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Gautam chand sirvi
Department of Physiology,
Dr. S.N. Medical College,
Jodhpur, Rajasthan, India.

Jayant Kumar
Professor, Department of
Physiology, Dr. S.N. Medical
College, Jodhpur, Rajasthan,
India.

ND Soni
Professor and Head of
Department of Physiology,
Dr. S.N. Medical College,
Jodhpur, Rajasthan, India.

Raguveer Choudhary
Associate Professor,
Department of Physiology,
Dr. S.N. Medical College,
Jodhpur, Rajasthan, India.

Correspondence
Gautam chand sirvi
Department of Physiology,
Dr. S.N. Medical College,
Jodhpur, Rajasthan, India.

Study of relationship between body mass index (BMI) and intra ocular pressure in western Rajasthan

Gautam chand sirvi, Jayant Kumar, ND Soni, Raguveer Choudhary

Abstract

Introduction: Study was carried out to evaluate the relationship between intraocular pressure (IOP) and age or obesity adjusted for systemic health parameters such as gender, mean blood pressure in western Rajasthan.

Methods: A total of 300 healthy participants underwent test, including tonometry, blood pressure and body mass index (BMI). All these subjects were subdivided in four different age groups of 21-30, 31-40, 41-50 & 51-60 years.

Results: The mean IOP, blood pressure, and BMI value was significantly). IOP was associated with mean blood pressure, gender, age, and BMI by multiple regression analysis. BMI had a significantly positive relation with IOP after controlling for age, gender, and mean blood pressure.

Conclusions: Obesity is also directly correlated with IOP. It can be concluded that, persons with hypertension and advancing age need to be monitored for high IOP.

Keywords: Intraocular pressure, blood pressure, body mass index.

Introduction

Glaucoma is a common ophthalmic disease in India and worldwide and is a significant cause of visual impairment and blindness. Glaucoma is the second leading cause of blindness responsible for 23% of all cases. Blindness leads not only to reduce economical and social status but may also result in premature death. Hence, this work is undertaken to study the relationship of IOP with BMI in different age groups, so that prediction of ocular hypertension and its consequences can be forecasted by using more common systemic parameters, i.e., BP, BMI and age. IOP is affected by various systemic parameters like age, sex and BP, BMI. Medical intervention can be done to bring BP to normal and hence preventing the consequences of hypertension. Elevated IOP is one of the major risk factor for developing glaucoma or glaucomatous neuropathy and its progression^[1, 2]. Glaucoma is a common ophthalmic disease worldwide and a significant cause of visual impairment and blindness. It is the second leading cause of blindness responsible for 23% of all cases^[2]. Blindness leads not only to reduce economic and social status but may also result in premature death^[3]. If ocular hypertension or glaucoma is detected early and treated appropriately, its progression and blindness can be prevented. Yet, in the physiologic arena, the detailed variation of IOP and BP with reference to different age groups affecting the visual functioning is still not available completely. Hence, this work is undertaken to study the relationship of IOP and BP, BMI at different age groups.

Material and Methods

The present study was conducted in M.D.M. Hospital associated with Dr. S. N. Medical College and associated group of hospitals, Jodhpur. 300 apparently healthy subjects aged between 21 to 60 years attending Ophthalmology OPD of M.D.M. Hospital, Jodhpur were examined. All these subjects were subdivided in four different age groups of 21-30, 31-40, 41-50 & 51-60 years. Subjects of all four groups were subjected to anthropometric measurements like height and weight(BMI). BP of all subjects was recorded in supine position as per standard protocol. IOP was also recorded by using Schiotz's tonometer. Data thus obtained were subjected to statistical analysis for any association between IOP, age, BP and anthropometric parameters(BMI).

Inclusion criteria

1. Subjects above 18 years.
2. Subjects who are newly diagnosed hypertensive and not on antihypertensive medication.

Exclusion criteria

1. Subjects below 18 years.
2. Subjects who were previously diagnosed as hypertensive and were taking medications.
3. Subjects who were having closed angle glaucoma and other causes of glaucoma.
4. Subjects who are blind.
5. Subjects with any ocular surgery.
6. Subjects diagnosed as diabetic.
7. Subjects with any other medical or surgical illness.
8. Subjects with any medications.

Selected subjects gave an informed consent after detailed procedure of the non-invasive technique was explained to them. Detailed history about name, age, occupation, personal and past history, habits of the subjects were taken. Family history of hypertension, diabetes, refractive errors and glaucoma were enquired. Physical examination of all subjects including measuring height in meters (m), weight in kilograms (kg) was done. BMI was derived by Quetelet's index i.e. (weight in kg) / (height in m) [2].

Result

The IOP increase gradually with age and was significantly higher in males than in females in almost all age groups. Body mass index (BMI) significantly correlated with IOP. [table 1, table 2, table 3].

Table 1: Variation of Iop with Sex and Age

Sex	Age (in yrs)	No. of Subjects	Intraocular Pressure(mmHg)	
			Mean	S.D.
Male	21-30	31	14.83	±2.31
	31-40	39	15.67	±2.03
	41-50	42	15.86	±2.24
	51-60	48	16.35	±2.01
Female	21-30	23	14.47	±1.34
	31-40	35	15.45	±2.2
	41-50	35	15.6	±1.9
	51-60	47	16.53	±2.27

Table 1 shows mean variation in intra-ocular pressure in males and females of different age groups. In males of all the four age groups viz. 21-30, 31-40, 41-50 and 51-60 years, the mean intra-ocular pressure variation are 14.83±2.31, 15.67±2.03, 15.86±2.24 and 16.35±2.01 mm Hg respectively. Similarly in females of all the four age groups viz. 21-30, 31-40, 41-50 and 51-60 years, the mean intra-ocular pressure variation are 14.47±1.34, 15.45±2.2, 15.6±1.9 and 16.53±2.27 mm Hg respectively.

Table 2: Comparison of Iop between Male and Female

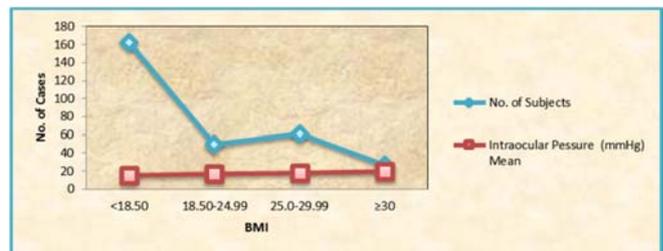
Sex	No. of Subjects	Intraocular Pressure(mmHg)	
		Mean	S.D.
Male	160	15.76	±2.18
Female	140	15.69	±2.14

Table 3 shows comparative statement of intra-ocular pressure variations in males and females. Mean value of IOP in 160

males found to be 15.76±2.18 mm Hg whereas in 140 females it was found to be 15.69±2.14 mm Hg.

Table 3: Distribution of Iop with Different Bmi

BMI	No. of Subjects	Intraocular Pressure(mmHg)
		Mean
<18.50	162	15.57
18.50-24.99	50	16.74
25.0-29.99	61	17.87
≥30	27	19.82



BMI had a significantly positive relation with IOP. P value<.0001

Discussion and conclusions

In the present study BMI, an index of obesity was positively correlated with IOP and statistically significant. Some other studies have also shown that IOP increased with increased BMI [5, 6, 8]. In obese individuals lipid deposition increases the episcleral venous pressure hence reduces aqueous outflow and elevates IOP [7, 8]. Also obese persons have other cardiac risk factors like hypertension, elevated serum cholesterol, blood glucose levels which increases blood viscosity, reduces aqueous outflow and elevates IOP [7]. Corticosteroid secretion is also increased in obese persons, this may explain the relationship between obesity and IOP [4].

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