

A comparative study on the intraocular pressure among diabetic and non-diabetic patients

NP Vidhya¹, Sutapa Das², R. Priyadarshini³, M. Subashini^{4,*}, Kaviraj Mahadevan⁵

¹PG Student, ²Associate Professor, ⁴Professor & Head, ⁵Research Associate, Dept. of Ophthalmology, Sri Manakula Vinayagar Medical College & Hospital, ³Fellow, Aravind Eye Hospital

***Corresponding Author:**

Email: crl@smvmch.ac.in

Abstract

Background: Diabetes mellitus is one of the major health issues affecting people across nations. The complications of diabetes mellitus affects vital organs of human body, among which eyes are more susceptible to diabetic complications like primary open angle glaucoma. Increased IOP is one of the complications faced by diabetics. The pathogenesis behind this correlation is not clearly understood. Difference in IOP among diabetic and non-diabetic patients were analysed in this study.

Materials and Methods: A hospital based cross-sectional study was carried out. A complete ophthalmologic examination was done. Intraocular pressure was recorded using a Goldmann applanation tonometry. Gonioscopy and perimetry was planned if IOP > 21mmHg or optic disc changes suggestive of glaucoma were present. Dilated fundus examination was done.

Results: 150 patients who met the inclusion criteria were taken for the study. The mean IOP \pm SD in eyes of patients with diabetes was 16.4 ± 1.32 and in eyes of patients without diabetes was 12.9 ± 1.09 . A significant difference in mean intraocular pressure was observed in patients with diabetes when compared with non-diabetic patients.

Conclusion: This study shows significantly higher intraocular pressures in patients with Type 2 diabetics. This would suggest that diabetics should be monitored regularly for intraocular pressure to detect an early onset of glaucoma.

Keywords: Diabetes mellitus, Glaucoma, Intraocular pressure, Tonometry

Introduction

The intraocular pressure is determined by the balance between the production of aqueous humour and its drainage. Various factors may influence the level of intraocular pressure (IOP) e.g. age, sex, blood pressure, body mass index, diabetes etc.^(1,2) Elevated intraocular pressure is a significant risk factor for the development of primary open angle glaucoma (POAG). Glaucoma is the leading cause of blindness in the world.⁽¹⁾

Diabetes mellitus is a major health problem in India, with its incidence increasing every day. Diabetes is associated with long term damage to various organs such as eye, kidney, heart, blood vessels and nerves. Diabetes mellitus has emerged as a major cause of vision loss and visual disability, developing and also in developed countries. Besides its other ocular manifestations, diabetes also affects intra ocular pressure.⁽³⁾ The association of diabetes with elevated intraocular pressure and primary open angle glaucoma is controversial. The mechanism that causes higher intraocular pressure is not clear, but various etiologies has been postulated as genetic, autonomic dysfunction, and osmotic diffusion.⁽⁴⁾ Many studies have shown diabetes mellitus (DM) in association with intraocular pressure and open angle glaucoma. Others have found no association between diabetes and intraocular pressure.^(5,6)

Because of the conflicting reports between diabetes mellitus and intraocular pressure, and the paucity of studies on these subjects from south India, this study was undertaken to find the relationship between diabetes mellitus and intraocular pressure.

Materials and Methods

A hospital based cross-sectional study was carried out in patients presenting to the ophthalmology outpatient department (OPD) from September 2014 to January 2015 at Sri Manakula Vinayagar Medical College and Hospital.

Patient inclusion criteria: All patients of both sexes and age of 40 years and above without the exclusion criteria were included in this study.

Patient exclusion criteria: Patients of age less than 40 years, family history of glaucoma, myopes, pseudoexfoliation syndrome, previous history of trauma/ surgeries and patients on long term topical steroids were excluded from this study.

150 patients who met the inclusion criteria were included in the study. Written informed consent was taken from the patients. Detailed history of patients regarding name, age, sex, occupation, address, drug history, presenting symptom, duration, associated conditions and past history was recorded. History of diabetes such as symptoms, duration, and type of treatment was enquired. Overall control was assessed by lab parameters.

Intraocular pressure was recorded using a Goldmann applanation tonometry. Before each measurement the tonometer was set to 10mmHg and pressure was recorded. Gonioscopy and perimetry was planned if IOP > 21mmHg or optic disc changes suggestive of glaucoma were present. Dilated fundus examination was done by direct ophthalmoscopy and with +90D lens.

Statistical analysis: All data were expressed as means \pm standard deviations. Student's t-test was used to compare the mean intraocular pressures of diabetic and non-diabetic patients, with a confidence interval of 95%. A p-value of less than 0.005 was considered statistically significant.

Results

Age and Sex: A total of 150 patients were enrolled in this study. The age group ranged from 41-80 years with a mean of 54.94 ± 10.44 . Of the 150 patients, 80 were males and 70 were females. Seventy seven persons had diabetes mellitus and seventy three persons did not have diabetes (Fig. 1).

The mean intraocular pressure in mm Hg \pm standard deviation (SD) of males was 14.71 ± 2.15 and females were 14.61 ± 2.10 (Fig. 2). There was no significant difference in the mean intraocular pressure of males and females.

The mean intraocular pressure in mmHg \pm SD in age groups 40-49, 50-59, 60-69 and above 70 were 13.54 ± 1.567 , 14.44 ± 1.961 , 15.94 ± 1.867 and 16.63 ± 2.032 respectively (Fig. 3). There was an increase in mean intraocular pressure with each decade of life.

Diabetics and non- diabetics: The mean IOP \pm SD in eyes of patients with diabetes was 16.4 ± 1.32 and in eyes of patients without diabetes was 12.9 ± 1.09 (Fig. 4). A significant difference in mean intraocular pressure was observed in patients with diabetes when compared with non-diabetic patients.

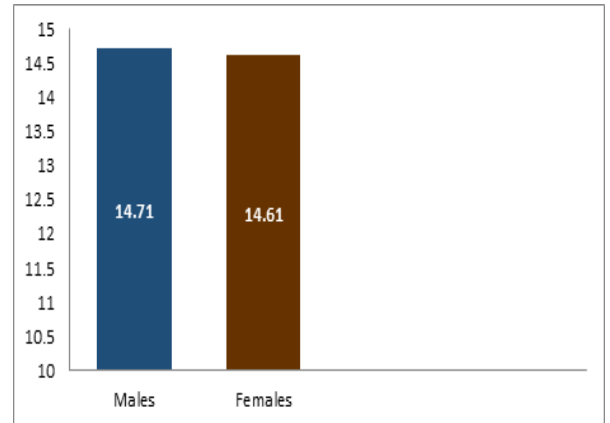


Fig. 2: Mean IOP between males and females

There was no significant difference found between males and females.

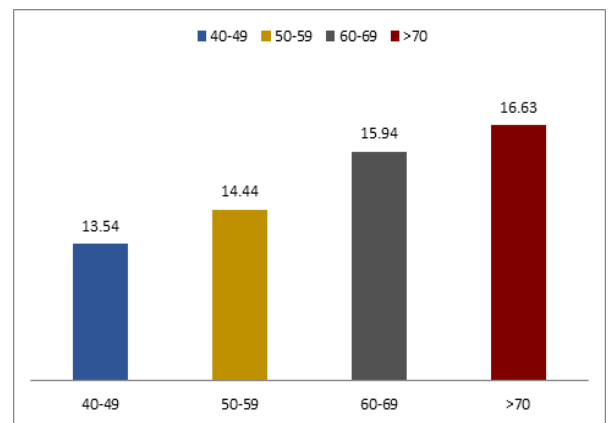


Fig. 3: Correlation of mean IOP with age

A significant increase in the mean IOP was found in each decade.

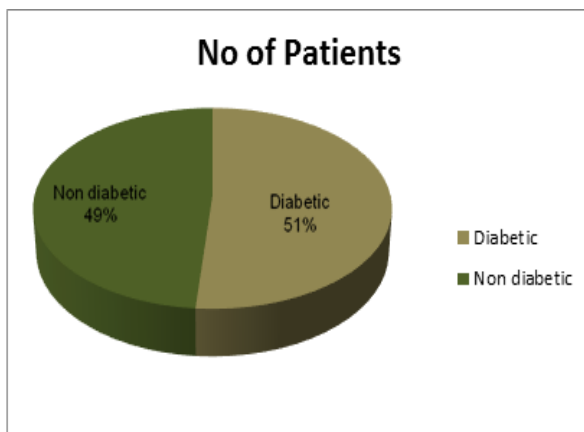


Fig. 1: Diabetics and non-diabetics among study population

A sum of 150 patients were included in the study.

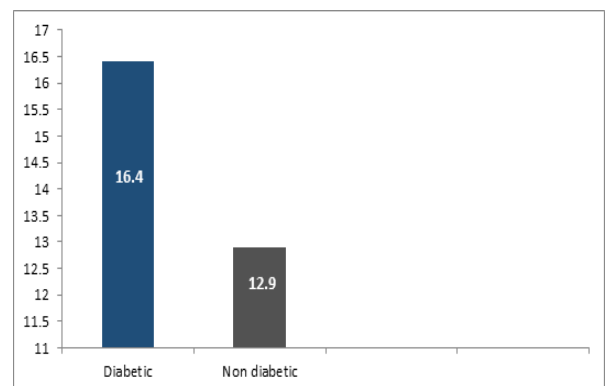


Fig. 4: Mean IOP between diabetic and non-diabetic patients

Significant association was found between increased IOP and diabetes mellitus.

Discussion

Intraocular pressure constitutes as a major risk factor for the emergence of glaucoma, an ophthalmological condition associated with DM.⁽⁷⁾ DM and IOP are related in a way that the elevated blood glucose results in the induction of an osmotic gradient which leads to fluid shifts into the intraocular space.⁽⁸⁾

Our study showed that the patients with diabetes had a significantly higher mean intra ocular pressure (IOP) than the non-diabetic patients and also there was statistically significant increase in mean intraocular pressure in the patients > 70 years of old.

Several studies have found a higher mean intraocular pressure with increasing age.^(9,10,11,12) Our study found a higher mean intraocular pressure for each decade of life.

The mean intraocular pressure of patients with diabetes was 16.4 ± 1.32 , which was significantly higher when compared with the non-diabetic patients (12.9 ± 1.09), showing a positive correlation between diabetes and intraocular pressure. The result of our study is comparable with that of the study conducted by Neeetans et al in 1997.⁽¹³⁾ The positive relationship between diabetes and increased intraocular pressure has been well documented in several other studies.^(9,13,14,15)

Newly diagnosed diabetes mellitus and high levels of blood glucose are found to be associated with elevated IOP in a study conducted in Netherland population.⁽¹⁶⁾ Kenji et al in 2000, reported that increased IOP was seen in diabetic retinopathy cases along with hypertension.⁽¹⁷⁾ Significant association between glucose levels and IOP was seen in a study conducted by Pimentel et al in 2015. The study also found that the postprandial IOP was significantly higher than the random IOP levels.⁽¹⁸⁾ Significantly higher IOP values in patients with glucose levels of above 200mg/dL was observed by Traisman⁽¹⁹⁾ and associates.

Conclusion

This study shows significantly higher intraocular pressures in patients with Type 2 diabetics. Since intraocular pressure is a known risk factor for glaucoma and considering that there is a greater prevalence of diabetes mellitus in patients diagnosed with glaucoma, this would suggest that diabetics be monitored regularly for intraocular pressure to detect an early onset of glaucoma in susceptible patients. Institution of early treatment could thus limit visual morbidity due to glaucoma in diabetic patients.

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