

## Study of Intraocular Pressure (IOP) Changes in Relation Blood Pressure

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### Abstract

*Background:* IOP is one of the vital factors whose maintenance within normal limit is essential for serve its normal function. IOP is influenced by various factors like smoking, alcohol, hypertension, sex hormones, pregnancy, medications etc. This study is undertaken to find out the effect of hypertension on IOP changes. *Methodology:* A total number of 200 people with age group of 40 to 60 were included in the study. They were divided into two groups of each 100 normotensive and hypertensive. IOP was recorded in all individuals and was compared between two groups by using student t test. A P- value of <0.05 was taken as a statistically significant. *Results:* Our study showed that there was a significant increase in IOP in hypertensive patients compared to normotensive patients. *Conclusion:* There is a positive correlation between IOP changes in relation to blood pressure. So it needs to undergo regular eye check up for those patients with hypertension for early detection of glaucoma which is second leading cause of blindness.

**Keywords:** IOP; Blood Pressure.

### Introduction

Intraocular pressure (IOP) is one of the vital factors, whose maintenance within normal limits is essential for the eye to serve its function [1]. The average normal IOP is about 15mm Hg (12 to 20 mm Hg) [2].

IOP is influenced by various factors like exercises, fluid intake, medications alcohol, smoking, hypertension, sex hormones and pregnancy [3]. Elevated IOP causes a mechanical stress situation leading to damage of neurons in retina and their axons resulting in progressive loss of visual field and blindness [4].

Changes in IOP are directly and significantly associated with changes in systemic blood pressure with the age. Increase in IOP leads to glaucoma. Glaucoma is second only to cataract as leading cause of blindness [5].

Population based study have revealed prevalence of glaucoma in India to be 11.9 million and 60.5 million in the world by the year 2010 out of which approximately half are undiagnosed [6,7]. The people with hypertension have more chance to develop

glaucoma than with normotensive patients. So control of IOP within the normal range is necessary.

There are lot of causes for glaucomatous optic nerve damage among them raised IOP is one risk factor that can be modified by medical and surgical intervention [8-12]. So if ocular hypertension detected early and treated in time, its progression to irreversible blindness can be prevented.

This study is under taken to find out relationship between IOP changes and blood pressure.

### *Aims and Objectives*

Study the correlation between systemic blood pressure and intra ocular pressure.

### **Material and Methods**

our study included total 200 patients with age group of between 40 to 60 years. They were divided into two groups of each 100 normotensive and hypertensive. Recent classification for blood pressure

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is as follows, normotensive – systolic blood pressure <120mmHg and diastolic <80mmHg, prehypertensive – systolic blood pressure 120-139mmHg and diastolic 80 – 89mmHg, hypertensive – systolic blood pressure > 140mmHg and diastolic blood pressure >90mmHg. Patients with history of ocular trauma, ocular surgeries, refractive errors, medical and surgical illness, smoking, diabetes, family history of glaucoma and on medications like beta blockers, diuretics and hormonal replacement therapy were excluded from the study.

IOP is measured in each eye using GoldmannApplanation tonometer, average of three reading taken. All the recordings were taken in the morning hours between 10.30 AM to 12.20 PM to maintain constancy of testing and to prevent anydiurnal variations in IOP. Blood pressure is measured in right arm supine position by using manual sphygmomanometer, average of three reading were taken. Analysis was done using the SPSS software package. Results on continuous measurements are presented as Mean±SD and results

on categorical measurements are presented as %. Significance was assessed at 5% level of significance. Student t test (two tailed, independent) was used to find the significance of study parameters between two groups.

## Results

Among total number of 100 normotensive patients 42 males and 58 females, and in 100 hypertensive patients 48 males 52 female (Table 1). The mean systolic blood pressure (SBP) 116.85±.8mmHg and diastolic blood pressure (DBP) 72.25±.0mmHg in normotensive group and mean systolic blood pressure 1487±.6mmHg and diastolic blood pressure 88.17±.2mmHg in hypertensive group (Table 2).

The mean IOP in normotensive group was 13.212±.41mmHg and in hypertensive group was 17.722±.68mmHg. The mean IOP was found to increase with increase in blood pressure this difference was statistically significant (p<0.001).

Table 1:

	Males	Females	Total
Normotensive	42	58	100
Hypertensive	48	52	100

Table 2:

Variables	Normotensive Mean ± SD#	Hypertensive Mean± SD	P value
Age (years)	48.682±.54	49.422±.15	0.14
Weight (kg)	57.007±.42	55.707±.40	0.221
SBP (mmHg)	116.85±.8mmHg	1487±.6mmHg	<0.001
DBP (mmHg)	72.25±.0mmHg	88.17±.2mmHg	<0.001
IOP ( mmHg)	13.212±.41mmHg	17.722±.68mm Hg.	<0.001

# - standard deviation (SD)

## Discussion

The IOP is widely regarded as the most important modifiable risk factor which is associated with the development of glaucomatous optic neuropathy [8-12]. So the factors that influence the IOP and its measurement are of great relevance in understanding pathogenesis of disease.

Our study showed there is positive correlation between increased in IOP in relation increase in systolic and diastolic blood pressure. The Beaver Dam Eye Study showed there is positive relation between

raise in IOP in relation to rise in systolic and diastolic blood pressure [13]. Other study which shows similar positive correlation between IOP systemic blood pressure are Leske MC et al The long island glaucoma case control study showed that association between IOP and systemic blood pressure [14]. Foster PJ et al The Tajongpagar study concluded that IOP estimates are related to systemic blood pressure and corneal thickness [15]. Seddon JM et al Retrospective case control study showed that ocular hypertensive patients have history of systemic hypertension more frequently than ocular normotensive patients [16]. Mclloed SD et al this study indicates that changes in

intraocular pressure over time are associated with changes in systolic blood pressure and that intraocular pressure does not necessarily increase with age [17]. Hennnis A et al Population based cohort study showed that increased risk of elevated IOP in populations with high prevalences of diabetes and hypertension [18].

The role of hypertension in development and progression of glaucoma and pathophysiological basis for relationship between blood pressure and IOP remains not known. It has been proposed that positive correlation between blood pressure and IOP is related to increased blood pressure leading to increased aqueous humour ultrafiltration by means of increased ciliary arterial pressure, and thus an increase in IOP [19,20]. Role of common physiological factor such as age related increase in sympathetic tone also have been proposed conversely.

### Conclusion

There is a positive correlation between IOP changes in relation to blood pressure. IOP is the only modifiable risk factor that can be used to prevent progressive glaucomatous optic neuropathy. So it needs to undergo regular eye check up for those patients with hypertension for early detection of glaucoma which is second leading cause of blindness.

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