JMSCR Vol||05||Issue||04||Page 20466-20473||April 2017

www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i4.119

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

A Study on Risk Factors of Cataract among the Age Group 35- 50 Years

Authors
Dr Mini P.A.[1], Dr Mallika O.U.[2]
[1]Additional Professor in Ophthalmology, Govt.T.D. Medical College, Alappuzha, Kerala, India
[2]Professor in Ophthalmology, Govt.T.D.Medical College, Alappuzha, Kerala, India
Corresponding Author
Dr. Mini P.A
Govt.T.D. Medical College, Alappuzha, Kerala, India
Phone: 9447304075, Email: *drminipantony@gmail.com, Fax 04772282368*

Abstract
Background: *Cataract is a major cause of blindness in our community. This study was done in the context of the increased burden of the cataract blindness in our country especially cataract developing at a much earlier age than expected. There are probably many causes of cataract, with many different toxic substances producing cataract, but the major alleged risk factors include diabetes, radiation of various kinds (sunlight, ultraviolet, and infrared radiation), diarrhoea and malnutrition, smoking, alcoholism, renal failure, drugs like steroids, diuretics, strong miotics, major tranquilizers, and genetic factors. The problem of 'who develops cataract' may well be determined by environmental insults as well.*
Aim of the Study: *The present study is aimed at identifying the various risk factors involved in cataract formation in cataract patients of the age group 35-50 yrs attending the department of ophthalmology in a tertiary care hospital.*
Materials and Methods: *The present study is a hospital based case-control study. A total of 100 cases and 100 controls were selected, after applying the inclusion and exclusion criteria. Controls were selected after matching for age (± 2 years) and sex with the cases. The information for the study was collected using a semi-structured pre-tested proforma. The data collected were transferred to a master chart, and necessary tables were prepared. The chi square test and odds ratio were applied to bring out the significance of the association of risk factors.*
Results: *Residents in coastal area, outdoor occupation, prolonged sunlight exposure, low educational status, positive family history, hypertension, diabetes, systemic steroid intake, elevated fasting blood* sugar, *high serum calcium level, low serum cholesterol are associated with increased risk for cataract.*
Conclusion: *The present study suggest a multifactorial aetiology in cataractogenesis, where various risk factors accelerate lens opacification, perhaps through the common pathway of oxidative damage.*
Keywords: *Cataractogenesis, risk factor.*

INTRODUCTION

Cataract is the major cause of blindness and visual impairment throughout the world. According to W.H.O, in developing countries, notably in South Asia, in the 40 to 50 year age group, at least 10 percent have significant vision loss from cataract. From various previous studies [1],[2],[3] it is clear that the age of onset of senile cataract in

population of developing countries in the tropical belt is some two decades earlier than in the USA or Europe. This is the reason why the present study deals with risk factors of cataract in the age group 35 to 50 years.

There are probably many causes of cataract, but the major alleged risk factors include diabetes, radiation of various kinds (sunlight, ultraviolet, and infrared radiation), diarrhoea and malnutrition, smoking, alcoholism, renal failure, drugs like steroids, diuretics, strong miotics, major tranquilizers, and genetic factors. The results of various epidemiologic studies suggest that cataract is not simply another sad consequence of ageing. The problem of 'who develops cataract' may well be determined by environmental insults as well.

The lens opacities case control study [6] by M. Cristina Leske and co-workers led to important advance in the field of cataract epidemiology. This study evaluated risk factors for age related nuclear, cortical, posterior subcapsular and mixed cataracts. According to this study low education increased the risk and regular use of multivitamins decreased the risk of all types of cataracts. Diabetes increased risk of posterior subcapsular, cortical and mixed cataracts. (OR=1.56). Oral steroid therapy increased posterior subcapsular cataract risk OR=5.83). Risk factor for nuclear cataract were a nonprofessional occupation (OR=1.96), current smoking (OR=1.68), body mass index (OR=0.76) and occupational exposure to sunlight (OR=0.61).

In another study by C.A.Donnelly et al [7] some blood plasma constituents were correlated with human cataract formation. The authors looked for difference between matched pairs of patients and controls in concentrations of various plasma constituents and concluded that bilirubin, alkaline phosphatase and r-glutamyltranspeptidase were significantly higher in cataract group, cholesterol levels were significantly lower in cataract group, than in the controls. West S.K and Valmadrit CT [8] conducted a study on the epidemiology of risk factors for age-related cataract at Dana centre for preventive ophthalmology, Maryland, USA, and concluded that cortical and posterior subcapsular cataracts were most closely related to environmental stresses such as ultraviolet exposure, diabetes, and drug ingestion. In another study [9] on the risk factors for age related cortical, nuclear, and posterior subcapsular cataracts conducted by the Italian-American cataract study group, an increased risk for cataract was found for females (cortical; OR=2.20) and persons with less than a high school education, (all types; R=1.53), job locations in the sunlight (cortical, mixed; OR=1.75), a positive family history of cataract (posterior subcapsular, cortical, mixed; OR=1.88) and a history of cortisone use (posterior subcapuslar OR=8.39).

In cataract, lens membrane lipids are broken down and their breakdown products are cataractogenic. In addition activity of certain proteolytic enzymes in the lens increases with resultant breakdown of proteins to aminoacids which diffuse through the lens capsule. Existing literature suggests that an intraocular generation of active oxyradicals and the reduced antioxidant defence in the ageing eye constitute a significant risk factor in overall pathogenesis of senile cataract. The commonly postulated mechanisms by which these risk factors produce cataract are outlined briefly.

Sugar cataracts: Glucose is converted to sorbitol by aldose reductase, when the hexokinase pathway is saturated by elevated blood/aqueous glucose. The sorbitol accumulates intracellularly as it does not diffuse readily through membranes. An osmotic gradient is thus set up which causes hydration of the lens and if the changes are severe enough, opacification results. Below the age of 70 years the diabetic population develops cataract roughly 10 years earlier than non-diabetic population. Thus Diabetes appears to be a risk factor for cataract.

Sunlight and ultraviolet light: Tryptophane may be converted to fluorophors. The production of these may result in free radical formation. Ultraviolet light can also lead to the formation of hydrogenperoxide and superoxide anions. A combination of these products may result in cataractous changes.

Ionising radiation: The mechanism of cataract formation is thought to be through the generation of free radicals.

Corticosteroids: Corticosteroids apparently react with specific amino groups of the lens crystallins and induce a conformational change which unveil protein sulphydril groups. These groups are then able to form disulphide bonds with the result that, large light scattering protein aggregates are formed.

Severe diarrhoea: Recent laboratory evidence suggest that severe diarrhoeal disease may play a role in cataractogenesis by cyanate induced carbamylation of the lens.

MATERIALS AND METHODS

The present study is a hospital based case-control study. This study on the risk factors of cataract in the age group 35-50 years was conducted in department of Ophthalmology, in a tertiary care teaching hospital in Kerala.

Sampling method: 100 cases were selected from the patients admitted for cataract surgery during the study period. 100 controls were selected from subjects who attended the hospital for routine eye check up or with minor eye problems. The selection of patients and controls was at random.

Inclusion Criteria

Cases : 1. Age group 35 to 50 years. 2. Patients with lenticular opacity detected by slit lamp examination.

3. Patients with visual acuity of <6/60

Controls : 1. Age group 35- 50 years 2. Subjects with no lenticular opacity when examined under slit lamp.

3. Subject with distant visual acuity of 6/6 or better.

Exclusion Criteria

Cases: 1. Patients who gave a history of significant ocular trauma or ocular surgery were excluded. 2. Patients who gave history of defective vision which started prior to the age of 30 years were excluded. 3. Patients who gave history of recurrent episodes of redness and pain in the eyes and those with slit lamp evidence of past or present uveitis were excluded. 4. Those patients with an I.O.P.of 21mm Hg or above measured with schiotz tonometer were excluded.

Controls : 1. Subjects who showed any evidence of lenticular opacity by slit lamp examination were excluded. 2.Those who showed any evidence of past or present uveitis by slit lamp examination were excluded. 3. Those with an I.O.P. of 21 mm of Hg or above measured with schiotz tonometer were excluded. 4. Those with corrected distant visual acuity of less than 6/6 were excluded.

Methods of data Collection: A total of 100 cases and 100 controls were selected, after applying the above said inclusion and exclusion criteria . Controls were selected after matching for age (± 2 years) and sex with the cases. The information for the study was collected using a semi- structured pre-tested proforma. Items were selected on the basis of published information on possible cataractogenic factors. A detailed history was taken regarding the age. sex, dietary habits, occupation, residence, sunlight exposure, smoking, alcohol intake, any systemic diseases including Diabetes and Hypertension, and any long term medication (at least once a week for at least 1 month) especially systemic steroids, residence, educational status, major life time occupation, and family history of cataract (among first degree blood relatives). Then a general and systemic examination was made. Measurements of weight, height, blood pressure and I. O.P were taken. Slit lamp examination was done in both eyes after pupillary dilatation with 0.5% Tropicamide and lenticular opacity was assessed, layer by layer. Also looked for any evidence of past or present uveitis.

Statistical Tests applied in the study: The data collected were transferred to a master chart, and necessary tables were prepared. The chi square (x^2) test and odds ratio were applied to bring out the significance of the association of risk factors studied, x^2 is defined as sum of (observed value - Expected value)^2 divided by expected value .

It can be used to know whether a variable is significant or not. Referring to Fisher's x^2table, the calculated value was compared with the table

value under different probabilities such as 0.05, 0.02, 0.01 etc. If calculated value of x^2 is higher than table value at 0.05 level the association is significant at 5% level. Odds ratio is the prevalence of disease among the exposed group divided by prevalence of disease among the non-exposed group. P-value stands for the probability level of significance and if P-value is <0.05, it is taken as significant.

RESULTS AND DISCUSSION

Percapita Income: The total monthly income of the household was calculated and this was divided by the total number of family members, to get the monthly percapita income. 84% of cataract patients had monthly percapita income <Rs.400 where as only 16% had percapita income >Rs.400. This was compared with the control group and no significant association was found out statistically between incidence of cataract and percapita income (P value >0.1).

Residence: Patients and controls were grouped into two according to their residence, ie whether in coastal areas or noncoastal areas. Of the 100 cataract patients studied, 54% were coming from the coastal areas while among the controls only 34% were from the coastal areas. The association was tested for significance using x^2 test and it was found to be significant as the P value was <0.01 (df=l).Odds Ratio was calculated and was found to be 2.27. Thus residents of coastal areas were found to have an increased risk of cataract formation compared to noncoastal residents. This may be because most of these patients from the coastal area were fishermen and were subjected to prolonged sunlight exposure.

Occupation: Patients and controls were divided into 2 groups; those having indoor occupation and those with outdoor occupation. Among the patients 61% had indoor occupation while 39% had outdoor occupations. Among the controls 81% had indoor occupations whereas only 19% had outdoor occupations. This association between cataract and outdoor occupation was tested using x^2 test and was found to be significant, (x^2 = 9.71; df=l, p value <0.01). Those with an outdoor occupation were found to have increased risk of cataract formation, than those with indoor occupation. Due caution has to be exercised in interpreting this result because the possibility of overlapping between these occupations cannot be ruled out.

Sunlight Exposure: In order to rule out the inconsistencies regarding indoor and outdoor occupation, approximate daily hours of exposure to sunlight was taken into account and cases and controls were divided into 2 groups i.e those with <5 hours of daily sunlight exposure and those with >5 hours of daily sunlight exposure. x^2 test was applied for testing the significance of the association between cataract and prolonged sunlight exposure and was found to be highly significant(p value <0.001; df=l). Odds ratio was found to be 3.69.

Educational Status: An inverse relationship of cataract with educational status (which can be taken as an indicator of socio-economic status of an individual) has been observed in this study. Patients with high school and college education were put into one group and those with below high school education were put into the second group. Both were compared with that of the control group. Among the patients 51% had < High school education while 49% had High school education or above. Among the control 28% had < High school education 72% had higher education. x^2 test was applied and the association between cataract and low educational status was found to be statistically significant. (P value <0.01; df=l). Odds Ratio was found to be 2.67. This observation may be because of the fact that better education result in an indoor occupation and subsequently less exposure to sunlight.

Body Mass Index: Body Mass Index is weight in kilograms divided by Height in metre^2 [4] and it can be considered as a parameter of nutritional status of a patient. Cataract patients and controls were divided into 2 groups; those with Body mass Index of <23 and those with B.M. index of >23. x^2 test was applied and the association between cataract and body mass index was found to be not significant. (P value >0.1; df= 1). Thus according

to the present study a high or low body mass index does not increase the risk of cataract development.

Food Habits: Regarding the dietary habits most of the patients and controls were taking mixed diet. Among the cases 3% were pure vegetarians and among controls 2% were using only vegetarian food, thus not making much difference between the two groups, regarding the food habits.

Family history of Cataract: Out of the 100 cataract patients 37% gave positive family history of cataract among first degree blood relatives where as among controls only 22% gave a positive family history of cataract. x^2 test was applied and the association between cataract formation and positive family history was found to be significant, (x^2 = 5.40, P value <0.05; df=l). Odds Ratio was found to be 2.08.

Smoking: In the present study, out of the 100 patients 33% were smokers, where as among the controls 22% were smokers. The association between smoking and cataract formation was tested for significance by x^2 test and was found to be not significant, (p value >0.05; df=l).

Alcohol Intake : Out of the 100 cataract patients 19% had the habit of regular alcohol intake while among the controls 16% had the habit of alcohol drinking, x^2 test was applied and the association between cataract and alcohol intake was found to be not significant statistically, (x^2 = 0.31, P value>0.50 df=l).

Hypertension : Out of the 100 patients 17 were known hypertensives and out of the controls 5 gave history of Hypertension, x^2 test was applied for testing the significance of the association between cataract and hypertension and was found to be significant, (x^2 = 7.35; P value <0.01; df= 1). Odds Ratio was calculated and was found to be 3.89. Thus in the present study Hypertension was found to be a risk factor associated with cataract. Association of cataract with hypertension and high glucose levels have been found in the Framingham Eye study [4].

Diabetes Mellitus: It was found to be one significant risk factor associated with cataract formation in the present study. Out of the 100 patients with cataract 13% gave history of Diabetes, where as among controls it was only 2%. x^2 test was applied to test the significance of the association and it was found to be significant statistically, (x^2 = 7.20, P value <0.01 df=l). Odds Ratio was calculated and was found to be 7.32. The Framingham studies[4] provide a good epidemiological evidence for an association between the prevalence of cataract and diabetes. According to that study the diabetic population developed cataract roughly 10 years earlier than the non-diabetic population.

Steroid intake: Out of the 100 cataract patients 7 gave history of oral steroid intake where as among the controls none gave history of systemic steroid intake. None of the patients and controls gave history of prolonged topical steroid therapy. Thus oral steroid intake was found to be a contributing factor in cataractogenesis in the present study. and this necessitates close follow up of patients on steroid intake so that early detection and treatment may be instituted.

Severe diarrhoea: None of the patients or controls in the present study gave history of any severe diarrhoea necessitating hospitalisation and thus this study fails to detect any association between cataract formation and severe diarrhoea.

Total protein: Patients and controls were compared based on their plasma total protein levels and were grouped into two, i.e., those with total protein <7gm/dl and hose with total protein>7gm/dl). The difference between the two groups were tested for significance by using x^2 test and it was found to be not significant statistically as the P value was >0.10 (df=l). In the present study nutrition does not seem to play much role in cataractogenesis.

Albumin: Patients and controls were compared based on their serum albumin level and the difference was tested statistically. It was found to be not significant as the P value was >0.10 (df=l). Thus the present study did not find any significant difference in the level of serum albumin between cataract patients and controls.

Globulin: The study group and control group were divided into two based on their serum globulin level i.e., those with serum globulin <3gm/dl, and those with globulin level > 3 gm/dl. The difference was statistically tested and found to be not significant. Thus the present study shows no association existing between serum globulin and cataract prevalence.

Albumin : Globulin Ratio: When patients and controls were compared based on their A:G ratio the difference was found to be significant statistically. x^2 =10.14, P value <0.01 (df=l) The cataract patients had a high albumin: globulin ratio compared to the controls. But this observation cannot be given much importance because the total protein, albumin and globulin levels did not show any significant difference between cases and controls in the present study.

Table -1 Percentage distribution of cases and controls across fasting blood sugar level

	FBS<100 mg/dl	FBS> 100 mg/dl	Total
Cataract group	50	50	100
Control group	78	22	100
Total	128	72	200

Significant
x^2 =17.01 : P Value <0.001 (d£=l) O.R = 3.54
Odds ratio was sound to be 3.54.

Fasting blood sugar: The fasting blood sugar level was found to be significantly higher in the cataract group when compared to the control group. Patients and controls were grouped into two based on their FBS levels, and both groups were compared. This finding is consistent with the earlier finding that there is increased risk for cataract formation in diabetic patients. Thus the present study shows that raised fasting blood sugar is a risk factor for cataractogenesis.

Haemoglobin: Cataract patients were compared with the controls based on their Hb level and no significant difference was found between the two statistically (Pvalue > 0.10 (df=l). Haemoglobin level can be considered as one of the parameters of the nutritional status of the patient, adding further evidence that nutrition does not play much role in cataractogenesis in the present study population.

Serum calcium: The patients and controls were compared based on their serum calcium level and it shows a significantly higher level of serum calcium in cataract patients, when tested statistically using x^2 test. (P value < 0.01 (df=l). This is consistent with the study report of some earlier workers. Odds Ratio was calculated as 2.35.

Serum cholesterol: Present study showed a significantly lower level of serum cholesterol in the cataracts group when compared to the control group, possibly due to dietary variation or an abnormality in liver function. The lower cholesterol level might imply a defect in metabolism of cell membrane which is important in cataractogenesis. This result is consistent with the observation of previous studies[7].

Table 2 Percentage distribution of cataract patients and control across the serum cholesterol level

	Cholesterol ≤210 mg/dl	Cholesterol >210 mg/dl	Total
Cataract group	78	22	100
Control	62	38	100
Total	140	60	200

x^2=6.09. Pvalue<0.02 (df=1) Significant. O.R=2.17.

Urea: The slightly higher level of urea found in cataract patients compared to the controls was not found to be significant statistically. The patients and controls were divided into 2 classes based on their blood urea levels; and they were compared statistically. The difference was tested for significance using x^2 test and was found to be not significant. (P value >0.05; df=l), probably indicating no difference in renal function between the 2 groups.

Table 3 - Statistical summary – Risk factors of cataract which showed a positive association

Risk factors	X^2	P value	Odd ratio
Residence in coastal area	8.11	<0.01	2.27
Outdoor occupation	9.71	<0.01	2.72
Prolonged sunlight exposure(>5 hrs/day)	17.46	<0.001	3.69
Low educational status (<8th standard)	11.06	<0.001	2.67
Positive family history of Cataract	5.40	<0.05	2.08
Hypertension	7.35	<0.01	3.89
Diabetes mellitus	7.20	<0.01	7.32
Steroid intake	5.33	<0.05	-
Fasting blood sugar >100 mg/dl	17.01	<0.001	3.54
Serum calcium >8.8 mg/dl	7.98	<0.01	2.35
Serum cholesterol <210 mg/dl	6.09	<0.02	2.17

SUMMARY AND CONCLUSION

Cataract is a major cause of blindness in our community. This study was done in the context of the increased burden of cataract blindness in our community especially cataract developing at a much earlier age than expected. Therefore the present study population included cataract patients in the age group of 35 to 50 years excluding traumatic and complicated cataracts, in order to determine the risk factor associated.

Conclusions made from the present study are:

* Residents in coastal area were found to be at increased risk for cataract formation.

*Those with an outdoor occupation were found to have an increased risk of cataract formation

*Study showed that those with prolonged sunlight exposure have increased chance of cataract development.

*Low educational status increased the risk of cataract formation.

*A positive family history of cataract increases the risk of cataract formation.

*Hypertension is a risk factor for cataract in the age group 35 to 50 years.

*Diabetes mellitus increases the risk of development of cataract in the presenile age group.

*Systemic steroid intake is a risk factor in cataractogenesis, in the age group 35 to 50 years.

*Elevated fasting blood sugar is associated with increased risk of cataract formation.

*Higher serum calcium level is found to be associated with increased risk of cataract formation

*A low serum cholesterol increases the risk of cataract formation.

Factors which didn't show any significant association with cataract formation include overcrowding, low economic status, body mass index, smoking, alcoholism, diarrhoea, total plasma protein, albumin and globulin levels, haemoglobin and blood urea level. These findings are in agreement with other published reports.

Because of its high prevalence, even a modest decrease in cataract risk has major public health importance. From this view point, risk factors amenable to modification or intervention are the most interesting findings of this study because they offer a possibility for cataract prevention. The potentially modifiable risk factors include sunlight exposure, low educational status, and use of some medications such as corticosteroids The results highlight a need for periodic lens evaluation among persons with Hypertension, Diabetes and those using oral steroids. This could lead to early identification of lens changes and appropriate treatment. Future studies are needed to confirm and evaluate the potentially modifiable risk factors suggested by this study.

BIBLIOGRAPHY

1. Goldsein H (1980) The reported demography and causes of blindness throughout the world. Advances in Ophthalmology: 1 – 99
2. Chatterjee A, Milton R.C., Thyles (1982). Cataract prevalence and aetiology in Punjab. BJO, 66: 35-42
3. Leske M.C., Sperdurto R.D. (1983). The epidemiology of cataract a review American Journal of Epidemiology 118: 152 – 165
4. Kahn, H.A., Leibowitz, H.M., Ganley, J.P., Kini, M.M., Cotton, T. ,Nickerson, R.S. *et al.* The Framingham Eye Study II.

Association of Ophthalmic pathology with single variables previously measured in the Framingham Heart study. American Journal of Epidemiology 1997; 106:33-1.

5. Harding, J.J., Egerton, M., Van Heyningen, R., Harding, R.S. Diabetes, Glaucoma and Cataract: analysis of combined data from two case-control studies. British Journal of Ophthalmology 1993; 77:2-6.
6. M. Cristina Leske, MD.MPH; Leo, T. Chylack, Jr. MD., Suh-Yuh Wu, MA; The lens opacities case-control study. Risk factor for cataract. The lens opacities case Control study group. Arch. Ophthalmol. Vol.109, Feb. 1991; 244-251.
7. C.A. Donnelly, J. Seth, R.M. Clayton, C.I. Phillips, J Cuthbert R.J. Prescott, Some blood plasma constituents correlate with human cataract. British Journal of Ophthalmology 1955; 79:106-1040.
8. West, S.K. Valmadrit, C.T. Epidemiology of risk factors for age- related cataract survey of ophthalmology 39(4): 323-34, 1995-Jan-Feb
9. Authors. Anonymous. The Italian American Cataract Study group. Risk factors for age-related cortical, nuclear, and posterior subcapsular cataracts. American Journal of Epidemiology. 133(6): 54-43. 1991 March 15.
10. Taylor Hugh R., The environment and the lens. BJO 1980 (64) : 303 – 310
11. Harding J.J., Rixon K.C. (1980) Carbamylation of lens proteins: Experimental Eye Research 31:557-567