

RISK FACTORS FOR VISUALLY DISABLING AGE-RELATED CATARACTS IN IBADAN

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Abstract

Objective: To assess the risk factors for visually disabling age related cataracts.

Methods: A hospital based case-control study carried out at the university College Hospital Ibadan between May 1996 and March 1997. Three hundred and eighty three cases were matched for age and sex with five hundred and ninety nine controls. Subjects aged 50 years and above were examined for visual disabling central lens opacities, which were graded on a scale of 0-3, through undilated pupil with direct ophthalmoscope set at +2.00 Diopters, and held 1/3 meter away. Grades 2a or more with visual acuity less than 6/18 only were selected as cases. Both cases and controls were examined and the risk for development of cataract determined.

Results: The analysis revealed a strong association between uncontrolled diabetes and cataracts (O.R 2.03, P < 0.021). A risk was seen to exist between visually disabling cataract and ultraviolet exposure (O.R 1.45; P < 0.003), uncontrolled hypertension (O.R 1.3, p>0.05) and topical steroid use (O.R 1.57; p>0.05).

Exposure to alcohol was found to be protective (O.R 0.66; P < 0.05) while no risk was observed with severe diarrhoea (O.R 0.85; P > 0.05) and heavy smoking (O.R 0.81; P > 0.05).

Conclusion: The study confirms an association between cataract and exposure to diabetes, ultraviolet irradiation, hypertension, corticosteroids, and cigarette smoking. There is therefore a need for introduction of intervention measures aimed at reducing exposure to these risk factors.

Key words: Age-related cataract, visually disabling cataract, cataract risk factors

Introduction

Cataract or opacity of the crystalline lens is the commonest cause of blindness worldwide, accounting for over 40% of the world's 38 million blind population.¹ Most cases of cataract are said to be of unknown etiology. In a study done at the University College Hospital, Ibadan,² involving 567 cataract cases, over 80% were idiopathic and occurred in an otherwise healthy pre-senile and senile age group.

Cataract is not preventable at the present level of knowledge, but blindness from cataract can be cured through cataract extraction followed by adequate visual rehabilitation. Very few surgeries are however being done in many developing countries because of numerous socio-economic problems.^{3,10} A large backlog of cases is therefore left un-operated. With dwindling resources there is no immediate hope in sight for improvement in the cataract surgical rates. Cataract has however been linked to multi-factorial etiology by a number of studies^{4, 5} in Europe, India

and America. Nutritional factors⁶, ultraviolet ray exposure,⁷ smoking,⁸ alcohol,⁸ systemic diseases such as diabetes and hypertension⁶ as well as steroids have all been identified. No reported work has been done in the study environment to establish a role for any of these risk factors in the causation of cataract. This study was therefore carried out with the aim of examining the role played by some of these risk factors in the development of visually disabling age related cataract with the intention of making appropriate recommendations based on findings that may help in reducing the cataract incidence.

Materials and methods

This study was conducted at the Eye Clinic of the University College Hospital Ibadan. A city located between latitudes 7.23 degrees North of the equator and longitude 3.56 degrees East of the Greenwich meridian. Ibadan is dominated by hills and

has relatively high temperatures throughout the year with an average annual maximum of 31⁰ Celsius and an average lowest of 23⁰ Celsius. An annual average rainfall of 48 inches (120cm) measured over a period of 40 years makes Ibadan atmosphere very dry compared to many places such as Bida, Illorin and Kaduna in the North and Forcados in the South.^{11,27}

The study population consisted of mostly peasant farmers, petty traders, and retired civil servants from Ibadan and nearby towns.

Examination procedure

All patients aged 50 years and above attending the eye clinic during the study period had their consent taken after detailed explanation of the study, they were initially questioned and examined for eligibility, tested to assess visual acuity (using E-chart at 6 meter with or without pin hole). The red reflex of each eye was visualized through the un-dilated pupil with direct ophthalmoscope set at +2.00 Diopters and held at 1/3 meter from the patient's eye to examine for central lens opacity.

Central lens opacities that partially or wholly obscured the red reflex were identified and graded on a scale of 0-3 according to the method for rapid grading of cataract in epidemiological studies described by Merha and Menasian.¹² Only patients with visually disabling cataracts as confirmed by pinhole visual acuity worse than 6/18 and of grade 2a or worse (lens opacities obscuring more than 1/3 area of red reflex were chosen as cases.

Excluded were patients with ocular conditions such as uveitis, retinal detachment, glaucoma, traumatic, congenital or developmental cataracts and other forms of secondary cataracts. Also excluded were cases of central corneal opacity, which would not allow adequate assessment of the cataract.

Controls

were defined as subjects with visual acuity of 6/18 or better who did not have central lens opacities and did not have ocular disease. They were screened from patients or relations who accompanied patients to the University College Hospital, Ibadan. Two controls matched for age and sex were selected per case less than 70 years of age.

For those over 70 years of age due to inadequate number of persons without cataracts at this age only one control was matched per case.

Selected cases and controls were then interviewed with same set of questionnaires in the eye clinic by one of the authors (COB). Cases had their pupils fully dilated with topical 1% tropicamide and 10% phenylephrine to enable slit lamp examination of the lens using oblique illumination with a narrow slit of 1mm and the light source directed from an angle of 45 degrees from the microscope, full, illumination and x10 magnification to allow classification into

morphological types.¹⁸

Cases and controls had their blood pressures checked and urine tested for glucose. They were also examined for association with the following factors:

- i. Diarrhoea: History of one or more episodes of severe life threatening diarrhoea severe enough to render patient seriously ill in bed for three days or hospital admission. This episode having occurred at least three months before visual impairment as a positive history.
- ii. Ultraviolet Light Exposure: A positive history was considered to be occupational history of sunlight exposure all day long (6am - 6pm) unprotected with sun shades and brim hat every day except day of worship for at least one year i.e. 12 hours every day for 300 days.
- iii. History of heavy smoking: Smoking equivalent of a pack of cigarette daily for five years, as positive history.
- iv. History of heavy drinking: Drinking more than 4 units of alcohol per day (two bottles of beer) for at least five years as positive history.
- v. Steroidal eye medications: Use of steroid eye drops regularly consistently every day for up to 12 months was regarded as positive history of steroid use.
- vi. Hypertension: History of hypertension or use of anti-hypertensives for up to one year. Hypertension was confirmed by blood pressure readings of 160/90mmHg or more with the aneroid sphygmomanometer with patient sitting down.
- vii. Diabetes: History of diabetes or use of drugs for diabetes for up to one year. Confirmation of diabetes was by a positive urinalysis of freshly voided urine tested with clinistix strips for sugar.

Statistical analysis was with Stat Pac Gold Application package. Odds ratio as estimates of relative risk were computed for factors to assess the risk of visually disabling cataracts. All statistical testing for significance was at 5% probability level.

Results

Nine hundred and eighty two subjects (383 cases and 599 controls) were examined, interviewed and included in this study. A majority of the cases 268 (69.9%) were mixed cataracts. Others were cortical opacities 11(2.9%), nuclear cataracts 47(12.3%), and posterior sub-capsular cataracts 56(14.6%).

A majority of the cases were from the 60 - 74 year age group accounting for 65.3% of all cases. Majority of the controls were from the 60-74 years age

group accounting for 63%. The mean age for cases was 66.1 years and controls 63.0 years, (t-test=5.91, p.value 0.001).

Of all cases there were 216 males (56.4%) and 167 females (ratio 1.3: 1.0) of the control 334 (55.8%) were males and 265 females (ratio 1.3: 1.0). Sex chi-square was 0.02 and p.value 0.89. There was no significant difference in sex distribution of the study. The distribution of the occupations of the subjects for the study is shown in Table 1.

Risk of Visually Disabling Cataract

When the risk of visually disabling cataract was examined for UVR, heavy smoking, heavy drinking, diarrhoea, prolonged use of topical steroids, hypertension and diabetes, the results are shown in Tables 2.

- i. U.V.R: There was an estimated 45% increased risk of developing visually disabling cataracts in unprotected UVR exposure. (O.R 1.45, C.I 1.10-1.90, P-0.003)
- ii. Heavy Smoking: No risk was found with heavy smoking. (O.R 0.81, C.I 0.46-1.42, P-0.25)
- iii. Heavy Drinking: An association was found between heavy drinking and cataract, which was protective. (O.R 0.66, C.I 0.40-1.08, P<0.048).
- iv. Diarrhoea: No risk was found with diarrhoea (O.R 0.85, C.I 0.54-1.34, P=0.26).
- v. Topical Steroids: There was a 57% increased risk for visually disabling cataract with use of topical steroid but it was not statistically significant. (O.R 1.57, C.I 0.44-5.59, P>0.31).
- vi. Hypertension: There was 33% increased risk for cataract with systemic hypertension, which was not statistically significant. (O.R 1.33, P=0.083).
- vii. Diabetes: There was a doubling of the risk of cataracts in uncontrolled diabetes. (O.R 2.05, P=0.021).

Risk of developing different morphological types of cataracts

Examination of the risk for developing different

morphological types of cataracts for each risk factor is as shown in Table 3.

- i. U.V.R: There was an increased risk for all morphological types of cataracts except for cortical opacities. This risk was how ever statistically significant for mixed cataracts only.
- ii. Diarrhoea: No risk was found with diarrhoea and all morphological forms of cataracts.
- iii. Smoking: A marginal risk was found for cortical opacities but not statistically significant. No risk was found for other morphological types.
- iv. Heavy drinking: There was an identified increased risk for cortical opacities but of no statistical significance.
- v. Topical steroid: There was an identified increased risk for posterior subcapsular cataracts but not of statistical significance.
- vi. Hypertension: There was increased risk for posterior subcapsular and mixed cataracts but not of statistical significance.
- vii. Diabetes: The risk was tripled for P.S.C and doubled for mixed cataract but not statistical significant.

Table 1: Distribution of studied subjects by occupation

Occupation	Case (%)	Control (%)	Total
Trading	162 (42.3)	294 (49.1)	456
Farming	62 (16.2)	72 (12.0)	134
Civil servant	42 (10.9)	70 (11.7)	112
Artisan	14 (3.7)	13 (2.2)	27
Driving	10 (2.6)	14 (2.3)	24
Mason	6 (1.6)	16 (2.7)	22
Armed forces	6 (1.6)	17 (2.8)	23
Security guard	5 (1.3)	4 (0.7)	9
Tailoring	4 (1.0)	11 (1.8)	15
Others	72 (18.8)	88 (14.4)	160

Skilled=civil servants; semiskilled=artisans, drivers; unskilled= traders, farmers.

$\chi^2=3.09$, $p=0.379$.

Table 2: Risk factors for visually disabling cataracts

Risk factor	Cases (%)	Control (%)	O R	95% CI	p value
Diabetes	23 (6.1)	20 (3.4)	2.5	1.06 – 3.98	0.021
UVR	175 (45.7)	220 (36.8)	1.45	1.10 – 1.90	0.003
Hypertension	86 (22.6)	106 (18.0)	1.33	0.95 – 1.85	0.083
Topical steroid	6 (1.6)	1 (1.57)	0.44	0.44 – 5.59	0.31
Diarrhoea	36 (9.4)	65 (10.9)	0.85	0.54 – 1.34	0.26
Heavy smoking	22 (5.7)	42 (7.0)	0.81	0.46 – 1.42	0.25
Heavy drinking	27 (7.9)	62 (10.4)	0.66	0.40 – 1.08	0.045

OR=Odds ratio; CI=Confidence interval.

Table 3: Risk for developing various morphological cataract types

Risk factor	Cataract							
	Cortical		Nuclear		PSC		Mixed	
	OR	p value	OR	p value	OR	p value	OR	p value
UVR	0.98	0.7	1.80	0.05	1.60	0.2	1.40	0.03
Diabetes	0.0	0.2	0.98	0.2	3.18	0.03	2.06	0.05
Topical steroid	0.0	0.2	0.0	0.2	1.8	0.2	1.88	0.2
Hypertension	0.0	0.2	1.07	0.2	1.37	0.2	1.45	<0.05
Heavy smoking	1.36	0.5	0.30	0.3	0.77	0.2	0.93	0.2
Diarrhoea	0.83	0.9	0.78	0.8	0.82	0.8	0.93	0.8
Heavy drinking	1.92	0.2	0.38	0.2	0.49	0.2	0.70	0.2

Discussion

This study identified an increased risk for visually disabling cataracts with unprotected daily exposure to UVR for at least one year. It was not possible to calculate the actual dose of UVR received by subjects in this study. An indirect estimate based on total daily sunlight hours of exposure was used as a measure of UVR exposures. It is a recognized indirect estimate as shown by previous studies.^{13,25} A positive association between UVR and cataracts has been identified by previous studies.^{6,7,13} The India-U.S case control study found a reduced risk for all types of cataracts and indices of larger amounts of lifetime cloud cover. The Chesapeake Bay study using estimate of annual ocular sunlight exposure from detailed occupational, hat and glasses use history with laboratory and field measurements of sunlight exposure found an increased risk for cortical cataracts with cumulative levels of UVR exposure. No risk was found for the other cataract types. The absence of risk with cortical cataract in this study may be due to the fact that some subjects with cortical opacities did not have visually disabling cataracts and were not selected as cases. A marginal increased risk for heavy smoking was found for cortical lens opacities but not at a statistically significant level, probably because of the

few subjects with cortical opacities for statistical analysis. Previous studies^{8, 15} have identified heavy smoking as a risk for cataract especially of the nuclear type. Absence of a strong risk (especially for nuclear cataracts) in this study may be related to misinformation by subjects or perhaps is a true reflection of the absence of heavy smoking practice amongst the studied population. Two case-control studies one in India⁶ the other in the United States¹⁷ did not find any significant association between smoking and cataract.

A reduced risk was found between heavy drinking and visually disabling cataracts but was increased for cortical opacities. The Oxfordshire⁸ and Beaver Dam¹⁷ studies found a positive association between heavy drinking and all types of cataracts. Other studies¹⁸ have found a J-shaped relationship, with higher risks among total abstinence and heavy drinkers compared to occasional drinkers. The J-shaped relationship was said to have suggested a protective effect of light drinking or possible misclassification of none drinkers. Protective effect of drinking on cataract formation in this study may have been due to misclassification in view of the stringent definition of heavy drinking used.

No risk was identified for cataract with severe life threatening diarrhoea in the study environment. Most

of the respondents had suffered from some form of diarrhoea in the past but not in the magnitude of that mentioned in the Raipur India study.²⁶ Another study, which has found no risk with diarrhoea disease, is the India-U.S.⁶ case control study, which defined diarrhoea as that lasting one day or more.

Prolonged use of topical steroids had an increased risk for PSC and mixed cataracts but not at a statistically significant level. This may be related to the fewer number of positive responses to the question of steroid use. One basic problem identified was the difficulty with eliciting the history of steroid use. Most of the respondents did not know the names or types of ocular medications they had used in the past. Previous studies^{18, 9,19} on prolonged use of large dose systemic steroids have identified a positive risk for cataract with steroids. There have also been reports of PSC with topical steroids.^{20,21} There is however scarcity of literature on controlled clinical studies involving topical steroids and cataract.

Hypertension had a marginally increased risk for cataracts but not at a statistically significant level. Previous studies have also found hypertension as a significant risk for cataract.^{6,22}

A case-control study by an urban health maintenance organisation²³ however did not find any risk between hypertension in those less than 60 years and cataract. The results may have been affected by the relatively young age of the population studied since essential hypertension is predominantly a disease of the aged.

Diabetes was identified as a strong risk factor for cataract in this study, particularly of the PSC and mixed types. Analysis of pooled data from 2 Oxfordshire studies²⁴ also showed a strong positive association with R.R of 5.04. A number of the studies⁸ on diabetes in the past have identified a positive association with cortical, posterior subcapsular and mixed cataracts. Lack of positive association with cortical opacities in this study may be related to the study methodology.

Conclusion and recommendations

This study set out to identify risk factors associated with visually disabling cataracts in the study environment. Ultraviolet radiation, topical steroids, hypertension and diabetes were found to be significant risk factors for cataract. Drinking of alcohol was found to be protective. No significant risk was found for diarrhoea and smoking. Use of hospital subjects has introduced selection bias in this study, to eliminate this in future studies a less biased method of random selection of controls from the community would need to be used.

The largest group of people involved in this study consisted of traders and farmers accounting for 58.8%

of all cases. They spend a large part of the day working outdoors unprotected from the ultraviolet radiation of sunlight. It is therefore recommended that the use of wide brimmed hat and sunshade be advocated for all outdoor workers to reduce the effective dose of UVR getting into their eyes. People also need to be educated on the side effects of topical steroid to prevent widespread abuse. For hypertension and diabetes it is recommended that people be encouraged to have regular check up to ensure early diagnosis.

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