Original Research Article

COMPARATIVE INTRAOCULAR PRESSURE STUDY AMONG DIABETIC AND NON-DIABETIC PATIENTS

ABSTRACT

Background: Diabetes mellitus is one of the major health issues in the world. Its microvascular complications contribute to ocular complications including increased intraocular pressure (IOP) which is a risk factor of glaucoma. Identification of factors responsible for glaucoma is a mainstay in the early detection and prevention of blindness.

Aim and Objectives: The objective of the study was to compare IOP among diabetic and non-diabetic patients and to assess the correlation between age and IOP.

Materials and Methods: The cross-sectional study was performed on 104 participants. Patients were divided into two groups based on diabetes (case, n = 52) and non-diabetes (control, n = 52). The detailed history and routine clinical investigations were performed. Three consecutive readings of IOP of the left and right eye were recorded separately using Goldmann applanation tonometer. Wilcox sign-rank test and Spearman-correlation test was used to find the difference between the IOP and correlation between age and IOP, respectively.

Results: A significantly higher IOP was observed in diabetic patients than non-diabetic patients. (0.0001). There was no sex difference in IOP was observed in diabetic and non-diabetic patients. Age of the patient was not correlated with IOP (r = –0.02197219, P = 0.824).

Conclusion: Diabetic patients are prone to higher IOP; therefore, diabetic patients should be regularly assessed for IOP for diagnosis glaucoma.

KEY WORDS: Blindness; Diabetes Mellitus; Glaucoma; Intraocular Pressure; Open-angle Glaucoma

INTRODUCTION

Globally diabetes became a pandemic. It was estimated that in the year 2017, there were 451 million people with diabetes mellitus (DM) and most of the people were 40–60-year age. These numbers are expected to increase to 693 million by 2045.[1] The prevalence of diabetes in Asian countries is high and it accounts for >60% of the global diabetic

population.[2] In Pakistan, currently, 62 million people are affected with DM and these numbers are predicted to be increased to 79.4 million by the year 2030.[3] It causes major health burden causing substantial financial loss because of higher rates of morbidity and mortality and health care expenditures.[4]

DM is commonly associated with microvascular complications contributing to various ocular complications such as increased intraocular pressure (IOP) and subsequent glaucoma which is a common cause irreversible blindness.[5-10] Diabetics are more prone to have primary open-angle glaucoma than non-diabetics.[11,12] To be noted, glaucoma is estimated to affect 12 million Pakistanis: Accounting for 12.8% of total blindness and is considered to be the 3rd most common reason for blindness in the country.[13] IOP is the pressure exerted by the fluid inside the eye. It is an important ophthalmic physiological parameter important to understand the distribution and risk factors of IOP for the prevention and prognosis of glaucoma.[14] Various factors such as age, body mass index, blood pressure, and central corneal thickness are associated with IOP.[15-17] However, the results of the various studies were not entirely consistent, and the potential risk factors in their analysis were failed to account due to a lack of data.[14] Moreover, it remains ambiguous whether DM population has distinct distribution or risk factors for IOP, and the association of DM with glaucoma has still been controversial, despite this DM individuals are twice likely to develop glaucoma compared to non-diabetic individuals.[18] Therefore, data regarding IOP distribution and risk factors in DM individuals are required to produce the relationship between glaucoma and DM and plan effective strategies. The present study aimed to compare IOP among diabetic and non-diabetic patients and to assess the correlation between age and IOP.

MATERIALS AND METHODS: The cross-sectional study was conducted at the tertiary care center at Jamshoro and Hyderabad. A total of 104 Types 2 diabetic and non-diabetic subjects of 40–60 years of age were included in the study and informed consent was obtained. Patients with Type 1 DM, gestational diabetes, intraocular tumors, and glaucoma were excluded from the study. Patients were divided into two groups based on diabetes (cases), and non-diabetes (control). Each group consisted of n = 52 patients. The detailed history of patients and routine clinical investigations were performed. Three consecutive readings of IOP were recorded by Goldmann applanation tonometer. The IOP of the left and the right eye was recorded separately after anesthetizing eye with xylocaine during outpatient department hours.

Statistical Analysis

Data were analyzed using R Studio V 1.2.5001 software. Continuous variables were expressed in mean ± SD whereas, categorical variables were expressed as percentage and frequency. Wilcox sign-rank test was used to find the difference between the IOP and Spearman-correlation test was used to find the correlation between age and IOP. P <0.05 was considered statistically significant.

RESULTS

The average age of the participants was 55.83 ± 5.87 years and the majority of the participants were female (58%). Both groups were similar in terms of age and sex. A significantly higher IOP was observed in diabetic patients than non-diabetic patients (0.0001) [Table 1]. A significantly higher IOP was observed in diabetic male and female patients than non- diabetic male and female patients. No significant difference was observed between the IOP of males and females of both groups [Table 2]. No correlation was observed between age and IOP (r = –0.02197219, P = 0.824) [Figure 1].

DISCUSSION

In diabetic patients, the IOP was higher than non-diabetic patients (P = 0.0001). Among diabetic male and female patients, no sex difference was observed. Similarly, there was no correlation between age and IOP. The study showed significantly higher IOP in diabetic patients (15.96 ± 2.27 mmHg) than non-diabetic patients (13.84 ±2.94 mmHg) (P = 0.0001). These findings are following the previous reports.[3,7,19] The exact mechanism of increased IOP in DM patients is not known. However, in vitro study suggested that increased deposition of fibronectin in the extracellular matrix of tubercular meshwork blocks the aqueous outflow which leads to decreased aqueous drainage hence, a rise in IOP.[20] In this study, no sex difference was observed. However, studies have reported that hormonal differences may play a role in the sex difference of IOP, resulting in higher IOP in female than male participants.[14,21,22] The difference in the reports may be due to the ethnic/racial difference, method of IOP assessment, or lifestyle of the population. In this series, no correlation was observed between age and IOP (r = –0.02197219, P = 0.824). However, Vidhya et al. in their study suggested that increase in mean IOP with each decade of life.[19] Despite this, there is no general agreement on the association between IOP and age in the literature. Studies reporting increased, decreased, and no association of IOP with age.[23-25] The difference in the results may be due to different populations, or a nonmonotonic relationship between age and IOP such as different studies with different aged

participants.[26] The present study showed higher IOP in diabetic compared to non-diabetic patients. These findings suggest that diabetic patients should undergo routine IOP assessment to avoid chances of glaucoma. The limitation of the study was the small sample size, the parameters such as blood pressure, body mass index, and obesity were not assessed. A study with a large sample size including all variables is the further recommendation for the confirmation of the present study findings.

Table 1: Distribution of demographical variables and IOP according to groups

Variable	**Control**	**Cases**	***P*-value**
Age (years)	56.96±4.89	54.71±6.58	0.1694
Sex			
Female	29	29	1.000
Male	23	23	
IOP (mmHg)	13.84±2.94	15.96±2.27	0.0001***
****P*<0.001, IOP: Intraocular pressure			

Table 2: Distribution of IOP according to sex

Sex	**IOP**		***P*-value**
	Control	**Cases**	
Male	14.19±2.57	15.96±2.47	0.024*
Female	13.53±2.68	15.41±1.94	0.007**
P-value	0.4498	0.3368	
**P*<0.05, ***P*<0.01, IOP: Intraocular pressure			

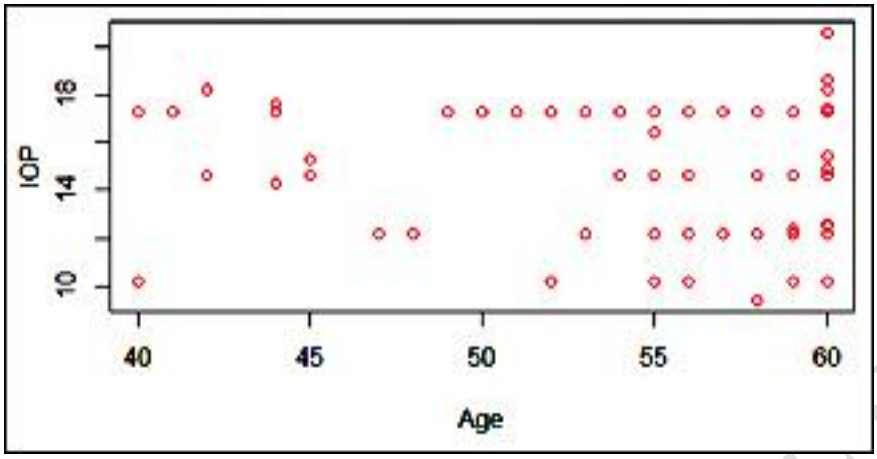

Figure 1: Scatter plot between age and intraocular pressure

CONCLUSION

The conclusion of the study suggested an increased IOP in diabetes patients and no sex difference in IOP of diabetic and non-diabetic patients. Furthermore, no correlation was found between age and IOP. Since IOP is a known risk factor for glaucoma in diabetic patients, this would suggest that diabetics be monitored regularly for IOP for early diagnosis of glaucoma in the susceptible patients.

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