

Effect of weight and height on intraocular pressure

Abstract

Purpose: Purpose of this study is to determine the effect of weight and height on intraocular pressure (IOP) and to compare effect of height and weight on IOP in males and females.

Methodology: This cross-sectional study was carried on 114 subjects through non-probability convenient sampling technique, both gender and age ranging from 15 to 30 years who had not undergone any ocular surgery or medical treatment for hypertension glaucoma diabetes. The data collected from the patients at the department of ophthalmology during time of 8am-2pm in Madinah teaching hospital, Faisalabad in duration of 7 months from January 2018 to August 2018. Data was collected after taking consent and extensive history. Visual acuity was tested by using Snellen chart and IOP measured by Air puff tonometer and weight measured by weight machine in Kgs and Height measured by Height scale in feet. Data was noted on Performa. Data was analyzed by using test multiple linear regressions by using SPSS version 20.

Result: Total number of studied individuals were 114, 48(42%) males and 66(57.9%) females with age ranges from 15-30 years. Weight and Height was measured and tested relation with IOP and gender by using Linear multiple regression test. Analysis shows that relation of weight and IOP is significant ($p < 0.001$) with mean of IOP 17.432 ± 3.4397 and weight 57.71 ± 12.774 . Weight is more affected the males than females statistically. Height and IOP weekly related statistically ($p < .794$) with mean of height and IOP $5.306 \pm .2159$ and 17.432 ± 3.4397 . Height is also weekly affect IOP in females then males.

Conclusion: The weight is strongly affecting the IOP then height. Males have larger height and high weight so they affect the IOP more than females according to gender. In clinical practice it can allow to test IOP in highly weighted patients.

Keywords: BMI, intraocular pressure, height, weight

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Fatima Iqbal,¹ Hashim Ali Khan,² Iqra Khalil,³ Mawra Zahid⁴

¹School of Optometry, The University of Faisalabad, Pakistan

²SEHHAT Foundation Hospital, Pakistan

³School of Optometry, The University of Faisalabad, Pakistan

⁴The University of Lahore, Pakistan

Correspondence: Fatima Iqbal, School of Optometry, The University of Faisalabad, Pakistan,
Email drfatimaiqbalawan@gmail.com

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Introduction

Intraocular pressure is the pressure within the eyeball; it maintains the firm and round shape of eyeball, this parameter of eye is associated with glaucoma. Glaucoma is an optic neuropathy characterized by progressive degeneration of retinal ganglion cells and their axons, optic disc cupping and constricted visual field.¹ IOP elevation causes deformation of the lamina cribrosa which gives rise to mechanical compression of ganglion cell axons at the optic nerve head, leading to impaired axoplasmic transport. Lamina cribrosa distortion induced by IOP elevation causes compression of blood vessels at the optic nerve head which in turn reduces the ocular perfusion pressure, thus producing regional hypoxia and ischemia which is the basis of vascular mechanism Change.² So it is important to maintain intraocular pressure of eye. Intraocular pressure is the only conformable risk factor for glaucoma.

Anterior chamber depth also play important role in maintenance of intraocular pressure. It is also important to evaluate physical factors which effect intraocular pressure.³ One of the most prevalent disease in the world is obesity, different researches shows that there is compelling association between change in intraocular pressure and weight. Obesity is the major risk factor for many systemic diseases like hypertension and diabetes. It is also risk for eye diseases like glaucoma, cataract, age related macular degeneration.⁴ Different studies have shown that there is positive relation between obesity and intraocular pressure. Obesity results in increase in intraocular pressure, it is because of an excessive intra-orbital fat tissue this causes increase in episcleral venous pressure which decreases aqueous outflow, obesity also increases blood viscosity through increasing red

blood cell, hemoglobin and hematocrit, and this causes resistance to aqueous outflow through episcleral vein.⁵ Height is an indicator of many physical factors genetic as well as growth hormone and childhood nutrition. Height is co related to anterior chamber depth, persons with short height have shallow anterior chamber than tall persons, and shallow anterior chamber is associated with short body stature.⁶

Method and methodology

Cross-sectional study was carried on 114 subjects through non-probability convenient sampling technique, both gender and age ranging from 15 to 30 years who had not undergone any ocular surgery or medical treatment for hypertension glaucoma diabetes. The data collected from the patients at the department of ophthalmology during time of 8 am to 2 pm in Madinah teaching hospital, Faisalabad in duration of 7 months from January 2018 to August 2018. Data was collected after taking consent and extensive history. Visual acuity was tested by using Snellen chart and IOP measured by Air puff tonometer and weight measured by weight machine in kilogram and Height measured by Height scale in feet. Data was noted on Performa. Data was analyzed by using test multiple linear regressions by using SPSS version 20.

Total 114 healthy volunteer or with ametropia (myopia and hyperopia) less than 2Ds with either sex and age ranging between 15-30 years will be studied at Department of Ophthalmology; Madinah Teaching Hospital (MTH), Faisalabad. Oral informed consent will be taken. Extensive history will be taken in account. Visual acuity will be tested from LCD Snellen at 6-meter distance. Refraction will

be measured with Auto Refractometer. Three measurements will be taken as average for each eye. Intraocular pressure will be measured with air puff tonometer. Three measurements will be taken for each eye. Weight will be measured with standard weight machine and height will be measured with height scale.

Results

Data analyzed by multiple linear regressions by using SPSS version 20. Figure 1 showed that total 48(42%) males and 66(57.9) females out of 114 patients. Males have longer height than females and more weights than females. IOP more related with high weight and less relation with height. Weight is associated more with IOP. Height is weakly associated with IOP (Tables 1-4).

Table 1 Relation between IOP and weight showed a significant association

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
I	(Constant)	12.736	1.433	8.885	0
	Weight (Kg)	0.081	0.024	3.354	0.001

This table shows relationship between weight and IOP. Results are significant and showed strong association between IOP and weight.

Table 2 Frequency distribution of intraocular pressure and weight

	I2	Intra-ocular pressure (mm Hg)	Weight (Kg)
N	Valid	114	114
	Missing	0	0
	Mean	17.432	17.432
	Std. Deviation	17.432	12.774

This table shows that mean of weight and IOP with their standard deviations. Mean of weight is 57.71(12.7Std) and IOP mean 17.4(3.43) Std

Table 3 Relation between height and intraocular pressure

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	B	B		
I	(Constant)	19.519	7.993	2.442	0.016
	Height (Feets)	-0.394	1.505	-0.261	0.794

This table shows the relationship between IOP and height and a weak relation between height and IOP.

Table 4 frequency distribution between height and intraocular pressure

	Intra-ocular pressure (mm Hg)	Height (Feets)
I	Valid	114
	Missing	0
	Mean	5.306
	Std. Deviation	0.2159

This table showed that that mean of IOP and height with their standard deviations. IOP 17.43(3.43std) and height mean 5.30(.215).

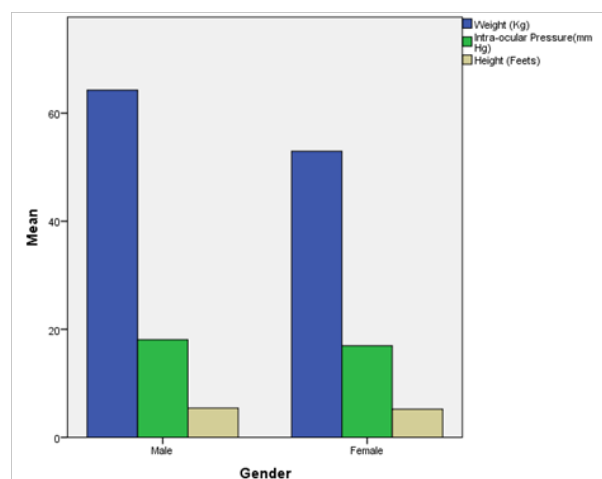


Figure 1 showed that total 48(42%) males and 66(57.9) females out of 114 patients.

Discussion

Results of this study showed that the IOP is strongly affected by high weight. This relationship is strongly statistically related. George reported in 2015 increase in weight increases blood pressure and intraocular pressure which may result in hypertension and glaucoma. Similarly, Mori also reported there is strong relationship between IOP and obesity in 2000.⁷ But Albuquerque shows in 2013 there is no relationship between IOP and BMI in obese and non-obese children and in 2012. Geloneck also reported that there is no relationship between IOP and BMI in sitting position, but supine IOP correlated with high BMI.

This study shows that there is weak relation between IOP and height. Similarly, Lai shows in 2005 there is inverse relation between height and IOP. Another study shows that no significance relationship between BMI and IOP, but significance relationship between BMI and age carried out by in 2013).⁸

This study shows that weight and height is more affected males than females. But Cohan suggests in 2016 increased weight increases IOP in both males and females. Babu study proves that in 2015, IOP exhibit positive correlation with BMI Gender wise comparison of intraocular pressure did not reveal much importance.

Conclusions

Previous studies illustrated dynamic variations of BMI on IOP. BMI has two main factors i.e weight and height. Current study concludes that weight is strongly affecting the IOP than height. Males have larger height and high weight so they affect the IOP more than females according to gender. In clinical practice, assessment of intraocular pressure in obese is very important. By giving fat-lowering drugs and lifestyle modifications we can delay the progression of glaucoma as well as can made early interventions to stop development of glaucoma.

Acknowledgments

None.

Conflicts of interest

Author declares there is no conflicts of interest.

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