

Variation of Intraocular Pressure in Relation to Age and Gender: A Hospital Based Observational Study

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Abstract:

Objectives: This present study was to evaluate the variation of intraocular pressure in relation to age and gender in Muzaffarpur district of Bihar.

Methods: A total of 200 subjects with age group 20 to >60 years were enrolled in this study. IOP was measured in both the eyes using the Goldmann Applanation Tonometer.

Results: A total of 100 males and 100 females with age group 20 to >60 years were enrolled in this study. Majorities of subjects 84(42%) were in age group of >50 years. when we compared the mean \pm standard deviation of male and female in age group of 51-60 years and >60 years respectively. P-value was found to be less than 0.05, which is statistically significant. Similarly, when we performed the gender wise comparison of mean \pm standard deviation of intraocular pressure, then p-value was found to be <0.0001, which is highly statistically significant.

Conclusions: Mean of intraocular pressure is significantly greater in females than males. And intraocular pressure is significantly decreasing with increasing age but more decreasing in males as compared to females.

Keywords: Intraocular pressure, Age, Gender

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Introduction

Intraocular pressure (IOP) is the fluid pressure inside the eye. Elevated intraocular pressure is a major risk factor for the development of primary open-angle glaucoma [1], and even in normal tension glaucoma the reduction of IOP may slow the progression of visual field loss [2]. It has also been suggested that racial and ethnic differences in the individuals can also affect IOP. The region wise difference

in IOP can also be attributed to environmental factors [3]. As genetic and environmental factors attribute to the region wise difference in levels of IOP hence data collection from different populations carries significance. There is abundance of data available on association of IOP with various systemic and local factors from Korean [3], Central Indian [4],

Asian [5], South Indian [6], Chinese [7], Japanese [8] and Nigerian population [9].

IOP can fluctuate due to different internal and external factors. Among them, age and sex are acknowledged factors that condition IOP [10]. Additionally, corneal thickness [11] and baseline IOP levels [12] have been identified to play a role in the short-term IOP fluctuations. As far as we know, no previous research has analyzed the potential effects of baseline IOP levels and corneal thickness (CCT) on the IOP fluctuations caused by acrobatic gymnastics (AG) exercise. Exercise is a key external factor that modifies intraocular pressure [13] and cardiovascular parameters [14]. More specifically, aerobic, continuous exercise such as running or cycling at low to moderate intensities has proven to acutely reduce IOP [15,16].

Most of 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 [17]. Objectives of our study was to evaluate the variation of intraocular pressure in relation to age and gender.

Material & Methods

This present study was conducted in the Department of Ophthalmology, Sri Krishna Medical college & Hospital, Muzaffarpur, Bihar, India during a period from December 2022 to June 2022.

A total of 200 subjects with age group 20 to >60 years were enrolled in this study. Out

of total 200 subjects, it was consisted with 100 males and 100 females. Entire subjects signed and informed consent approved by institutional ethical committee of SKMCH was sought. The procedure was explained to the subjects

Subject suffering from any type of glaucoma, ocular injury, ocular surgical trauma, corneal ulcer, corneal oedema, corneal scar or those having only one eye were excluded from the study. IOP was measured in both the eyes using the Goldmann Applanation Tonometer. An important quantitative relationship that derives IOP is: $IOP = F / C + PV$ Where F = aqueous fluid formation rate, C = outflow rate, PV = episcleral venous pressure.

Observation

A total of 100 males and 100 females with age group 20 to >60 years were enrolled in this study. Majorities of subjects 84(42%) were in age group of >50 years. When we compared the mean \pm standard deviation of male and female in age group of 20-30 years, p-value was found to be 0.289, which is not statistically significant differences. Similarly, when compared the mean \pm standard deviation of male in age group 31-40 years subjects, which is not statistically significant. When we compared the mean \pm standard deviation of male and female in age group of 41-50 years, p-value was found to be 0.057, which is almost statistically significant. Similarly, when we compared the mean \pm standard deviation of male and female in age group of 51-60 years and >60 years respectively. P-value was found to be less than 0.05, which is statistically significant.

Table 1: Mean \pm S.D. of IOP in different age groups.

Age group (Years)	Gender (Mean \pm S.D)		t-value	p-value
	Male	Female		
20-30, N=39(19.5%)	14.98 \pm 2.23 (N=20)	14.23 \pm 2.12 (N=19)	-1.075	0.289
31-40, N=36(18%)	16.35 \pm 3.82 (N=17)	15.98 \pm 3.12 (N=19)	-0.320	0.751
41-50, N=41(20.5%)	12.67 \pm 3.12 (N=21)	14.67 \pm 3.42 (N=20)	1.958	0.0574
51-60, N=42(21%)	12.23 \pm 4.65 (N=20)	14.97 \pm 3.11 (N=22)	2.264	0.029
>60, N=42(21%)	13.66 \pm 3.27 (N=22)	16.11 \pm 4.33 (N=20)	2.081	0.044

Table 2: Variation in IOP according to gender

Gender	Mean \pm S.D	t-value	p-value
Male (N=100)	12.99 \pm 3.12	4.418	<0.0001
Female (N=100)	14.89 \pm 2.96		

When we performed the gender wise comparison of mean \pm standard deviation of intraocular pressure, then p-value was found to be <0.0001, which is highly statistically significant.

Discussions

IOP is an important factor for glaucoma pathogenesis, and is also crucial for monitoring the treatment of glaucoma. Therefore, it is important to identify the variations in IOP by sex, age, and geographical location. Investigation of specific RIs of IOP will help to distinguish normal eyes from glaucomatous eyes based on IOP readings and contribute to setting precise IOP RIs for glaucoma treatments in diverse patients [18].

Measured values of intraocular pressure are influenced by corneal thickness and rigidity [19]. Current consensus among ophthalmologists and optometrists define normal intraocular pressure as that between 10 mm of Hg and 20 mmHg [20]. The average value of intraocular pressure is 15.5 mmHg with fluctuations of about 2.75 mmHg [21]. Ocular hypertension (OHT) is defined by intraocular pressure being higher than normal, in the absence of optic nerve damage or visual loss [22]. Intraocular pressure usually increases with age and is genetically influenced [23].

The present study was conducted to know the variation of IOP with age and gender in subjects above the age of 20 years. Most of the subjects 84(42%) were in age group of above the 50 years. A slight statistically significant differences ($p=0.057$) of intraocular pressure between male and female was seen in age of 41-50 years subjects. Similarly, A significant differences ($p< 0.05$) of intraocular pressure between males and females were also seen in age 51-60 years and >60 years

subjects. Sex-related differences in the distribution of IOP and its changes with age have also been inconsistent across studies.

Several studies have shown conflicting results in the association of age and intraocular pressure. While some found a positive association [24]. Others found a negative association [25] while some found no association [26].

In our present study, when we performed the gender wise comparison of mean \pm standard deviation of intraocular pressure, then p-value was found to be <0.0001, which is highly statistically significant.

In a study [27] by Mohammed J et al there was a highly significant difference between the mean IOP in males (15.2mmHg) and that in females (16.5mmHg) with the SD of ± 2.43 and ± 3.28 respectively. There was no significant difference in age between the male and female group in this study. Similar association was found in the Barbados Eye study [28], the Rotterdam study [29], the Los Angeles Latino Eye Study [30], and the Beaver Dam Eye Study [31], where men had lower IOP. On the contrary higher IOP was reported for men in the Egna-Neumarkt [32] and the Gutenberg Health [33] studies while the Framingham Eye study [34] and the Health and Nutrition Examination Survey [35] reported no association between sex and IOP.

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 [36]. Nowadays, glaucoma is defined as a progressive optic neuropathy with characteristic structural and functional

damage [37]. So, IOP has disappeared from the definition of glaucoma but elevated IOP is considered a major risk factor [38,39].

Conclusions

The present study concluded that the mean of the intraocular pressure is significantly greater in females than males. And intraocular pressure is significantly decreasing with increasing age but more decreasing in males as compared to females.

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