

CO-RELATION BETWEEN BODY MASS INDEX AND INTRAOCULAR PRESSURE IN ADULTS

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ABSTRACT

Background: Glaucoma is one of the world's leading causes of acquired blindness. A Number of studies have attempted to identify the risk factors associated with development of elevated IOP. This study was conducted to find out co-relation between body mass index and intraocular pressure in adult patients.

Material & Methods: It was a case series study of 300 patients examined in the out patient department of Ophthalmology, Khyber Teaching Hospital Peshawar, from April 2007 to November 2007.

Results: Three hundred patients were examined, 158(52.7%) were males and 142(47.3%) were females. The mean IOP was found to be 16.29 ± 4.16 mmHg, with mean age of 42.23 ± 15.43 years. Mean body mass index was 24.76 ± 4.74 Kg/m². Body mass index was significantly correlated with IOP with $p < 0.05$.

Conclusion: Increase in BMI is strongly associated with increase in IOP.

Key words: Body mass index, Intraocular pressure, Obesity.

INTRODUCITON

Glaucoma remains one of the world's leading causes of acquired blindness. An estimated 67 million have the disease, 3 million of those in United States, of which roughly half are undiagnosed.

Pakistan is the sixth most populous country in the world¹ and is situated in the world health organization (WHO) eastern Mediterranean region. Estimates for the number of blind people by WHO (EMR) region in 2000 show 5 people per million blind in eastern Mediterranean region, and glaucoma is the second leading cause after cataract. The national blindness survey in Pakistan shows that after cataract and sequelae of cataract surgery, glaucoma is the next most important cause of treatable blindness, accounting for 7.1% of total blindness.² This is lower than 11% quoted for WHO eastern Mediterranean region, sub-region D, which includes Pakistan.³

A survey in India of adults age ≥ 50 years, which used a blindness definition of $< 6/60$, showed that 5.8% of blindness was due to glaucoma.⁴ The earlier study in Pakistan estimated the number of people blind from glaucoma to be 80 thousands,⁵ which was similar to result from Pakistan National survey i.e. 89,000.

Currently glaucoma is defined as disturbance in structural or functional integrity of optic nerve,

leading to visual field defects over time.⁶ The development of optic nerve damage leading to visual field loss / or optic disc findings, is more likely to be associated with high intraocular pressure,^{7, 8} although IOP is not the only risk factor for glaucomatous nerve damage.

A number of studies have attempted to identify the risk factors associated with development of elevated IOP. Several studies in western population have suggested that age is related positively with IOP⁹ Moreover, some epidemiological studies examined relationship between BMI and IOP.¹⁰ These studies show that high BMI is independent risk factor for IOP when considered with age and hypertension.

The combined evidence from several studies now suggests the high level of BMI is strongly associated with risk of increased IOP. In our knowledge no work has been done till date on this subject in our region.

We conducted this study to see any correlation between BMI and IOP in adult population.

MATERIAL AND METHODS

Patients attending Eye OPD of Khyber Teaching Hospital during the study period, were divided into 7 groups according to age; < 25 years, 25-35, 36-45, 46-55, 56-65, 66-75 and > 75 years of age. All of them were examined after informed

consent. Information was collected on a structured proforma. Intraocular pressure was checked with Goldmann Tonometer. Height was measured in meters. Weight was measured in Kilogram. Corneal Pachymetry was done to adjust the intraocular pressure. 520 μ m was taken normal and pressures were adjusted accordingly. Body mass index was calculated. SPSS version 10 was used for data analysis. Mean value was calculated for variables like age, IOP, BP, and BMI. Frequencies were calculated for sex, age, mean IOP and BMI. Pearson correlation was calculated for BMI and intraocular pressure. Pearson correlation was also calculated for age and IOP. P value <0.05 was taken as significant.

RESULTS

Three hundred patients were examined, age ranging from 20-80 years, among which 158 (52.7%) were males and 142 (47.3%) were females, with mean age of 42.23 \pm 15.43 years. (Table 1)

Table 1: Age and sex distribution of patients.

Age* sex Crosstabulation

		Sex		
		Male	Female	Total
Age <25	Count	36	18	54
	% of Total	12.0%	6.0%	18.0%
25-34	Count	20	22	42
	% of Total	6.7%	7.3%	14.0%
35-44	Count	27	32	59
	% of Total	9.0%	10.7%	19.7%
45-54	Count	33	35	68
	% to Total	11.0%	11.7%	22.7%
55-64	Count	25	27	52
	% to Total	8.3%	9.0%	17.3%
65-74	Count	14	7	21
	% of Total	4.7%	2.3%	7.0%
>74	Count	3	1	4
	% of Total	1.0%	.3%	1.3%
Total	Count	158	142	300
	% of Total	52.7%	47.3%	100.0%

Mean BMI was 24.8 Kg/m², ranging from 15- >30 Kg/m². Gender distribution of BMI is given in Table 2.

Mean IOP of both the eyes was calculated, and it was 16.29 \pm 4.16 mmHg. IOP was calculated in groups for male and female separately. Most of patients (94 male, 80 females) were in pressure range 16-20 mmHg. (Table 3)

BMI was correlated to IOP which was found to be positive with p-value <0.05. (Figure)

Table 2: Gender distribution of BMI.

BMI	Male	Female	Total
< 15	0	2	2
15 – 20	28	18	46
21 – 25	72	40	112
26 – 30	42	50	92
31 – 35	14	26	40
36 – 40	2	6	8
Total	158	142	300

Table 3: Gender distribution of IOP.

IOP	Male	Female	Total
<15 mm Hg	54	44	98
16-20 mm Hg	94	80	174
21-30 mm Hg	8	14	22
>30 mm Hg	2	4	6
Total	158	142	300

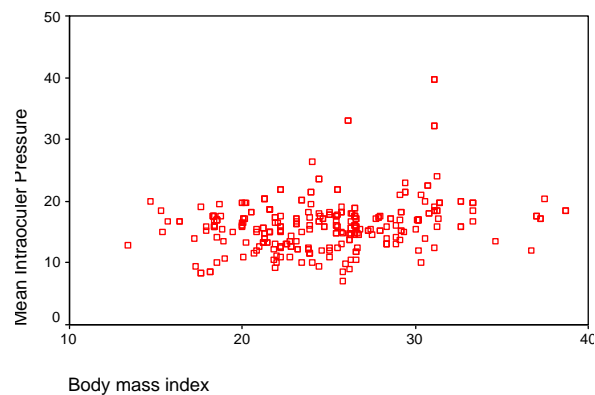


Figure: Scatter plot showing correlation between mean IOP and mean BMI.

DISCUSSION

This study evaluated BMI as a risk factors for increased IOP. This study showed positive correlation of BMI with IOP.

The mean IOP, using Goldman Tonometer, was 16.29 \pm 4.16 mmHg in this study, which was slightly higher than the study done in Japan using non-contact tonometry¹² but similar to other surveys done using applanation tonometry; the values obtained were between 14-17mmHg.^{8,11}

Many cross-sectional studies in western population have shown a positive correlation between IOP and age.¹²⁻¹⁶ Regarding age related changes

in IOP, Shiose and Kawase¹⁵ reported a negative correlation between IOP and age in Japanese population, but Qureshi¹⁷ reported that IOP progressively increased with age in both sexes in Pakistani population.

Although these countries belong to same oriental cultures, there are some differences in IOP relationship with age and sex between Japan and Pakistan. Qureshi¹⁷ reported that IOP progressively increased with age in both sexes in Pakistani population but more markedly in females. While Shiose¹⁵ showed that mean IOP was higher in males than females. Qureshi¹⁷ reported that the mean IOP in female was higher than males especially after age of 40 years.

With aging, the increased BMI was noted until 60 years of age after which it showed a tendency to decrease.

According to various epidemiological studies there are twice as many obese people (more than 10% over their ideal weight) among elderly population in western population than oriental population. This fact may have influenced the rising affect of IOP with aging in western culture.¹⁸

The mean BMI in our study was 24.8 Kg/m². The prevalence of BMI ≥ 26 was more in females than in males. According to the current Definition for Obesity in the Asia-Pacific region, the adults are over weight at BMI ≥ 23 and obesity at BMI ≥ 25 .¹⁹ but Papas et al. used BMI values of ≥ 25 and ≥ 30 to define over weight and obesity in Pakistani population respectively.²⁰ which also showed that obesity prevalence is more in females. BMI was found positively correlated to IOP in this study. The p-value of in this study is highly significant. It is seen generally that with increasing age, BMI increases especially in female, so both factors can affect the IOP put together.

The mechanism of effect of BMI on IOP may be due to excess intra-orbital fat tissue, an increase in episcleral venous pressure and consequent decrease in outflow facility. Obesity increases blood viscosity through increasing red cell count, haemoglobin, and haematocrit, thus increasing outflow resistance of episcleral vein. Further obesity is also risk factor for diabetes and hypertension which also have effect on IOP. The outcome of this study confirms the importance of weight control in preventing increased in IOP.

CONCLUSION

Increase in BMI is strongly associated with increased IOP.

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