1)
4	Hypertension (normal)	1.9 (1.2 – 3.0)	1.7 (1.1 – 2.7)
5	Asthma (nonasthmatics)	2.0 (1.0 - 4.0)	1.7 (0.8 – 3.6)
6.	Diarrhoea (no h/o diarrhea)	2.1 (1.2 – 3.8)	1.8 (1.0 – 3.4)

Multivariate analysis of predictors of cataract prevalence

To find the combined effect of all the predictor variables of cataracts, the variables seen to be significantly associated in bivariate analysis were included in the multivariate model to get the specific odds of getting cataracts. As the dependent variables are binary, we used binary logistic regression for this purpose. The predictor variables were age, sex,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

education, hypertension, asthma, and the occurrence of diarrhoea that needed hospitalization.

The model, which included the above variables had the goodness of fit indicated as an acceptable fit by Hosmer Lemeshow test statistics (Chi-square = 14. 598, df =8, p-value = 0.067 with the percentage of values accurately predicted by the model being66.1%. Barring education, the odds for the selected variables to be included in the multivariate analysis remained more or the same. There may be a strong association between education and other variables included in the multivariate analysis.

Age and hypertension were strongly associated with cataracts [OR =1.9 CI (1.9 – 3.0)]. People less than 75 years have only a one-third chance of developing cataracts than people above 75 years [OR = 0.3 (CI 0.2 – 0.5)]. Those having hypertension were 1.7 times at risk of developing cataracts than normal (without hypertension)

DISCUSSION

Cataract remains the single largest cause of blindness, low vision, and one-eye blindness in India with 46.7% of a representative sample of the population in the country above the age of 59 suffering from cataract on examination.[6,13] This study examined the risk factors and prevalence of cataracts among the 60 and above population in a coastal village in Central Kerala. A total of 340 subjects were examined using a pen torch to detect the status of the lens. The total number of persons detected with cataracts was 161 out of 340 examined. [Table 1] The prevalence of cataracts in the study area was estimated to be 47.4% which is like the prevalence detected in the Rapid Assessment of Avoidable blindness in India (RAABI study).[6]

The total number of eyes with cataracts was 309. The eyes with unilateral cataracts in the sample were 115 and the persons with bilateral cataracts were 97. The prevalence of cataracts is 57.4% in women and 36.8% in men. Further analysis was done to establish the association of age, previous occupation, and education with cataracts by gender

Cataract was more common in women (42.4%) compared to men (26.6%) in less than 75 years. The prevalence was almost double (72%) that of men (36.8%)in women above 75 years. [Table 1] The association was very strong in women in both age groups (p-value = 0.0001, OR = 0.286, CI = 0.159 – 0.515) but less strong in men (p-value = 0.003, OR = 0.261, CI = 0.106 – 0.645), though both had significant risk associated for cataract. Women bear two-thirds of the global burden of blindness. The same pattern is observed elsewhere in South India and globally also.[4,14,15] This was true even among non-white collar jobs, though statistically not significant. Cataract was also more prevalent in people living with low socioeconomic status. Other studies also have reported a higher prevalence of cataracts in them.[12,16] The present study also found a lower proportion of cataracts being operated on among the same group.[14,15,16,17] Illiterate people (10.9%) hada higher percentage of cataracts (67.6%) compared to more educated (Highschool and above,35.7%), almost twice that of literates. Similar patterns were also observed in other parts of India.[18] Hypertension, Diabetes mellitus, and ischemic heart disease (IHD) [Table 2].

Hypertension (OR 1.3, 95% CI: 1.1 – 1.6) and diabetes (OR 1.9, 95% CI: 1.4 – 2.6) were associated with cataracts as per the Arvind comprehensive study. The present study showed a strong association between cataracts with hypertension as seen in several South Indian studies also.[18] However, we did not find the expected association between cataracts and diabetes mellitus in this study. 20.9% of the study population reported as diabetic. 97% of them are taking regular treatment for the control of diabetes. 45.6% of diabetics also reported as hypertensive, among whom cataract was 43.9%. 46 out of 340 participants (13.5%) reported both diabetes and hypertension. Regular and meticulous control of diabetes would have reduced the risk of these diabetic subjects. Different studies quoted up to a 12-fold increase in the risk of cataracts in various populations among diabetic subjects. Two case-control studies in Oxfordshire showed a risk for cataracts in diabetic males as (OR 3.2; 3.4) and for females, it was (OR 10.5, 6.0) respectively. The multivariate analysis supported the bivariate analysis findings in diabetes. [Table 3] 13.2% of study subjects also had IHD. 21.8% had a history of cataracts in the family and 6 of them had injured their eye in the past. The prevalence of cataracts who had a family history of cataracts was 47.9%.

Diarrhea

The risk of developing cataracts and diarrhoea requiring hospitalization is significantly associated with developing cataracts (OR 2.09, 95% CI 1.16 – 3.77). A study in Orissa indicated a higher odds ratio of 3 for cataracts among those with severe diarrhea among the younger population in the age group 30-59.

Smoking and Alcohol Consumption

In the present study, both smoking and drinking were found to have a protective effect. The prevalence of cataracts was higher among non-smokers who were consuming alcohol, a rather unexpected finding on the protective effect of smoking and alcohol consumption. This was further studied by examining the relationship between smoking and other risk factors. A significantly high proportion of people with hypertension in our study, were non-smokers (OR: 0.354, 95% CI: 0.199-0.666, p-value: 0.001) and hypertension is a very strong risk factor for cataracts. This may be the reason why non-smokers have a higher risk of cataracts in the study. The protective effect for cataracts (OR: 0.8, 95% CI: 0.6 – 0.9) was found for non-smokers and is a modifiable risk factor for age-related cataracts in the rural

ISSN (O): 2687-5365; ISSN (P): 2753-6556

southern Indian population. The association between smoking and the consumption of alcohol is significantly associated with several other studies. But It is also known that smoking and alcohol consumption are independent risk factors for hypertension. Other studies have found a higher risk for smoking. Smoking bidi led to a high accumulation of Cadmium in the lenses of smokers with cataract which hastens cataract genesis

Asthma

Asthma has been found (OR:1.998, 95% CI 1.013 – 3.941, p-value: 0.043) to be a significant association with cataracts. Similar findings are also seen in the POLA study, the OR is 2.04.[12] Association between inhaled corticosteroids and posterior subcapsular cataract dose-related higher risk has been found in other studies also.

Vitamins

Vitamins in our study did not find any association with cataract formation and very few subjects were taking vitamins. But several other studies demonstrated its preventive effect on cataracts. A case-control study in Spain reported higher levels of Vitamin C above 49mmol/liter were associated with 64% reduced odds of cataracts. (p-value <0.0001). Dietary intake of Vitamin C, E, and Selenium was marginally associated with decreased odds of developing cataracts (p-value 0.09, 0.09, 0.07 respectively).

Sunlight Exposure

Sunlight exposure in our study did not show any significant association with cataract formation. Other studies showed an odds ratio of 1.1 to 1.2.[19,20]

CONCLUSION

Gender disparities in CSC coverage are evident in a state like Kerala, where we expect gender-based discrimination against women to be low. Women had higher rates of cataract, which was not explained by differential access to surgery. There is inequity in CSC by age and SLI and this is a challenge that must be addressed.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556