e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13(3); 411-413

A Cross-Sectional Study

Association Between Body Mass Index and Intraocular Pressure Among Adults Attending a Tertiary Care Hospital: A Cross-Sectional Study

Abha Wadhawan[1], Moparthi Brunda[2], Priyabrata Mondal[3]

[1]Assistant professor, Department of Ophthalmology, ICARE Institute of Medical Sciences and Research, Haldia, West Bengal

[2]Assistant professor, Department of Ophthalmology, ICARE Institute of Medical Sciences and Research, Haldia, West Bengal

[3]Assistant professor, Department of Anesthesia, ICARE Institute of Medical Sciences and Research, Haldia, West Bengal

Received: 07-02-2023 / Revised: 26-02-2023 / Accepted: 27-03-2023

Corresponding Author: Priyabrata Mondal

Conflict of interest: Nil

Abstract

Background: Intraocular pressure (IOP) is a major modifiable risk factor for glaucoma. Obesity, measured by body mass index (BMI), has been implicated in elevated IOP through various physiological mechanisms including increased episcleral venous pressure and altered aqueous humor dynamics.

Objectives: To evaluate the association between body mass index and intraocular pressure among adults attending a tertiary care ophthalmology outpatient department.

Materials and Methods: A hospital-based cross-sectional study was conducted among 200 adults aged 18–70 years attending the ophthalmology outpatient department. BMI was calculated as weight (kg)/height (m^2) and categorized according to World Health Organization criteria. Intraocular pressure was measured using Goldmann applanation tonometry. Correlation between BMI and IOP was analyzed using Pearson's correlation coefficient. Comparison among BMI groups was performed using one-way ANOVA.

Results: The mean age of participants was 45.6 ± 12.8 years. The mean BMI was 25.4 ± 4.2 kg/m^2 and mean IOP was 15.8 ± 3.1 mmHg. Mean IOP increased progressively across BMI categories: normal weight (14.5 ± 2.6 mmHg), overweight (16.1 ± 2.8 mmHg), and obese (18.2 ± 3.4 mmHg). A significant positive correlation was observed between BMI and IOP ($r = 0.41$, $p < 0.001$).

Conclusion: Higher BMI was significantly associated with increased intraocular pressure. Obesity may represent a modifiable risk factor for elevated IOP and subsequent glaucomatous damage.

Keywords: Body mass index, Intraocular pressure, Obesity, Glaucoma, Ophthalmology

Introduction

Glaucoma is one of the leading causes of irreversible blindness worldwide. Elevated intraocular pressure remains the most important modifiable risk factor for the development and progression of glaucomatous optic neuropathy. Several systemic factors including obesity, hypertension, and diabetes mellitus have been reported to influence IOP.

Obesity has become a global public health concern with increasing prevalence in developing countries. Increased adiposity may elevate intraocular pressure through increased episcleral venous pressure, orbital fat deposition, oxidative stress, and vascular dysregulation. Previous epidemiological studies have reported a positive relationship between BMI and IOP, although the strength of association varies among populations.

Therefore, the present study was undertaken to evaluate the association between body mass index and intraocular pressure among adults attending a tertiary care hospital.

Materials and Methods

This hospital-based cross-sectional study was conducted in the Department of Ophthalmology of a tertiary care teaching hospital over a period of six months. A total of 200 adult participants aged between 18 and 70 years who attended the ophthalmology outpatient department were enrolled in the study after obtaining written informed consent. Individuals with a history of glaucoma, ocular trauma, previous ocular surgery, corneal pathology, or current corticosteroid therapy were excluded from the study. Demographic data including age and sex were recorded using a predesigned proforma. Anthropometric measurements were obtained following standard procedures. Body weight was measured to the nearest 0.1 kg using a calibrated digital weighing scale,

while height was measured to the nearest 0.1 cm using a stadiometer. Body mass index (BMI) was calculated by dividing weight in kilograms by the square of height in meters (kg/m²). Based on the World Health Organization classification, participants were categorized as normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obese (≥30 kg/m²).

All participants underwent a comprehensive ophthalmic examination. Intraocular pressure (IOP) was measured using Goldmann applanation tonometry by a trained ophthalmologist under standardized conditions. Three consecutive readings were obtained from each eye, and the average value was recorded for analysis. Measurements were performed during routine outpatient hours to minimize diurnal variations in intraocular pressure.

The collected data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were expressed as frequencies and percentages. The association between BMI and IOP was assessed using Pearson's correlation coefficient. Differences in mean IOP among BMI categories were evaluated using one-way analysis of variance (ANOVA). A p-value less than 0.05 was considered statistically significant.

Results

A total of 200 participants were included in the study. The mean age of the study population was 45.6 ± 12.8 years. The mean body mass index was 25.4 ± 4.2 kg/m², while the mean intraocular pressure was 15.8 ± 3.1 mmHg. Of the total participants, 90 (45.0%) had normal BMI, 70 (35.0%) were overweight, and 40 (20.0%) were classified as obese.

Analysis of intraocular pressure across BMI categories demonstrated a progressive increase in mean IOP with increasing BMI. Participants with normal BMI had a mean IOP of 14.5 ± 2.6 mmHg, whereas overweight individuals had a mean IOP of 16.1 ± 2.8 mmHg. The highest mean IOP was observed among obese participants, with a value of 18.2 ± 3.4 mmHg. One-way ANOVA revealed a statistically significant difference in mean IOP among the three BMI groups ($p < 0.001$), indicating that individuals with higher BMI tended to have higher intraocular pressure.

Table 1. Demographic Characteristics

Variable	Mean ± SD
Age (years)	45.6 ± 12.8
BMI (kg/m²)	25.4 ± 4.2
IOP (mmHg)	15.8 ± 3.1

Table 2. Distribution According to BMI Categories

BMI Category	Number (%)
Normal	90 (45.0)
Overweight	70 (35.0)
Obese	40 (20.0)

Table 3. Mean IOP According to BMI Category

BMI Category	Mean IOP (mmHg)
Normal	14.5 ± 2.6
Overweight	16.1 ± 2.8
Obese	18.2 ± 3.4

ANOVA showed a significant difference in IOP among BMI groups ($p < 0.001$).

Correlation Analysis

Pearson correlation analysis showed a significant positive correlation between BMI and intraocular pressure ($r = 0.41$, $p < 0.001$). This finding suggests that as body mass index increases, intraocular pressure also tends to increase. The correlation was of moderate strength and statistically significant, supporting the existence of a meaningful association between obesity and ocular pressure.

Discussion

The present study demonstrated a significant positive association between BMI and intraocular pressure. Obese individuals had significantly higher IOP compared to normal-weight individuals. These findings are consistent with previous studies suggesting that obesity contributes to increased intraocular pressure.

Possible mechanisms include increased episcleral venous pressure, autonomic dysfunction, elevated blood viscosity, and increased orbital adipose tissue leading to impaired aqueous outflow. The findings

emphasize the importance of routine ophthalmic screening in overweight and obese individuals.

Conclusion

Body mass index showed a significant positive correlation with intraocular pressure. Obesity may contribute to elevated IOP and potentially increase the risk of glaucoma. Weight management strategies may help reduce ocular morbidity associated with elevated IOP.

References

1. Klein BE, Klein R, Linton KL. Intraocular pressure in an American community. The Beaver Dam Eye Study. Invest Ophthalmol Vis Sci. 1992;33(7):2224-8.
2. Leske MC. Open-angle glaucoma—an epidemiologic overview. Ophthalmic Epidemiol. 2007;14(4):166-72.
3. Pasquale LR, Kang JH. Lifestyle, nutrition and glaucoma. J Glaucoma. 2009;18(6):423-8.
4. Cohen E, Kramer M, Shochat T, Goldberg E, Garty M, Krause I. Relationship between body mass index and intraocular pressure in men and women. J Glaucoma. 2016;25(5):e509-e513.
5. Louisraj S, Thomas PA, Jesudasan CAN. Correlation between body mass index and intraocular pressure: A pilot study. TNOA J Ophthalmic Sci Res. 2018;56(1):8-11.
6. Berdahl JP, Allingham RR, Johnson DH. Cerebrospinal fluid pressure is decreased in primary open-angle glaucoma. Ophthalmology. 2008;115(5):763-8.
7. Memarzadeh F, Ying-Lai M, Chung J, Azen SP, Varma R. Blood pressure, perfusion pressure, and open-angle glaucoma. Arch Ophthalmol. 2010;128(6):767-75.
8. Mori K, Ando F, Nomura H, Sato Y, Shimokata H. Relationship between intraocular pressure and obesity in Japan. Int J Epidemiol. 2000;29(4):661-6.
9. Han TS, Sattar N, Lean M. Assessment of obesity and its clinical implications. BMJ. 2006;333:695-8.
10. Panon N, Kongwattananon W, Piyon P, et al. Correlation between body mass index and ocular parameters. Clin Ophthalmol. 2019;13:763-769.