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A Study on Measurement of Intra Ocular Pressure in Diabetic and Non-Diabetic Individuals

KEYWORDS: Intra ocular pressure, Diabetes, Blood glucose levels

Dr. Swarastra P Singh
MS (Ophthalmology) Assistant Professor, Department of Ophthalmology, Career Institute of Medical Sciences and Hospital, Lucknow

Dr.Rajeev Kumar
DOMS (Ophthalmology) Senior Resident, Department of Ophthalmology, Career Institute of Medical Sciences and Hospital, Lucknow.

ABSTRACT *Background: Diabetes mellitus is an important ocular risk factor with the occurrence of retinopathy, certain types of lens opacification (cataract), intraocular pressure increase and also, open angle glaucoma during its course .Objectives: The main objective of this study was to compare IOP in normal subjects and subjects with diabetes (type 2 diabetes) between 40-70 years age. Material and Methods: 100 subjects, aged between 40-70 years out of which 50 were diabetics and 50 non diabetics (control group) were included in our study after obtaining their consent. IOP was measured in both eyes using non contact digital tonometer (NT-P-530 by NIDEK) and recorded. Subjects height in metre's, weight in kg was recorded. BMI is calculated as weight (kg) / height (in m2) . Blood glucose was estimated using Glucometer. P value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS 17. Results: Age and sex ratio did not differ significantly between the two groups (P = 0.35; 0.69). Baseline glucose levels were higher in the group of diabetic patients (P < 0.001). The mean IOP was 16.0±4.7 mm Hg and 17.0±4.5 mm Hg. There was a significant difference between the mean IOP amongst the diabetics and normal subjects (p=0.035; p=0.015). Conclusion: We concluded that there is a significant association between blood glucose levels and IOP variation, especially in diabetic patients.*

Introduction:
Diabetes mellitus (DM) is a systemic disease that alters the major metabolic pathway in the human body and destroys major organ systems. Diabetic retinopathy is the most common and investigated ocular complication. However, morphologic and functional changes in the cornea have been studied less frequently in diabetic eyes. It has been also seen that diabetics are more prone to develop raised intraocular pressure1.

Intraocular pressure constitutes the most important risk factor for the emergence of glaucoma 1,2, a pathology often associated with systemic arterial hypertension and diabetes mellitus. According to several studies, no significant relationship between systemic blood pressure and glaucoma has been observed. There is a report on the coexistence of hypertensive disease and glaucoma with normal IOP and glaucoma with high IOP 3. Diabetes mellitus is an important ocular risk factor 4,5 with the occurrence of retinopathy, certain types of lens opacification (cataract), intraocular pressure increase, rubeosis iridis and possibly open angle glaucoma during its course 5. Many studies have suggested an increase in the relative risk of people with diabetes mellitus to present ocular hypertension during the clinical course of the disease favoring the emergence of open angle glaucoma 5.

Although diabetes is associated with higher IOP values in most population studies, the underlying mechanisms are still unclear.6,7 Recent studies have suggested that changes in corneal biomechanics (increased corneal hysteresis) in diabetic eyes would lead to overestimated IOP measurements.8,9,10 However, it is not known whether variations in glucose levels could lead to IOP changes in diabetic and non diabetic individuals. As diabetes and glaucoma (or ocular hypertension) coexist in many patients, a better understanding about how variations in glucose levels can affect IOP changes would give additional information to the IOP assessment. Therefore, we sought to determine the relationship between glucose levels variation and IOP fluctuation in diabetic and non diabetic patients

Aims and objectives:
The main objective of this study was to compare IOP in normal subjects and subjects with diabetes (type 2 diabetes) between 40-70 years age. The implications of this study is to highlight the strong positive association between IOP in diabetics.

Material and methods:
100 subjects, aged between 40-70 years out of which 50 were diabetics and 50 non diabetics (control group) were included in our study after obtaining their consent between July 2015 and December 2015. An approval was obtained from Institutional Ethical committee. Hypertensive's, known diabetics undergoing insulin treatment; glaucoma or IOP lowering medications, ocular diseases; H/O of current smoking or alcohol use were excluded. IOP was measured in both eyes using non contact digital tonometer (NT-P-530 by NIDEK) and recorded. Subjects height in metre's, weight in kg was recorded. BMI is calculated as weight (kg) / height (in m2) . Blood glucose was estimated using Glucometer. Subjects were considered diabetics when fasting glucose was > 126 mg/dl or [post prandial blood glucose > 200 mg / dl]. IOP measurements were always performed between 9:00 am-12:00 pm by non contact tonometry, as to minimize the diurnal variation. All the results were shown as Mean ± SD. The results were evaluated using student t test, two sample assuming unequal variance . P value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS 17.

Results:
A total of 100 patients (50 non diabetic and 50 diabetic) were included. Age and sex ratio did not differ significantly between the two groups (P = 0.35;0.69). Baseline glucose levels were higher in the group of diabetic patients (P < 0.001). Demographic and clinical data of each group are provided in detail in Table 1.

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Table 2 shows the normal distribution of intraocular pressure among normal subjects and those with type 2 diabetes. The mean IOP was 16.0±4.7 mm Hg and 17.0±4.5 mm Hg. There was a significant difference between the mean IOP amongst the diabetics and normal subjects (p=0.035; p=0.015).

Parameters	Non diabetics (control) (n=50)	Diabetics (n=50)	p-value
Age (±SD years)	50±15.5	55±10.9	0.35
Gender			
Male	28	30	0.69
Female	22	20	

Table 1: Demographic distribution of diabetics vs non diabetics

Parameters	Non diabetics (control)	Diabetics	p-value
Body Mass Index (BMI, Kg/m^2)	25.5±4.0	26.5±4.5	0.52
Mean Intra ocular pressure (mm Hg)	15.2±3.5 (Right eye)	16.0±4.7 (Right eye)	0.035
	16.1±2.3 (Left Eye)	17.0±4.5 (Left Eye)	0.015
Mean Random Blood sugar (mg/dl)	90±16	195±35	<0.001

Table 2: Comparison of IOP and BMI amongst diabetics and non diabetics

Discussion:

The mean IOP in diabetics from our study was 16.1 ± 2.3 and 17.0 ± 4.5 mmHg in right and left eyes respectively. A marginal increase in mean IOP in diabetics was found in our study. However our study is not in agreement with the report of Palomar11 and Armaly12 who observed low IOP in diabetics as compared to non diabetics. When BMI was evaluated , the mean BMI in the diabetics subject from our study is 26.5 ± 4.5 kg/m2 and the mean BMI in the non diabetic subjects was 25.5 ± 4.0 kg/m2. A trend of increasing IOP with increasing BMI was observed in diabetics. The results of our study were in accordance the results of Barbados eye study, Shiose et al13, Klien et al14 and Bulpitt et al15.

Limitations of study:

The results of our study did not show a highly significant p value as the sample size is small. Further cross- sectional studies with large sample size can be recommended to elucidate significant statistical relation between IOP and Diabetes.

Conclusion:

In conclusion, our results suggest that there is a significant association between blood glucose levels and IOP values, especially in diabetic patients.

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