

# Systemic Associations of Socio-Demographic Profile of Cataract Patients and Grades of Cataract

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## Introduction

Cataract remains one of the major leading causes for avoidable blindness in the world. According to the latest survey, cataract is responsible for 51% of world blindness. In the Blue Mountains Eye Study (BMES) population, 72% of participants developed cataract in one or both eyes during a 10-year follow-up period, emphasizing the frequency of this age-related condition and its public health importance [1]. Surgery remains the only effective treatment. Main risk factors in the developed world, besides advanced age, appear to be smoking [2], exposure to sunlight [3], and use of corticosteroids [4-6]. A potential association between female gender and cataract remains controversial [7,8]. Although surgical techniques and subsequent outcomes have greatly improved in recent years, the economic cost of cataract surgery is high, so that recognition of modifiable risk factors could potentially reduce its economic burden. Improved understanding of risk factors for cataract would also help to identify high-risk groups and could assist eye health-care planning.

The prevalence of Diabetes Mellitus (DM) is increasing on a daily basis, with the International Diabetes Federation estimating that there will be 439 million DM patients by 2030. An aging population and longer patient life expectancy also mean that the prevalence of DM will exceed 33% by 2050. DM can lead to pathologies in many tissues in the eye structure, with both a systemic chronic metabolic disease and a microangiopathic character. Cataract is one of the major causes of visual impairment in diabetic patients [9]. Patients with DM are reported to be up to five times more likely to develop cataract, in particular at an early age [10,11]. Due to the increasing prevalence of DM, the incidence of diabetic cataracts has also risen. Hypertension is considered to cause elevation of inflammatory cytokines such as tumor necrosis factor-alpha (TNF- $\alpha$ ), interleukin-6 (IL-6) [12]. Besides, an elevation of C-Reactive Protein (CRP) level has been detected when individual blood pressure raises [12,13]. Considering that cataract is closely related to intense systemic inflammation [14-16], hypertension is therefore involved in the pathological pathway of cataract development through an inflammatory mechanism.

Cataract is although a localized ocular disease, however a variety of mechanism like inflammation, accumulation of advanced glycation end products and oxidative injury establish a link between cataract and atherosclerosis.

## Material and Methods

This study includes 300 cataract patients attending the Outpatient Department of Ophthalmology of our tertiary center. This study is a hospital-based case-control study.

Patients of cataract of different grades aged >40 years attending Ophthalmology OPD of our tertiary health center were included. Patients with ocular disorders such as glaucoma, undergone any intra-ocular laser treatment or intra-ocular injection in the past 3 months, patients with any previous ocular trauma, any previous cataract surgery with subluxated lens, posterior synechiae, undulating or small pupil were excluded from the study.

Patients were segregated into two groups using basic pre-operative investigations such as Blood Sugar levels, blood pressure, Electrocardiogram and proper history. The first group included patients who were pre-diagnosed with systemic disorders like Hypertension, Diabetes Mellitus and cardiac disorders. The second group had patients with deranged blood sugar levels, abnormal ECG and high blood pressure who were not diagnosed previously. Informed consent was obtained from all the patients. All the patients were given freedom to withdraw from the study if they wished so.

Snellen's chart was used for measuring best corrected visual for both the eyes which was followed by torch light examination, distant direct ophthalmoscopy, slit lamp examination, fundus evaluation by direct ophthalmoscope and fundus photography by Zeiss. Intraocular Pressure (IOP) was measured using Goldmann's Applanation Tonometer. Grading of cataract was done using slit lamp examination. Subsequent to preliminary demographic and medical evaluation and history taking, all the patients were subjected to anthropometric and hemodynamic assessment.

The data was analyzed using Statistical Package for Social Sciences, version 21.0 or above.

## Observation and Results

The study included 300 cataract patients of various age groups in which 128 were newly diagnosed with systemic illness (Systemic Hypertension, Diabetes Mellitus and Cardiac illness) and rest 172 came to the OPD pre diagnosed with the above-mentioned systemic disorders.

Out of the 300 patients 147 were males and 153 females, newly

| SNO         | CHARACTERISTICS             | NEWLY DIAGNOSED (N=128) | PREVIOUSLY DIAGNOSED | PERCENTAGE (NEWLY DIAGNOSED) | P VALUE                       |
|-------------|-----------------------------|-------------------------|----------------------|------------------------------|-------------------------------|
| 1.          | GENDER                      |                         |                      |                              | $\chi^2=2.462$ ; $p=0.117$    |
|             | MALE                        | 56                      | 91                   | 43.75                        |                               |
|             | FEMALE                      | 72                      | 81                   | 56.25                        |                               |
| 2.          | GRADE OF CATARACT           |                         |                      |                              | $\chi^2=9.065$ ; $p=0.028$    |
|             | PSC                         | 22                      | 24                   | 17.18                        |                               |
|             | IMSC                        | 90                      | 104                  | 70.31                        |                               |
|             | MSC                         | 07                      | 27                   | 5.47                         |                               |
|             | HMSC                        | 09                      | 17                   | 7.03                         |                               |
|             | <b>128</b>                  | <b>172</b>              |                      |                              |                               |
| 3.          | LOCALITY                    |                         |                      |                              | $\chi^2=0.338$ ; $p=0.561$    |
|             | RURAL                       | 75                      | 95                   | 58.59                        |                               |
|             | URBAN                       | 53                      | 77                   | 41.40                        |                               |
| 4.          | SMOKING                     | 41.41                   |                      |                              | $\chi^2=6.435$ ; $p=0.040$    |
|             | HEAVY SMOKER                | 19                      | 16                   | 14.84                        |                               |
|             | LIGHT/MODERATE SMOKER       | 53                      | 56                   | 41.41                        |                               |
|             | NON-SMOKER                  | 56                      | 100                  | 43.75                        |                               |
| 5.          | AGE                         |                         |                      |                              | $\chi^2=18.8$ ; $p=0.016$     |
|             | 40-45 Years                 | 7                       | 4                    | 5.46                         |                               |
|             | 46-50 Years                 | 16                      | 14                   | 12.5                         |                               |
|             | 51-55 Years                 | 18                      | 21                   | 14.06                        |                               |
|             | 56-60 Years                 | 23                      | 24                   | 17.96                        |                               |
|             | 61-65 Years                 | 34                      | 40                   | 26.56                        |                               |
|             | 66-70 Years                 | 17                      | 21                   | 13.28                        |                               |
|             | 71-75 Years                 | 3                       | 24                   | 2.34                         |                               |
|             | 76-80 Years                 | 6                       | 18                   | 4.68                         |                               |
| 81-85 Years | 4                           | 6                       | 3.12                 |                              |                               |
| 6.          | BMI                         |                         |                      |                              | $\chi^2 = 10.880$ ; $p=0.004$ |
|             | 18.5-24.9 kg/m <sup>2</sup> | 35                      | 77                   | 27.34                        |                               |
|             | 25.0-29.9 kg/m <sup>2</sup> | 84                      | 90                   | 65.63                        |                               |
|             | ≥30 kg/m <sup>2</sup>       | 9                       | 5                    | 7.03                         |                               |

diagnosed were 56 males and 72 females and rest 91 males and 81 females were pre diagnosed with systemic disorders. ( $p=0.117$ )

4 groups of patients were made on the basis of grade of cataract, 46 of them had Posterior Subcapsular cataract in which 22 of them were newly diagnosed and 24 were previously diagnosed. 194 patients had immature senile cataract in which 90 of them were newly diagnosed and 104 were previously diagnosed with systemic diseases. The group of mature senile cataract consisted of 34 patients in which only 7 of them were newly diagnosed and the rest 27 were pre-diagnosed. 26 patients were diagnosed as hyper mature senile cataract and in them 9 of them were newly diagnosed and remaining 17 were

previously diagnosed with systemic illness ( $p=0.028$ ).

Patients were also divided into groups on the basis of their locality, 170 of them were from rural background and the rest 70 were from urban areas, In the patients who came from the rural areas, 75 were newly diagnosed and 95 were previously diagnosed with systemic illness while in the urban population 53 were newly diagnosed and the rest 77 were previously diagnosed ( $p=0.561$ ).

Smoking was also taken as a criteria and patients were divided into 3 groups, in total 44 were heavy smokers, 114 were light/moderate smokers and the rest 142 were non-smokers. In the category of heavy smokers 15 of them were newly diagnosed and 29 were previously diagnosed with systemic illness where

as in the light/moderate category of smokers 53 were newly diagnosed and 61 were pre diagnosed. Lastly 60 of the newly diagnosed were non-smokers and the rest 82 of the non-smokers were pre diagnosed. ( $p=0.365$ )

Newly and previously diagnosed patients were also divided on the basis of their BMI (Body Mass Index) 112 patients were in the range of 18.5-24.9 (Normal BMI), 174 were in the range of 25.0-29.9 (Overweight), and 14 patients were having of BMI of more than 30 (Obese), In them 47 patients with normal BMI were newly diagnosed and 65 were previously diagnosed. 75 out of 174 overweight patients were newly diagnosed and 99 of them were previously diagnosed. Only 6 were newly diagnosed and 8 were pre-diagnosed among the obese patients. ( $p=0.982$ ) Grouping was also done on the basis of age of the patients, in the age group of 40-45 years 7 were newly diagnosed and 4 were previously diagnosed and in the age group of 46-50 years 16 were newly diagnosed and 14 pre diagnosed. Age group of 51-55 years consisted of 18 newly diagnosed and 21 pre diagnosed and 56-60 years consisted of 23 newly diagnosed and 24 pre diagnosed. Maximum were in the age group 61-65 years which consisted of 34 newly diagnosed and 40 pre diagnosed. In the age group of 66-70 years 17 were newly diagnosed and 21 were pre diagnosed with systemic illness. The age group of 71-75 consisted of only 3 newly diagnosed and 24 pre diagnosed whereas the age group of 76-80 years consisted of 6 newly diagnosed and 18 previously diagnosed. And lastly the age group of 81-85 years consisted of only 4 newly diagnosed and 6 pre diagnosed. ( $p=0.016$ )

## Discussion

The results of the present analysis showed that hypertension was associated with an increased risk of cataract without regard for cataract types. An increased incidence of PSC related to hypertension was also revealed Many studies suggested that hypertension is linked to cataract development in part because of anti-hypertension medications. Cumming et al [16]. reported a significant association between cataract risk and potassium-sparing diuretics, which is biologically plausible, as this kind of anti-hypertension medications can disturb the electrolyte balance across the lens fiber membrane [17].

Lee SM, et al [18]. have found in their study that systemic hypertension induces change in the protein conformational structures of the lens capsule, then cause altered membrane transport and permeability of ions and result in exacerbation of cataract formation. This could be one of the mechanisms by which hypertension plays a role in cataract formation.

Furthermore, the cataract patients undergoing cataract surgery were associated with a higher risk of IHD [19]. Although cataract is a localized ocular disease, increasing studies support the link between cataract and atherosclerosis [20-24] A variety of mechanisms was involved, including inflammation, accumulation of advanced glycation end products, and oxidative injury [19].

Due to the increasing prevalence of DM, the incidence of diabetic cataracts has also risen.

Osmotic stress as a result of extensive swelling of the cortical lens fibers is another compounding mechanism in the rapid development of cataracts, especially in young patients with type 1 DM [25-27]. In 95% of type 1 diabetics and 60% of type 2

diabetics with disease duration longer than 20 years, signs of diabetic retinopathy occur. More severe cases of proliferative diabetic retinopathy are seen in patients suffering from type 1 diabetes [28].

A positive association was also found between smokers and development of cataract [29]. The association was stronger among current smokers than past smokers. Firstly, oxidative damage appears to have a major role in cataract formation [30]. The analysis indicated that current smokers are at higher risk of incident than past smokers.

## Conclusion

The study highlights latent cases of systemic illness while being evaluated for cataract. These results suggest a positive significance between grade of cataract and systemic illness. Most newly diagnosed cases of systemic illness were IMSC and least were MSC. Some of the non-smokers were newly diagnosed with presence of systemic illness, heavy smokers were mostly previously diagnosed. Our study helped in identifying the undiagnosed patients of various systemic illness such as hypertension, diabetes mellitus, and various cardiac disorders and aided in preventing their progression by referring them to the concerned department for further evaluation. Furthermore, this study at a large-scale level will help in early diagnosis and better treatment of the disease

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