

Back Ground Causes of Human Cataract Prevalence in the Non-Coastal Districts

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ABSTRACT

AIM: Kerala despite being a state with total literacy and good health infrastructure still has a problem of treatable blindness. Kerala has been able to arrest the increasing prevalence of blindness by improving the general health conditions of individuals and by decreasing the population growth by community based programme.

METHODS: A structural questionnaire was distributed among the patients in the hospitals, as well as in the houses in the two non-coastal districts (Kottayam and Pathanamthitta) of southern Kerala state of India directly or through the nurses to identify the background causes.

RESULT: Among the peoples participated in the questionnaire method, prevalence were highest among rurals than urbans or coastals, females than males, unilateral cataract blindness than bilateral cataract blindness, rice used as staple food as wheat and non-vegetarians as vegetarians in all the districts.

CONCLUSION: The present study has shown that Kerala has been able to arrest the increasing prevalence of blindness because of the improvement in the general health condition of individuals and decrease in the population growth.

Key words: Cataract; Prevalence; Districts; Non-coastal; Pathanamthitta; Kottayam; Background causes

INTRODUCTION

Cataract can be defined as any disturbance of the optical homogeneity of the crystalline lens of the eye. According to^[1], studies evaluating risk factors for the development of cataracts have implicated dietary factors, medications, exposure to sunlight, race, level of education, metabolic abnormalities, smoking, body mass, hand grip strength and family history in the causation of cataract.

Cataract is considered as a condition and not a disease, they develops due to multiple reasons. Secondary cataracts develop from procedures performed to correct other vision problems such as glaucoma. Traumatic cataracts develop from injury to the eye lens or the eye as a whole. Congenital cataracts are genetic and are found in babies and sometimes develop in childhood. There are also radiation cataracts that develop after some kinds of exposure such as excessive sunlight, ultraviolet or infra-red light. It has been shown that cataracts can develop from long term use of certain steroids as well as some lifestyle habits.

High levels of blood sugar eventually get into the fluid in the eye raising the level of the sugar in the crystalline lens. This will draw water into the lens and the lens will swell. Also, sugar will form alcohol in the lens creating lens opacities, which we call cataracts. The cataract is actually a breakdown of the protein structure in the lens, and high sugar and alcohol content will increase this phenomenon. The same is true for people who indulge in excess alcohol^[2].

METHODOLOGY

A structural questionnaire was distributed among the patients in the hospitals, as well as in the houses in the two non-coastal districts

(Pathanamthitta and Kottayam) of Kerala, directly or through the nurses to identify the background causes such as information in the current as prior status including demography, family and medical history etc. Individual information was collected about general characteristics, potential risk factors for cataract and history of exposure to medical radiation both personally and occupationally. Completed questionnaire were collected and back ground causes were calculated on data compilation and statistical assessment were made.

RESULT

Kottayam

It can be depicted from table 1 that out of 310 cataract patients, its prevalence varied with the place of residence being significantly high (86.8%, $p = 0.000223$) amongst rurals as compared to 13.2% amongst the urbanities in Kottayam district. Among that 51.3% females ($p = 0.0343$) were participated in questionnaire method. Unilateral cataract blindness (64.8%, $p = 0.0128$) was significantly higher than bilateral cataract. History of eye disease & other disease, family history of eye disease & cataract and other drugs & asthma drugs taken were 54.8%, 10.6% and 35.5% respectively. History of other disease ($p = 0.0144$) and other drugs ($p = 0.0144$) taken were significant. Radiation taken was 26.1% and dehydrational crisis (9.4%) was less. Rice (93.2%, $p = 0.000017$) used as staple food was highly significant than wheat (6.8%). The non-vegetarians (87.1%, $p = 0.000265$) were highly significant than vegetarians. The alcoholics, smokers, tobacco chewers, diabetics and hair dye users accounting 22.6%, 22.6%, 12.9%, 16.5% and 16.1% respectively as compared to non-alcoholics, non-smokers, non-tobacco chewers, non-diabetics

and no hair dye users representing 77.4%, 77.4%, 87.1%, 83.5% and 83.9% respectively. However none of the above factors were statistically significant. Employees (55.2%, $p = 0.0293$) were greater than unemployed. On a comparative study of different fuels, it was found that the prevalence is significantly higher among those who use firewood (49.7%, $p = 0.00198$) among female patients than gas (38.4%, $p = 0.00974$) and kerosene (11.9%) in Kottayam district.

Pathanamthitta

From the table 2 it was clear that out of 303 cataract patients, its prevalence varied with the place of residence being significantly more (88.1%) amongst rurals ($p = 0.0000125$) as compared to 11.9% amongst the urbanities in Pathanamthitta district. More females (58.4%, $p = 0.026$) participated in questionnaire method than males. Unilateral cataract blindness (75.2%, $p = 0.00015$) was highly significant than bilateral cataract. History of eye disease & other disease, family history of eye disease & cataract and other drugs & asthma drugs taken were 68.3%, 45.5% and 34.7% respectively.

History of other disease ($p = 0.045$), history of eye disease ($p = 0.046$) and other drugs taken ($p = 0.046$) were significant. Radiation taken was 21.8% and dehydrational crisis (11.6%) very less. Rice (95%) used as staple food among the patients was significantly ($p = 0.0000032$) higher than wheat. The non-vegetarians (90.1%) were highly significant ($p = 0.000135$) than vegetarians. The alcoholics, smokers, tobacco chewers, diabetics and hair dye users accounting 22.8%, 22.8%, 15.8%, 18.8% and 12.9% respectively as compared to non-alcoholics, non-smokers, non-tobacco chewers, non-diabetics and no hair dye users representing 77.2%, 77.2%, 84.2%, 81.2% and 87.1% respectively. However, none of the above factors were statistically significant. Unemployed (65.3%, $p = 0.00435$) were

Table 1 Distribution of different background causes in Pathanamthitta district.

Background causes		Number	Percentage (%)	P value
Resident (n = 303)	rural	267	88.1	0.0000125 **
	urban	36	11.9	0.117
	coastal	0	0	
Sex	male	126	41.6	0.0765
	female	177	58.4	0.026 *
Cataract	unilateral	228	75.2	0.00015 **
	bilateral	75	24.8	0.066
History of	other disease	105	34.6	0.045 *
	eye disease	102	33.7	0.046 *
Family history of	eye disease	72	23.7	0.081
	cataract	66	21.8	0.084
Drug taken (past & present)	other drugs	102	33.7	0.046 *
	asthma drugs	3	1.0	0.688
Radiation		66	21.8	0.084
Dehydrational crisis		35	11.6	0.1631
Staple food	rice	288	95	0.0000032 **
	wheat	15	5	0.442
Veg/non veg	vegetarian	30	9.9	
	non-vegetarian	273	90.1	0.000135 **
Alcoholic/non alcoholics	alcoholics	69	22.8	0.083
	non-alcoholics	234	77.2	
Smoker/ non-smoker	smoker	69	22.8	0.083
	non-smoker	234	77.2	
Tobacco chewing	yes	48	15.8	0.666
	no	255	84.2	
Diabetic/non diabetic	diabetic	57	18.8	0.162
	non-diabetic	246	81.2	
Hair dye	yes	39	12.9	0.885
	no	264	87.1	
Occupation	employed (government, private or self employed)	105	34.7	0.043 *
	unemployed	198	65.3	0.00435 *
	fire wood	120	67.8	0.000321 **
Among, women- fuel used. (n = 177)	kerosene	30	16.9	0.674
	gas	27	15.3	0.338

* significant ** highly significant.

more than employees. On a comparative study of different fuels, it was found that the prevalence is significantly higher among those who use firewood 67.8% ($p = 0.000321$) among female patients than kerosene (16.9%) and gas (15.3%) in Pathanamthitta district.

DISCUSSION

Among the cataract patients, diabetics in Pathanamthitta 18.8% and Kottayam 16.5%. In districts like Pathanamthitta and Kottayam the diabetes mellitus is not a significant cause for cataract formation. According to^[3], the non-diabetics may also be prone to cataractous change caused even by moderate amount of surplus sugar and salt.

On a comparative study of usage of different fuels among the female patients, it was found that the prevalence is significantly higher among those who use firewood in four districts. More women used firewood as fuel in Pathanamthitta (67.8%, $p = 0.000321$) and Kottayam (49.7%, $p = 0.00198$) than gas and kerosene. Cooking with rice straw was identified as being positively associated with young adult cataract, whereas cooking with cow dung was negatively associated^[4]. The study of^[5] found that cooking fuel, a higher risk of cataracts. The use of solid fuel in unflued indoor stove is associated with increased risk of cataract in women who do the cooking^[6].

The smokes from household solid fuel (wood, cow dung cake, crop residues, coal, coke, lignite), along with lack of ventilation in the kitchen, increases the risk of cataracts among women.

History of other disease and other drugs taken were significantly higher among the cataract patients in all the five districts. History of other disease and other drugs taken were 34.6% ($p = 0.045$) and 33.7% ($p = 0.046$) in Pathanamthitta and 35.5% ($p = 0.0144$) and 35.5% ($p = 0.0144$) in Kottayam. The association between systemic

corticosteroid therapy and the development of posterior subcapsular cataracts was originally described by Black *et al* in adults in 1960^[7]. The prevalence of PSCC during oral corticosteroid therapy has been correlated with daily dose, cumulative dose, and duration of treatment^[8]. Yilmaz *et al*^[9] reports the prevalence of PSCC in asthmatic patients receiving corticosteroid therapy.

In this study people used rice as staple food than wheat is significantly high in these districts. People used rice as staple food among the cataract patients were 95% ($p = 0.0000032$) in Pathanamthitta and 93.2% ($p = 0.000017$) in Kottayam. If cadmium is playing a major role in the link between smoking and cataract then workers exposed to high cadmium levels in the cadmium plated steel industry, or those consuming cadmium enriched food - for example, rice in some parts of Japan, might have an increased risk of cataract^[10] Rice is found as a risk factor in this study. Cadmium (Cd) is one of the most toxic heavy metals with no described biological function. It is supplied to soil, air and water mainly by effluent from industries, mining, burning and leakage of waste, and by fertilization with phosphate and sewage sludge. Cadmium is readily taken up by plants, leading to toxic symptoms such as growth reduction^[11].

On a comparative cataract prevalence study among the rurals, coastals and urbans, it is found that the prevalence is higher among the rurals than urbans and coastals. Among the cataract patients rurals were 88.1% ($p = 0.0000125$) in Pathanamthitta, and 86.8% ($p = 0.000223$) in Kottayam. Rural residence seems to be a risk factor for cataracts in this study. Low postoperative visual acuity was associated with rural region, under correction of refractive error, and hemorrhagic retinopathy^[12]. Cataract affects 20% of the population aged 30 years and older living in rural China, with cortical cataract the most common subtype and risk factors for cataract include

Table 2 Distribution of different background causes in Kottayam district.

Background causes	Number	Percentage (%)	P value
Resident (n = 310)	Rural	269	86.8
	Urban	41	13.2
	Coastal	0	0
Sex	Male	151	48.7
	Female	159	51.3
Cataract	Unilateral	201	64.8
	Bilateral	109	35.2
History of	other disease	110	35.5
	eye disease	60	19.3
Family history of	eye disease	12	3.9
	Cataract	21	6.7
Drug taken (past & present)	other drugs	110	35.5
	asthma drugs	0	0
Radiation	81	26.1	
Dehydrational crisis	29	9.4	0.074
Staple food	Rice	289	93.2
	Wheat	21	6.8
Veg/non veg	Vegetarian	40	12.9
	non-vegetarian	270	87.1
Alcoholic/non alcoholics	Alcoholics	70	22.6
	non-alcoholics	240	77.4
Smoker/ non-smoker	Smoker	70	22.6
	non-smoker	240	77.4
Tobacco chewing	Yes	40	12.9
	No	270	87.1
Diabetic/non diabetic	Diabetic	51	16.5
	non-diabetic	259	83.5
Hair dye	Yes	50	16.1
	No	260	83.9
Occupation	employed (government, private or self employed)	171	55.2
	unemployed	139	44.8
Among, Women- fuel used. (n = 159)	fire wood	79	49.7
	Kerosene	19	11.9
	Gas	61	38.4

* significant; ** highly significant.

myopia and diabetes^[13].

This study shows that unilateral cataract blindness was higher than bilateral cataract. Unilateral cataract patients 75.2%, ($p = 0.00015$) in Pathanamthitta, and 64.8% ($p = 0.0128$) in Kottayam. In Shandong Province of China prevalence of binocular blindness was 0.34%, that of unilateral blindness 0.65%, that of binocular low vision 0.46%, and that of unilateral low vision 0.64%^[14]. According to Song^[15], the prevalence of monocular blindness, bilateral and monocular low vision was 0.72%, 0.57% and 0.30% respectively in China.

The alcoholics and smokers accounting were 22.8% and 22.8% in Pathanamthitta and 2.6% and 22.6% in Kottayam as compared to non-alcoholics and non-smokers. Drinking and smoking is not found to be a risk factor of cataract in the present study. The only adverse effect of alcohol was among smokers: people who smoked and drank heavily had an increased prevalence of nuclear cataract^[16]. The study in Candigrah^[1] smokers had 73.9% prevalence of cataract and non-smokers 72.5%, showing no big difference. A case control study by Mohan *et al*^[17], did not find an association between smoking and senile cataract. A prevalence of 73.7% cataract among alcohol users is just little more than the prevalence of 72.6% cataract among non-alcohol users.

In this study tobacco chewing and hair dye usage were not found as a risk factor. The tobacco chewers and hair dye users accounting 15.8% and 12.9% in Pathanamthitta, and 12.9% and 16.1% in Kottayam as compared to non-tobacco chewers and no hair dye users.

Among the participants who had occasion to undergo radiation in Kottayam is 26.1% and in Pathanamthitta, 21.8%. A comparative study of the cataract prevalence of elderly $> \text{ or } = 40$ years in the areas of different levels above the sea and sunshine times, it shows that the higher level above the sea and longer sunshine time the higher cataract prevalence^[18].

In the present study Dehydrational crisis is not identified as a significant risk factor, it is 11.6% in Pathanamthitta and 9.4% in Kottayam. Like this study, a case-control study was carried out in the state of Tamilnadu, southern India do not support the hypothesis of an increased risk of visually disabling cataract in persons with a positive history of severe diarrhoea^[19].

Non-vegetarian diet is found to be a risk factor in the present study. In a comparative study among the cataract patients non-vegetarians are more than vegetarians, 90.1% ($p = 0.000135$) in Pathanamthitta and 87.1% ($p = 0.000265$) in Kottayam than vegetarians. Vegetarians were at lower risk of cataract than were meat eaters in the cohort of health-conscious British residents^[20]. Laboratory, clinical, epidemiologic and animal data support the association between cataract prevention and diet supplements such as riboflavin, vitamin C, vitamin E and Carotenoids^[21,22].

Among the cataract patients Employees were higher than unemployed in Kottayam (55.2%, $p = 0.0293$). But unemployed were higher in Pathanamthitta (65.3%, $p = 0.00435$). According to^[23], productively employed individuals had lowest blindness rates and the blindness rates were five times higher among respondents who were not working and two times higher among those engaged solely in household activities. The prevalence of blindness in people ≥ 50 years in Cape Town, South Africa was lower than expected probably because of high cataract surgery coverage^[24]. It is thus concluded that cataract is a major public health problem in Kerala, many factors including aging, female gender, rural residence, history of other diseases and other drug taken, non-vegetarian food, rice used as staple food and firewood as cooking fuel operating in its causation. The above risk factors are of concern not only for cataract

prevention but also for public health at large. The present study has shown that Kerala has been able to arrest the increasing prevalence of blindness because of the improvement in the general health condition of individuals and decrease in the population growth.

CONFLICT OF INTERESTS

The authors declare that they do not have conflict of interests.

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