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Risk Factors Associated with Development of Cataract

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Abstract.

Background: Cataract is the most common cause of reversible blindness worldwide, which has been associated with various causative risk factors. Hence, we aim to study the factors that might play a role in cataractogenesis.

Materials and methods. A total of 240 eyes of 240 subjects were included for the study, which consisted of 120 cases with a cataract and 120 matched controls, and in them various factors like blood pressure, body mass index (BMI), smoking, sun exposure, and serum cholesterol were studied.

Results: A statistically significant difference between the two groups. Subjects who were smokers, had a longer exposure to sun, and had higher serum cholesterol level were found to be positively associated with development of cataract. No significant association between BMI and blood pressure was observed.

Conclusion: Higher cholesterol levels, increased sun exposure, and smoking habit play a role in the development of cataract, and these are modifiable risk factors. Hence, control of these might help in delaying formation and progression of cataract.

Keywords: cataract, blindness, body mass index (BMI)

INTRODUCTION

Cataract is the most common cause of reversible blindness worldwide. According to the World Health Organisation (WHO), around 253 million people in the world are visually impaired, of whom 90% of the global burden of visual impairment is concentrated in developing countries [1].

Visual impairment caused by cataract leads to not only economic loss, but also impaired quality of life. Cataract is responsible for 50–80% of bilateral blindness in India [2–4]. Owing to its large impact and public health considerations, cataract has always been a target of Continuous epidemiologic research. Insights into causative factors amenable to intervention, genetic factors that predispose to disease, and avenues for novel treatment serve to reduce the disease burden [5].

Extensive research has established smoking, diabetes, and ultraviolet (UV) light exposure as the causative risk factors for age-related cataract, while recent studies have identified other potential risk factors like corticosteroid, exogenous oestrogen [6, 7], nutrition [8, 9], dietary fat and serum lipid [10, 11], and genetics [12, 13], which might play a role in the development and progression of cataract.The focus of identification of newer risk factors of cataract is basically driven by the underlying pathogenesis and pathophysiology behind the cataract. Cataractogenesis, is a multifactorial disease process that may be initiated or promoted by oxidative damage. Conversely, serum lipids have been shown to have a direct relationship with oxidative stress, and so they seem to play a causative role in the development and progression of cataract. Hence, this study was carried out to analyse the factors that potentially play a role in cataractogenesis.

MATERIALS AND METHODS:

This is a hospital-based case control study, carried out in the Department of Ophthalmology of Al-Hussain Teaching Hospital in Al-Muthanaa - Samawah-Iraq . Over a period of 6 months we recruited 240 subjects for the purpose of this study, which included 120 individuals aged below or above 50 years and 120-matched non-cataractous controls, after obtaining informed and written consent according to the Declaration of

Helsinki. ,smoking history, diabetes or hypertension, and patients with secondary cataract.

For the purpose of the study, detailed history regarding signs and symptoms of cataract, family history of cataract, history of any medicine intake and systemic disease that might influence cataract, any history of intraocular surgeries, and socioeconomic status was obtained. The patients were then subjected to systemic examination for height, weight, body mass index (BMI), blood pressure, and ocular examination for best corrected visual acuity by Snellen’s chart, and torch light and slit lamp examination. Evaluation of serum cholesterol was done by asking the patients ,if they are taking lipid lowering agents.

The statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. values, indicating the level of significance, were defined as significant ($p < 0.05$), highly significant

($p < 0.01$), and very highly significant ($p < 0.001$).

RESULTS:

The present study was carried out to assess the environmental risk factors in patients with cataract, and to understand their significance. For this purpose, a case-control study was planned in which 120 cases with cataract aged above50 years and 120 demographically matched healthy controls were enrolled and distributed into Group I and Group II, respectively.

Ages of patients in Group I ranged from 50 to 60 and from 60-70- and 70 or more-years old years. whereas those of controls ranged same. The majority of Group I (62.5%) as well as Group II (65.8%) subjects were aged 50–60 years. The mean age of cases was 62.23 ± 6.5 years and that of controls was 59.22 ± 7.15 years. Statistically, there was no significant difference between the two groups with respect to age ($p = 0.071$). In Group I the majority of patients were females (50.1%) whereas in Group II the majority were males (54.2%), and the male-to-female ratios in the two groups

were 1.03 and 0.96 respectively. The difference between two groups was not significant statistically (p = 0.292) (Tab. 1).

In Group I and II the BMI ranged either with normal built or above, it taken approximately. Numbers of subjects within normal body built in group I were 81 (67.5%) and subjects who are over-weight were 39 (32.5%) compared to group II , Numbers of subjects within normal body built were 89 (74.16%) , and subjects who are over-weight were 31 (25.83%). Statistically, there was no significant difference between two groups regarding their weight. TABLE 2

Regarding to Hypertension in group I , Number of subjects who are have Hypertension were 32 (26.66%), while subjects without Hypertension in same group were 88 (73.33%) . the results found there are no significant for Hypertension as risk factor of cataract TABLE 3.

In Group I, Subjects who are smoker were 42 (35%), while non-smoker subjects were 78 (65%). results found the smoking has not significant impact for development of cataract. TABLE 4.

The majority of Group I patients had duration of sun exposure > 6 hrs/week 82 (68.34%) , and patients with sun exposure <6hrs/week 38 (31.66%). Group II subjects with sun exposure > 6hrs/week were 53 (44.2%), whereas subjects with sun exposure < 6hrs/week were 67 (55.8%) .On comparing the data statistically, the difference between the two groups was found to be significant (p = 0.001)

TABLE 5.

In group I , Number of subject who had diabetic mellitus were 84 (70%) , while subjects who had not Diabetic mellitus were 36 (30%) . On comparing the data statistically, the difference between subjects in group I was found to be significant. Table 6

Table 1 .Age distribution cases and controls

	Group I (120)		Group II		
	numbers	Percentage	numbers	Percentage	statistics
50-60	75	62.5%	79	65.8%	T=1.72 P= 0.071
60-70	28	23.33%	31	25.8%	
70 - >70	17	14.16%	10	8.3%	X= 1.055 P= 0.292
M/f	1.03		0.96		
Mean age +_ sD	62.23 +_ 6.5 (50-70 or more)		59.22+_7.15 (50-78)		

Table 2 . BMI distribution

	Group I (120)	Group II (120)
normal	N= 81 (67.5%)	N= 89 (74.16%)
Over-weight	N= 39 (32.5%)	N= 31 (25.83%)

Table 3. hypertension / without hypertension Among group I

With Hypertension	32	26.66%
Without Hypertension	88	73.33%

Table 4 . smoker- Non smoker Amoung Group I

Smoker	N=42	35%
Non-smoker	N= 78	65%

Table 5 . Sun exposure Among Group I

	Group I		Group II		
	No	%	NO	%	
Exposure >6h / week	82	68.34%	53	44.2%	
Exposure <6H/ week	38	31.66%	67	55.8%	P=0.001

Table 6 Diabetic mellitus distribution among Group I.

	numbers	percentage
With Diabetic mellitus	84	70%
Without Diabetic mellitus	36	30%

DISCUSSION

Despite cataract being one of the most common causes of preventable blindness, there is limited understanding regarding the exact aetiology and pathogenesis. Cataract is often referred to as a multi etiological process. Laboratory investigations suggest that age-related cataract might result from oxidative stress after sunlight exposure [14]. Animal and observational studies suggest that a diet low in antioxidant micronutrients may increase the risk of lens opacification. Cholesterol levels have also been shown to produce oxidative stress [15]. Incidentally, cholesterol levels and cataract have both been shown to be age related, and hence a temporal relationship cannot be ruled out. Taking into account the oxidative stress-induced pathogenesis of cataract, it may be hypothesised that levels of antioxidant micro-nutrients might be lower while cholesterol levels might be higher among cataract patients. In order to test this hypothesis, the present study was planned as a case-control study in 120 patients. Serum total cholesterol levels were included as representative of an oxidative stress-inducing condition. The mean age of patients was 62.23 ± 6.5 years, and the majority were females (50.1%)

In the present study, the BMI of patients who are over -weight were 39 (32.5%) , Compared to the present study, Nourmohammadiet al. [16] found the mean BMI of patients to be 24.02 ± 4.10 kg/m2 , while Abbaszadeh et al. [16] reported a mean BMI of cataract patients of 25.04

± 3.69 kg/m2 . Compared to this, western studies report relatively high Nutritional Supplements and Age-related Cataract (CTNS) [16], the majority of patients were overweight (55%) and almost one quarter (23.6%) were obese. Karppi et al. [18] reported a mean BMI of cataract patients of 27.5 ± 4.4 kg/m2 in their study among the elderly Finnish population.

These findings in general suggest that while BMI could be a risk factor for cataract in western populations, it does not seem to be very significant in Asian populations. Bearing in mind the probable role of micronutrients in the determination of BMI, there could be differences in micronutrient levels among the controls were statistically matched to cases with respect to age, gender, and BMI, thus showing that these factors did not have a confounding effect.

In the present study, the majority of cataract patients were smokers (52.5%). Among smokers (n = 63) too, majority smoked 5–10 packs/year (46/63; 73.0%). In present study we excluded those smoking > 10 pack-years. Smoking is known to be a risk factor for development of age-related cataract [18]. Smoking might also induce oxidative stress [19] and affect the level of antioxidant micronutrients and lipids [20] under different health conditions. On the other hand, the proportion of smokers and those with smoking habit 5–10 packs/year was significantly lower in controls. These findings suggested that smoking habit was a confounding factor in our study.

In the present study, the majority of cases were 82 (68.34%) had sunlight exposure > 6 hrs/week as compared to 38 (31.66%) of controls. Thus, the proportion of those having sunlight exposure > 6 hrs/week was significantly higher in cases as compared to that in controls. Laboratory investigations have suggested that age-related cataract might result from oxidative stress after sunlight exposure [21-22]. The findings of the present study also validated this proposition.

We also investigated cholesterol levels among different types of cataract (posterior capsular, nuclear, and cortical cataract cases) but did not find a significant difference in cholesterol levels among different cataract types. Also, with respect to cholesterol levels, a number of studies supported that all types of cataract are affected by higher cholesterol levels too. However, Al-Talqani et al. [23] found that dyslipidaemia was associated significantly with nuclear and cortical cataract, but it was not associated significantly with posterior subcapsular cataract. Al-Talqani et al. [26] also found a significant association between the prevalence of dyslipidaemia ($p < 0.05$) with nuclear and cortical cataract, but it was not significant (> 0.05) for posterior subcapsular cataract.

CONCLUSION

The present study thus endorsed the findings that antioxidant micronutrients and cholesterol levels , sun exposure > 6 hrs/week , Diabetic mellitus play a significant role in causation of senile cataract, as proposed by various previous studies. The present study also highlighted that increased sun exposure and smoking habit could play a detrimental role in oxidative stress, which affected the antioxidant levels and lipid levels and thus played a role in the pathogenesis of cataract.

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