



## INFLUENCE OF HYPERTENSION ON THE AGE OF OCCURRENCE OF SENILE CATARACT.

### Physiology

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### ABSTRACT

Cataract is an important cause for blindness worldwide. Nowadays, hypertension is on increasing trends. This study is aimed to assess the influence of hypertension on the age of occurrence of senile cataract. Study group includes BMI matched, male, bilateral immature senile cataract persons. Among them controls were 50 persons with normal blood pressure and cases were 50 patients with newly diagnosed hypertension, as per JNC 7 criteria. The age factor was compared between the two groups by Student's t test. The mean age was 65.84 years among controls and 60.92 years among hypertensives which is 4.92 years earlier, comparing the controls (p value - 0.0001). It is inferred that the occurrence of senile cataract is at an early age in patients with hypertension, comparing the normotensive persons.

### KEYWORDS

Senile Cataract, Hypertension, Age.

### INTRODUCTION

Vision is an important sense for the wellbeing of a person. Visual impairment is a universal public health problem. Out of the estimated 45 million cases of global blindness, India has 12 million blind people.<sup>1,2</sup> Cataract is one of the leading cause of visual impairment and blindness worldwide. In India, as per the reports of the National Programme for Control of Blindness, the annual incidence of cataract is estimated to be 3.8 million and is responsible for 80.1% of blindness.<sup>3</sup>

Cataract is the opacification of the natural crystalline lens which focusses the light entering the eye on to the retina. This cloudiness diminishes the vision and leads onto blindness. The most common type is the senile cataract which is the cataract occurring in people above 50 years of age unrelated to known mechanical, chemical or radiational trauma.

The pathogenesis of senile cataract is multifactorial. The risk factors associated with it are ageing, gender, heredity, socioeconomic status, dietary factor, physical activity, diabetes mellitus, hypertension, smoking, alcohol, irradiations, metabolic syndrome, dehydrational crisis, corticosteroids and abdominal adiposity.<sup>4</sup>

Hypertension is an iceberg disease, challenging the medical society. Hypertension has been expected to increase up to 1.56 billion (60%) by 2025.<sup>5</sup> Hypertension is a known risk factor for ischemic heart disease, peripheral vascular disease, stroke, atherosclerosis, chronic kidney diseases, dementia and cognitive impairment. Studies have proved that hypertension exacerbates cataract formation by inducing changes in lens metabolism.

In a developing country like India, modification of the risk factors which might prevent or simply delay the onset and progression of senile cataract can reduce the burden imposed on the medical society by this global visual problem. This study is carried out to assess the influence of hypertension on the age of occurrence of senile cataract.

### METHODS

This is a cross sectional study done in the Institute of Physiology, Madurai Medical College, Madurai in collaboration with Department of Ophthalmology, Government Rajaji Hospital, Madurai after obtaining clearance from Ethical Committee Madurai Medical College and Government Rajaji Hospital, Madurai.

This study was done on a sample of 100 BMI matched, male, bilateral immature senile cataract persons selected from the Ophthalmology Department, after recording clinical history, anthropometric measurements and doing the general & ocular examination. Controls were 50 senile cataract persons without hypertension. Cases were 50 senile cataract patients with newly diagnosed hypertension. The mean age of occurrence of senile cataract between the controls and the cases was compared.

Body Mass Index was computed as the body weight in kilograms

divided by the square of the height in meters using Quetelet's Index. Measurement of blood pressure was done using the standardized mercury sphygmomanometer, on the left arm of the subjects. Cases with systolic blood pressure  $\geq 140$  mm of Hg and/or diastolic blood pressure  $\geq 90$  mm of Hg, recorded on two separate occasions were considered as hypertensives as per JNC 7 criteria.<sup>6</sup>

### Inclusion criteria:

Male, Senile cataract patients of age > 50 years.

### Exclusion criteria:

Persons less than 50 years of age, female, smokers, alcoholics, patients with glaucoma, corneal pathology, abnormalities of lens other than cataract, retinal pathology, vitreous disturbances, eye injuries, patients who have undergone any intraocular procedures, diabetes mellitus, patients on treatment for hypertension & intake of drugs that interfere with blood pressure like glucocorticoids and patients with other systemic diseases.

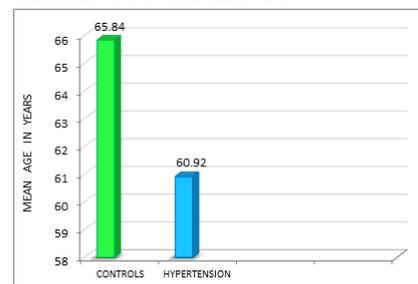
### RESULTS AND OBSERVATION

**TABLE-1: THE MEAN AGE, SYSTOLIC AND DIASTOLIC BLOOD PRESSURE AMONG THE SENILE CATARACT STUDY GROUP**

STUDY GROUPS	Mean Age (Years)	Mean Systolic Blood Pressure (mm Hg)	Mean Diastolic Blood Pressure (mm Hg)
CONTROLS	65.84 $\pm$ 4.103	111.60 $\pm$ 8.825	79.16 $\pm$ 4.316
CASES	60.92 $\pm$ 3.652	154.52 $\pm$ 13.382	93.84 $\pm$ 5.140

The mean systolic blood pressure for the controls is 111.60 mm of Hg and for the cases is 154.52 mm of Hg. The mean diastolic blood pressure for the controls is 79.16 mm of Hg and for the cases is 93.84 mm of Hg. The mean age of occurrence of senile cataract for the controls is 65.84 years and for the cases is 60.92 years.

**FIGURE -1: DISTRIBUTION OF MEAN AGE AMONG THE SENILE CATARACT STUDY GROUPS**



### COMPARISON OF AGE FACTOR

Student's t test was conducted to compare the mean age between the senile cataract study groups using SPSS software version 20.  $p < 0.05$  is considered as statistically significant.

**TABLE-2: COMPARISON OF MEAN AGE AMONG THE SENILE CATARACT STUDY GROUPS**

STUDY GROUPS	N	Mean	SD	Mean difference	Std. Error	sig	95% CI	
							Lower Bound	Upper Bound
CONTROLS	50	65.84	4.103	-	-	-	-	-
CASES	50	60.92	3.652	4.920*	.694	.0001	3.12	6.72

The mean age is 4.92 years earlier for the senile cataract patients with hypertension (Mean = 60.92, Standard Deviation=3.652) when compared to the controls, which is statistically significant [ $p=0.0001$ ]. The above details are shown in Table: 2 and Figure: 1.

## DISCUSSION

The mechanism for early onset of senile cataract in hypertensive patients may be explained by an elevated arterial pressure producing modification in the protein structures in the lens capsule. This causes alteration in membrane transport of the lens capsule by changing permeability for ions. These changes finally lead onto an increase in the intraocular pressure. This results in the exacerbation of cataract formation.<sup>7</sup>

This mechanism of cataractogenesis is supported by the research done in the *Nakano mouse*, in which hypertension caused a decrease in  $Na^+ K^+ ATPase$  activity in the lens epithelium leading onto cataract. Also experiments with the  $Na^+ K^+ ATPase$  inhibitor drugs caused changes in the ionic transport across the lens which resulted in lens opacification.<sup>8</sup> Elevated plasma levels of TNF- $\alpha$  and IL-6 occurring in hypertension is related to severe systemic inflammation with increased levels of C-reactive protein which also promotes cataract development.<sup>9</sup>

In this study, the mean age of occurrence of senile cataract for the controls is 65.84 years and that for hypertensive patients is 60.92 years. The elevation in blood pressure is found to influence the occurrence of senile cataract by 4.92 years earlier in hypertensives comparing the controls.

Study done by Muhammad Shakil et al.<sup>10</sup> showed that the mean age for cataract in patients with hypertension is 61.43 years and that for controls is 61.45 years which is not much in accordance with this study. This may be explained by the geographical variation, changes in the life style and dietary factors among that study group. The results of the present study are consistent with the Framingham eye study,<sup>11</sup> the India-US case control study,<sup>12</sup> and the Barbados eye study,<sup>13</sup> studies by M Sharma et al.<sup>14</sup>, Nouraddin Sharifi et al.<sup>15</sup> and an association of systemic hypertension with senile cataract has been found.

From the above observations, this study supports the view that hypertension is an important modifiable risk factor influencing the early onset of senile cataract.

## LIMITATIONS

As the cases were selected from hospital, the study sample may not be the representative of general population. This is a cross sectional study, so strong conclusion cannot be made. To authenticate the results a large scaled longitudinal study is preferable.

## CONCLUSION

The results from this study infer that the occurrence of senile cataract is at an early age in the study groups with hypertension comparing the controls. Hypertension, which is on increasing trend in the current scenario is also a primary risk factor for senile cataract. Routine screening, early diagnosis and proper medical management of hypertension can also reduce and postpone the development of senile cataract. This would be important both for improving the wellbeing of older individuals and reducing medical care costs.

## REFERENCE:

1. National programme for control of blindness. Chandhigarh: DGHS, Government of Punjab; 2010. [Accessed on 2010 Aug 12;]. Directorate general of health services. Available from: [pbhealth.gov.in/pdf/Blindness.pdf](http://pbhealth.gov.in/pdf/Blindness.pdf).
2. Ramesh Verma, Pardeep Khanna, Shankar Prinja, Meena Rajput and Varun Arora. The National Programme for Control of Blindness in India. *Australas Med J*. 2011; 4(1): 1-3. Published online 2011 Jan 31. doi: 10.4066/AMJ.2011.505.PMCID: PMC3562965. PMID: 23393496.
3. Vajpayee RB1, Joshi S, Saxena R, Gupta SK. Epidemiology of cataract in India: combating plans and strategies. *Ophthalmic Res*. 1999; 31(2):86-92.
4. Risk Factors for Age-related Cataract- a prospective cohort study. Birgitta Ejdevik Lindblad, 2008, Karolinska Institutet, Stockholm, Sweden. ISBN 978-91-7409-199-1

5. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: Analysis of worldwide data. *Lancet*. 2005; 365:2172-23.
6. Chobanian AV; Bakris GL; Black HR; Cushman WC; Green LA; Izzo Jr. JL et al. The Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report. *JAMA* 2003; 289:2560-2572.
7. Lee SM, Lin SY, Li MJ, Liang RC. Possible Mechanism of Exacerbating Cataract Formation in Cataractous Human Lens Capsules Induced by Systemic Hypertension or Glaucoma. *Ophthalmic Res*. 1997; 29:83-90.
8. Miller D, Tijerine ML, Mayman C. In vitro production of steroid cataract in bovine lens: Part I. Measurement of optical changes. *Acta Ophthalmol*. 1979; 7: 1101-1106.
9. Bautista LE, Vera LM, Arenas IA, Gamrara G. Independent association between inflammatory markers (C-reactive protein, interleukin-6, and TNF-alpha) and essential hypertension. *J Hum. Hypertension* 2005; 19:149-154.
10. Shakil M, Ahmed ST, Samiullah S, Perveen K, Sheikh S, Humaira A, Khoja A. Influence of hypertension and diabetes mellitus on senile cataract. *Pak. J Physiol*. 2008; 4(2):30-32.
11. Kahn HA, Leibowitz HM, Ganley JP. The Framingham Eye Study II. Association of Ophthalmic Pathology with single variable previously measured in the Framingham Heart Study. *Am J Epidemiol*. 1977; 106(1):33-41.
12. Mohan M, Sperduto RD, Angra SK et al. India-US case-control study of age related cataracts. India-US Case Control Study Group. *Arch Ophthalmol*. 1989; 107:670-76.
13. Leske MC, Wu SY, Hennis A, Connell AM, Hyman L, Schachat A. Diabetes, hypertension and central obesity as cataract risk factors in a black population: The Barbados eye study. *Ophthalmology* 1999; 106(1):35-41.
14. M Sharma, D Kumar, C Mangat, V Bhatia. An Epidemiological Study Of Correlates Of Cataract Among Elderly Population Aged Over 65 Years In Ut, Chandigarh. *The Int. J of Geriatrics and Gerontology*. 2008;4(2)
15. Nouraddin Sharifi, Vahid Alinejad, Vafa Samarai. Frequency of Diabetes Mellitus, Hypertension and Obesity in Patients with Cataract Surgery in Urmia Imam Khomeini Hospital. *Journal of Ardbil University of Medical Sciences and Health Services* 1383 (3), 2013; 102(12)48-53.