

Variation of Intraocular Pressure with Age and Gender

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ABSTRACT

Background: Intraocular pressure (IOP) is the fluid pressure inside the eye. Tonometry is the method, eye care professionals, use to determine this. IOP is an important aspect in the evaluation of patients at risk of glaucoma. Intraocular pressure usually increases with age and is genetically influenced.

Aims & Objective: To study the variation of IOP with age and gender.

Materials and Methods: A case control study was conducted in 50 Male and 50 Female subjects above the age of 40 years with normotension, without any glaucoma and raised IOP. Statistical analysis was done by using student "t" test and ANOVA.

Results: There is statistically significant difference between the mean IOP in males and IOP in females ($P < 0.05$). There is significant positive correlation between age and IOP ($r = 0.911$).

Conclusion: Mean intraocular pressure increases with increasing age group with higher values seen in females. It would be more accurate if ophthalmologists acquire the habit of approximating measured IOP to the nearest one mmHg and not to the nearest even number.

Key Words: Intraocular Pressure; Tonometry; Gender; Age

INTRODUCTION

Intraocular pressure (IOP) is the fluid pressure inside the eye. Tonometry is the method, eye care professionals use to determine this. IOP is an important aspect in the evaluation of patients at risk from glaucoma. Most tonometers are calibrated to measure pressure in millimeters of mercury (mm of Hg). Intraocular pressure is mainly determined by the coupling of the production of aqueous humor and the drainage of aqueous humor mainly through the trabecular meshwork located in the anterior chamber angle. An important quantitative relationship that derive IOP is:

$IOP = F / C + PV$ Where F = aqueous fluid formation rate, C = outflow rate, PV = episcleral venous pressure.

Measured values of intraocular pressure are influenced by corneal thickness and rigidity.^[1,2] Current consensus among ophthalmologists and optometrists define normal intraocular pressure as that between 10 mm of Hg and 20 mmHg.^[3,4] The average value of intraocular pressure is 15.5 mmHg with fluctuations of about 2.75 mmHg.^[5] Ocular hypertension (OHT) is defined by intraocular pressure being higher than normal, in the absence of optic nerve damage or visual loss.^[6,7] Intraocular pressure usually increases with age and is genetically influenced.^[8]

Glaucoma used to be defined as a group of diseases in which the intraocular pressure (IOP) is sufficiently elevated to damage vision. Two decades ago, it was defined as a disturbance of the structural or functional integrity of the eye which can be arrested or diminished by adequate lowering of IOP.^[9] Nowadays, glaucoma is defined as a progressive optic neuropathy with characteristic structural and functional damage.^[10] So, IOP has disappeared from the definition of glaucoma but elevated IOP is considered a major risk factor.^[11] It can still be used as category 3 diagnosis when the optic disc cannot be seen and perimetry is impossible. So our study includes, to know about variation of IOP with age and gender in normotensive individuals above age of 40 years.

MATERIALS AND METHODS

The present study was conducted in ophthalmology OPD at Navodaya medical college, Raichur, Karnataka. The study group consisted of 100 healthy normotensive subjects, consisting of 50 Male and 50 Female subjects, above the age of forty years, attending an ophthalmic OPD at Navodaya medical college, Raichur, Karnataka. The study was approved by ethical committee, Navodaya medical college, Raichur.

Subjects above the age of forty entering an ophthalmic OPD for any complaint not related to glaucoma or elevated IOP were included in study. Subjects with H/O ocular trauma, Cataract surgery, any intraocular surgery, ocular diseases like Uveitis, corneal ulcer, corneal opacities, scleritis were excluded from study.

The protocol was explained to the subjects and informed consent was obtained from each of the participant IOP was measured in both eyes using Perkins appplanation tonometer handheld instrument in sitting posture during 9am to 11am in Ophthalmology OPD.

Statistical Analysis

All data is expressed as Mean \pm SD. The results obtained were analyzed statistically by using the Paired 't' test, Unpaired 't' test and ANOVA. P value < 0.05 considered statistically significant and p value < 0.01 as statistically highly significant.

RESULTS

Cross - sectional and Descriptive study was undertaken in 100 healthy normotensive subjects, consisting of 50 Male and 50 Female subjects, above the age of forty years. The subjects belonging to the age of 40 to 80 years. There was no significant difference in age between males and females. However, the difference between the mean IOP in males and IOP in females was statistically significant (P < 0.05).

Table-1: Depicting Age Group with Mean IOP

Age Group (Years)	IOP (Mean ± SD)	Anova
40 to 50	12.4 ± 0.6	F= 2.21; df= 99; p< 0.01 Highly significant
51 to 60	15.3 ± 0.5	
61 to 70	17.3 ± 2.95	
71 to 80	18.5 ± 1.98	

Table-2: Depicting Mean IOP in Males and Females

Gender	IOP (Mean ± SD)	t test
Males	15.2 ± 2.4	t = 2.21; df = 98; p<0.05 Significant
Females	16.5 ± 3.2	

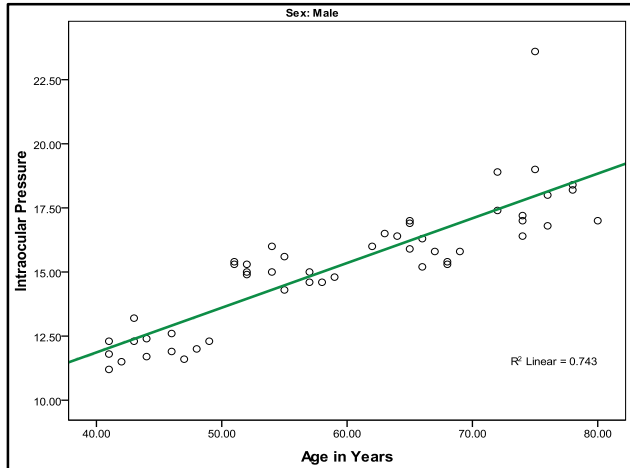


Figure-1: Mean IOP with Male Subjects

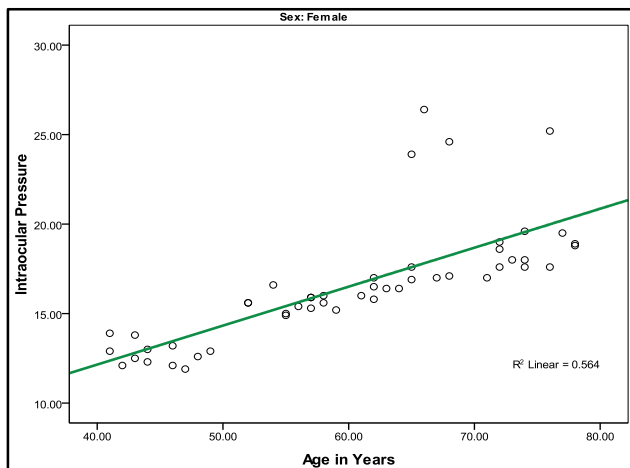


Figure-2: Mean IOP with Female Subjects

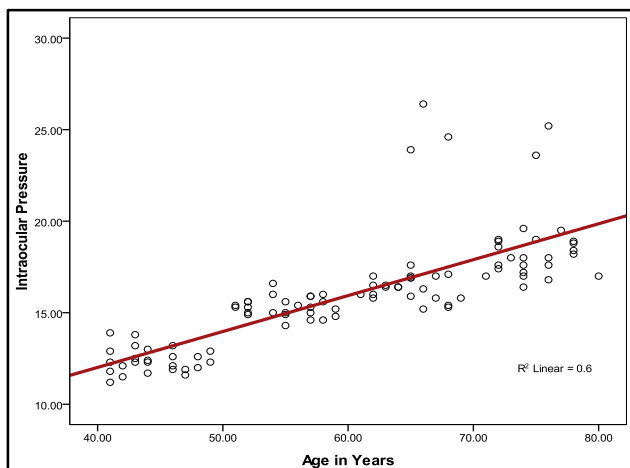


Figure-3: Mean IOP with Age in Years

The correlation was studied between age and IOP by plotting a scatter diagram, there was significant positive correlation between age and IOP with r value 0.911. Figures 1 to 3 represent the Scatter diagram of mean IOP changes with sex and age.

DISCUSSION

The study was conducted in to know the variation of IOP with age and gender in subjects above the age of 40 years without any hypertension or glaucoma.

Data analysis revealed that the mean IOP above the age of forty is 15.2 mmHg in males and 16.5 mmHg in females which means that ocular hypertension and glaucoma suspect should be considered when IOP is > 22 mmHg which satisfies both definitions of 2SD above the mean^[13] and > 97.5th percentile^[12]. Glaucoma should be considered when IOP is more than 26 mmHg which coincides with the 99.5th percentile.^[12]

IOP studies on different populations of the same age have given different results. In a Japanese and another Thai surveys, the mean IOP was reported to be 13.3 mmHg for normal people aged over 40 years^[14,15], while in an Iranian study it was 15.1 ± 2.9 mmHg^[16], in an Italian study it was 14.7 ± 3.5 mmHg^[17], and in a white American study it was 17.2 ± 3.3 mmHg^[18]. Also, the percentage of ocular hypertension in people above the age of 40 in various studies has ranged from 1.5-4.4%^[16,17,19,20], while it is 5% in our study.

Although there was no significant difference in age between the male and female group, there was a highly significant difference between the mean IOP in males (15.2 mmHg) and that in females (16.5 mmHg) with the SD of ± 2.43 and ± 3.28 respectively. However, most studies have reported insignificant relation between sex and IOP.^[16,19] In this study, there was a steady increase in the mean IOP from 12.4 mmHg in the 40-50 years age group, to 15.3 mmHg in the 51-60 years age group, to 17.3 mmHg in the 61-70

years age group and 18.5 mmHg in the above 70 years age group.

In similar studies, increasing age was associated with increasing IOP values^[16,20] and in some of them this relation was not significant^[21]. Recently, an Australian study reported a negative association.^[19]

CONCLUSION

Mean intraocular pressure increases with increasing age group with higher value seen in females. By this study we can evaluate the subjects who are at risk of developing Glaucoma. Since increase in IOP, is one of the risk factor. The mean IOP above the age of forty years, is 15.2 mmHg in males and 16.5 mmHg in females. This increases to 18.5 mmHg in the 71-80 years age group. Ocular hypertension and glaucoma suspect should be considered with IOP>22 mmHg in above the age of forty years provided, that there is neither structural nor functional glaucoma-specific damage of the optic nerve. Glaucoma should be considered when IOP is above 26 mmHg even in the absence of such damage. It would be more accurate if ophthalmologists acquire the habit of approximating measured IOP to the nearest one mmHg and not to the nearest even number.

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