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Research article

ASSOCIATION BETWEEN REFRACTIVE ERRORS AND SENILE CATARACT IN RURAL AREA OF WESTERN MAHARASHTRA

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ABSTRACT

Purpose: To study the association between refractive errors and senile cataract in rural area of western Maharashtra. **Materials & Methods:** It is a prospective cross sectional study carried out on 420 eyes of 210 patients with senile cataract was included in the study. The age and sex of the patient, grade and the refractive status of the cataract of the eyes were recorded. The grade of the cataract was recorded by the LOCS III (Lens Opacities Classification System, version III). Refractive status was measured subjectively using retinoscope and refractive error for each eye was converted into spherical equivalent units. **Results:** The age variation in the study was between 60-85 years. The maximum number of patients was in the age group of 60-65 years. The spherical equivalent ranged between -3.0 D to +4.25D. 45.95% of the study population had a spherical equivalent between -2 to -1.73. 81% of the study population had a myopic refraction. 20% had a hypermetropic refraction. Percentage of patients with a score of nuclear opalescence and colour between 1.0-2.0 was 41.90%, between 2.1-3.0 was 26.67% and above 3.0 was 31.43%. Percentage of patients with a score of cortical cataract between 0.1-1.0 was 69.76% and with a grade between 2.1-3.0 was 26.91%. Percentage of patients with a score of posterior subcapsular cataract between 0.1-1.0 was 53.57% and with a grade between 2.1-3.0 was 39.05%. **Conclusion:** The myopic refraction was associated with nuclear, cortical and posterior subcapsular cataract and this refractive error was statically significant with nuclear, cortical and posterior subcapsular cataract.

Keywords: Cataract, Refraction.

INTRODUCTION

Cataract is defined as opacity within the clear lens inside the eye that reduces the amount of incoming light and results in deterioration of vision. Natural lens is a crystalline substance and a precise structure of water and protein to create a clear passage for light.

Cataract is one amongst the major cause blindness in India' accounting for nearly 50-80% of blindness in both eyes in the country^[1]. There are several known risk factors for cataract formation. These include individual factors like age, smoking, systemic factors like diabetes mellitus, environmental factors like

ultraviolet light exposure, trauma, dehydration and drugs like steroids^[2]. An additional hurdle arises from the fact that different types of cataracts may have different etiologies and risk factors which are difficult to measure. Cataract is often described as being similar to looking through a waterfall or waxed paper^[3].

Refractive errors are frequently associated with age related cataract. Myopia has been associated with cataract^[4]. It is a well known fact that nuclear cataract can cause myopic shift in some cases which accounts for the second sight in the elderly that provides

normal reading ability without glasses but distant vision worsens. The effect of posterior subcapsular cataract and cortical cataract on refractive error is less clear.

The present study evaluates the association between refractive status and senile cataract.

MATERIAL AND METHODS

Study was conducted at Department of Ophthalmology, in a tertiary care teaching hospital located in rural area of western Maharashtra. The study was carried out over a period of two years, from September 2012 to August 2014. Total 210 patients with 420 eyes fulfilling the inclusion and exclusion criteria were enrolled in the study.

Inclusion criteria: Patients above the age of 60 years with diminished vision. Patients of either sex. Patients ready to give informed consent.

Exclusion criteria:History of intraocular surgery, ocular trauma, Corneal scar or opacity, Known case of dry eye syndrome, Lens induced glaucoma. Patients with the following risk factors for cataract: uveitis, glaucoma and steroid medications. Patients with the following conditions which are likely to affect the refractive status of the eye: keratoconus, trauma, orbital mass, pterygium and eyelid mass such as chalazion. Cases where refraction cannot be carried out due to extreme media opacity will also be excluded. Patients with the chronic systemic illness.

Each patient documenting as per proforma:

1. Sociodemographic information.
2. Clinical findings like Vision, anterior segment examination, fundus examination.

Age, sex, grade of the cataract, the refractive status of the eye was recorded. The grade of the cataract was then be recorded by the LOCS III (Lens Opacities Classification System, version III)^[5] (Fig-1) and categorized as nuclear (Fig-2) and cortical (Fig-3) and posterior subcapsular type (fig-4).

After recording visual acuity, pupil will be dilated and funduscopy done by direct ophthalmoscope or 78D or 90D. The refractive status of the patient was evaluated by performing retinoscopy on dilated pupils. Pupillary dilatation was achieved by putting Phenylephrine or Tropicamide eye drops. Refractive status was measured objectively by trial and error method^[6].



Fig 1: LOCS III Classification

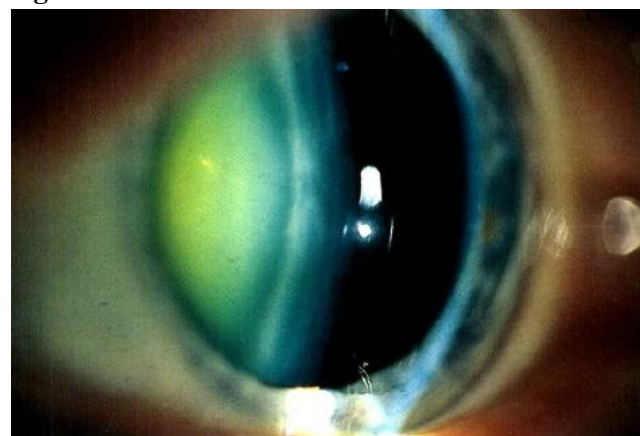


Fig 2: Nuclear Cataract

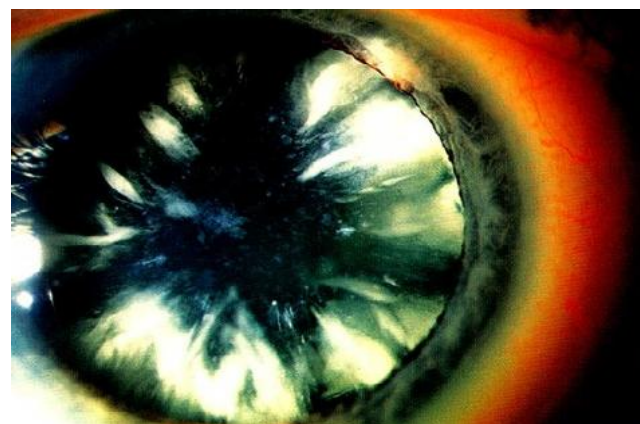


Fig3: Cortical Cataract

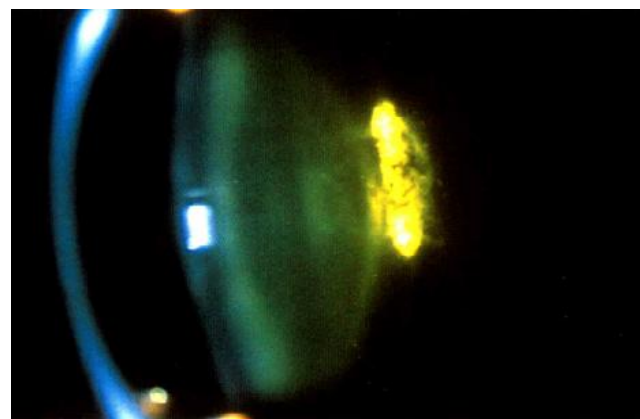


Fig4: Posterior subcapsular Cataract

RESULTS

Table 1: Age and sex wise distribution of cases studied

Age in years	Males	Females	Total
	No. (%)	No. (%)	No. (%)
60-65	59(63.44%)	83(70.94%)	142(67.62%)
66-70	19(20.43%)	26(22.22%)	45(21.43%)
71-75	13(13.98%)	2(1.71%)	15(7.14%)
76-80	0	6(5.13%)	6(2.86%)
81-85	2(2.15%)	0	2(0.95%)
Total	93(44.29%)	117(55.71%)	210(100%)

In the present study the age variation was from 60 to 85 years. Highest number of 142 patients were found in the age group of 60-65 years. (Table no.1)

There were 93 male and 117 female patients in the study group comprising of 44.29% and 55.71 % of the study population respectively.

Table 2: Nuclear Colour & Opalescence of cases studied

Nuclear Colour & Opalescence	Total no eyes	Percentage
	No.	(%)
1—2	176	41.90%
2.1—3.0	112	26.67%
> 3.0	132	31.43%
Total	420	100%
Mean ± SD	1.74 ± 0.47	

Out of the 420 eyes of 210 patients studied 176 patients (41.90%) had nuclear colour (NC)& (NO)between 1.0-2.0, 112 patients (26.67%) had NC& (NO) between 2.1-3.0 and 132 patients (31.43%) had (NC) & (NO) above 3.0. (Table -2)

Out of the 420 eyes of 210 patients studied 293 patients (69.76%) had cortical cataract between 0.1-1.0, 14 patients (3.33%) had cataract between 1.1-2.0 and 113 patients (29.91%) had cortical cataract above 2.1. (Table 3)

Table 3: Cortical Cataract of cases studied

Cortical cataract	Total eyes	Percentage
	No.	(%)
0.1-1.0	293	69.76%
1.1-2.0	14	3.33%
2.1-3.0	113	26.91%
Total	420	100
Mean ± SD	0.94±0.03	

Out of the 420 eyes of 210 patients studied 225 patients (53.57%) had Posterior subcapsular cataract between 0.1-1.0, 31 patients (7.38%)between 1.1-2.0 and 164 patients (39.05%) had PSC above 2.1.(Fig no-5)

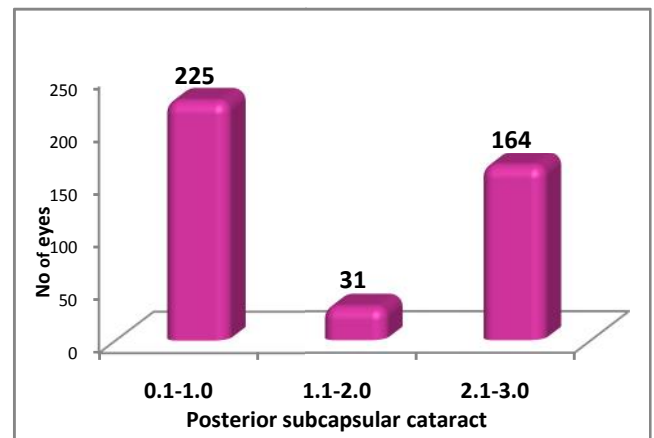


Fig 5: Posterior subcapsular cataract of cases studied

The pre-op refraction was expressed in terms of spherical equivalent. Spherical equivalent was calculated using the formula sphere (D) + ½ cylinder (D). The spherical equivalent ranged between – 3.0 to + 4.25 D. About 45.95 % of the study population had a spherical equivalent of -2 to -1 followed by 21.90% with a spherical equivalent of -1 to -0.5D.(Table 4)

Table 4: Spherical equivalent of cases studied

Spherical equivalent	Total eyes	Percentage
	No.	(%)
-3 to -2	25	5.95%
-2 to -1	193	45.95%
-1 to -0.5	92	21.90%
-0.5 to 0.5	26	6.20%
0.5 to 1	48	11.43%
1 to 2	19	4.52%
2 to 3	9	2.15%
3 to 4	4	0.95%
>4	4	0.95%
Total	420	100%
Mean ± SD	-1.04±0.027	

Definition:

Emmetropia: -0.5 TO +0.5 D

Myopia : LESS THAN -0.5D

Hypermetropia: MORE THAN +0.5D

73.81 % of the study population had a myopic refraction while only 20% had a hypermetropic refraction

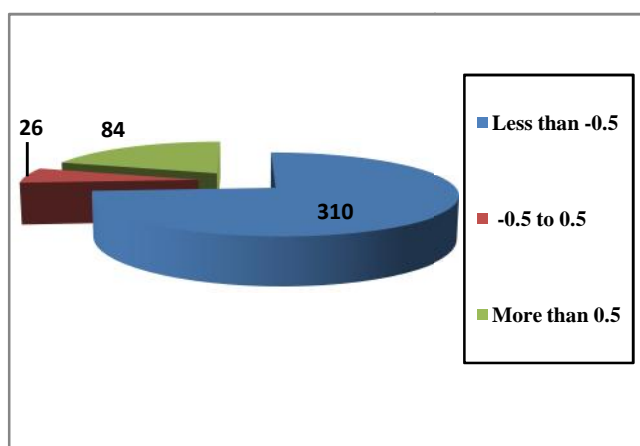


Fig 6: Spherical equivalent as per definition of cases studied

Association of Grading LOCS and Spherical Equivalence of patients studied

Statistically significant association was found for nuclear, cortical and posterior subcapsular cataract.

Table 5: Association of Grading LOCS and Spherical Equivalence of patients studied

LOCS	No. of patients	Mean \pm SD, Spherical equivalence	P value
Nuclear opalescence			
1.0 – 2.0	176	-1.23 \pm 0.05	$\chi^2 = 16.13,$ $p < 0.05$
2.1 – 3.0	112	-1.03 \pm 0.08	
> 3.0	132	-1.42 \pm 0.09	
Nuclear colour			
1.0 – 2.0	176	-1.23 \pm 0.05	$\chi^2 = 16.13,$ $p < 0.05$
2.1 – 3.0	112	-1.03 \pm 0.08	
> 3.0	132	-1.42 \pm 0.09	
Cortical cataract			
0.1 – 1.0	293	-1.34 \pm 0.06	$\chi^2 = 24.128,$ $p < 0.05$
1.1 – 2.0	14	-1.56 \pm 0.09	
2.1 – 3.0	113	-1.07 \pm 0.07	
Posterior subcapsular cataract			
0.1 – 1.0	225	-1.26 \pm 0.01	$\chi^2 = 26.415,$ $p < 0.05$
1.1 – 2.0	31	-1.31 \pm 0.05	
2.1 – 3.0	164	-1.56 \pm 0.07	

DISCUSSION

ASSOCIATION BETWEEN CATARACT AND SPHERICAL EQUIVALENT:

For nuclear cataract: In my study, 193 eyes had spherical equivalent between -2 to -1 and 92 eyes had spherical equivalent of -1 to -0.5. The mean spherical equivalent of -1.23 \pm 0.05D was found in the group with a score between 1.0-2.0 while the group with a score of more than 3.0 had -1.42 \pm 0.09D and mean spherical equivalent of -1.03 \pm 0.08 was found in the group between 2.1 to 3. Myopic refraction being

associated with nuclear cataract. This correlation was statistically significant.

In the study by Kubo et al^[7] mean spherical equivalent of -0.33 ± 4.06 D was found in the group with a score between 1.0-2.0 while the group with a score 4.0-5.0 had a spherical equivalent of -3.96 ± 5.8 D. In the Tanjong Pagar survey^[8] nuclear cataract was associated with a myopic refraction. Nuclear cataract was associated with myopia (-1.25 D vs -0.11 D, $p < 0.001$)

In the Beaver Dam Eye study^[9], myopia was related to prevalent nuclear but not cortical and posterior subcapsular cataracts. In Singapore Malay study^[10], myopia (spherical equivalent less than 0.5D) was associated with increased prevalence of nuclear cataract. In blue mountain eye study^[11], myopia subject who had worn distance glasses were more likely to have nuclear cataract. High myopia was associated with late nuclear cataract. In Tehran eye study^[12], myopia was significantly higher with nuclear cataract. High myopia seen in higher grade of nuclear cataract. **For cortical cataract:** In my study, 193 eyes had spherical equivalent -2 to -1 and 92 eyes had spherical equivalent -1 to -0.5. The mean spherical equivalent of -1.07 ± 0.07 D was found in the group with a score 2.1-3.0 and the group with a score of 1.1-2.0 has a spherical equivalent of -1.56 ± 0.09 D and mean spherical equivalent of -1.34 ± 0.06 was found in the group with score 0.1 to 1.0. Myopic association was found in cortical cataract and this correlation was statistically significant.

In the study by Kubo et al^[7], spherical equivalent of -1.96 ± 5.07 D was found in the group with a score of 1.0-2.0. The group with score 3.0-5.0 had a spherical equivalent of -0.97 ± 4.44 D. Thus myopic refraction was associated with cortical cataract in this study. In the Tanjong Pagar survey^[8] no refractive association was seen in cortical cataract. In the Beaver Dam Eye study^[9], cortical cataracts were possibly related to hyperopia. In blue mountain eye study^[11], high myopia was associated with cortical cataract. In Singapore Malay study^[10], myopia (spherical equivalent less than 0.5D) was not associated with cortical cataract. In Tehran eye study^[12], high percentage of hyperopia was significant in patient with cortical cataract. **For posterior subcapsular cataract:** In my study,

193 eyes had spherical equivalent between -2 to -1 and 92 eyes had spherical equivalent to -1 to -0.5. The mean spherical equivalent of -1.56 ± 0.07 was found in the group with a score of 2.1-3.0 and the mean spherical equivalent of $-1.26 \pm 0.01D$ was found in the group with a score of 0.1-1.0 and mean spherical equivalent of $-1.31 \pm 0.05D$ was found in the group with the score of 1.1 to 2. Myopic refraction was associated with posterior subcapsular cataract in this study. However there was statically significant correlation found.

In the study by Kubo et al^[7], mean spherical equivalent of $-1.85 \pm 5.09D$ was found in the group with score 3-5 and the mean spherical equivalent of $-0.97 \pm 4.39 D$ was found in the group with a score 1.0-2.0. In the Tanjong Pagar survey^[8], posterior subcapsular cataract correlated with myopic refraction. Posterior subcapsular cataract was associated with myopia, deeper anterior chamber, thinner lens, and longer vitreous chamber. In the Beaver Dam Eye study^[9], no refractive association was found with posterior subcapsular cataract. In Singapore Malay study^[10], Myopia (spherical equivalent less than 0.5D) was associated with increased prevalence of posterior subcapsular cataract. In blue mountain eye study, was supported by the finding of an association between current myopic refraction and PSC cataract (OR 2.5 ; CI 1.6-4.1). PSC was inversely associated with hyperopia. High myopia was associated with PSC. In Tehran eye study^[2], PSC shows a significantly higher prevalence of myopia.

Limitations of the study:

1. Prior refractive status of the patient could not be studied as many patients were presenting for the first time with the cataract.
2. Patients with early cataract could not be followed up to study the refractive changes as the cataract develops.

CONCLUSION

The myopic refraction was associated with nuclear, cortical and posterior subcapsular cataract and this refractive error (spherical equivalent) was statically significant with nuclear, cortical and posterior subcapsular cataract.

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Conflict of Interest: Nil

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