# EVALUATION OF THE RELATION BETWEEN THE BLOOD SUGAR LEVEL AND THE INTRAOCULAR PRESSURE IN DIABETIC PATIENTS

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## INTRODUCTION

Glaucoma is one of the main causes of irreversible but potentially preventable vision loss, which is described as a group of multifactorial ocular disorders with a clinically distinctive optic neuropathy and potentially progressive changes at the optic nerve head (ONH). It is the second most common cause of blindness after cataract, making it a serious public health concern. Primary open angle glaucoma(POAG) is the most common type affecting approximately 57.5 million people worldwide, with a prevalence of 2% to 4% of individuals aged 40 and older and about 10% of those aged 75 and older.

Diabetes Mellitus (DM) is one of the most prevalent metabolic diseases primarily characterized by hyperglycemia associated with changes in the metabolism of fat, protein and carbohydrates. Several common mechanisms have been proposed to contribute to the possible relationship between glaucoma and diabetes. For example , Results showed a two- to threefold increase in aqueous humor glucose levels in diabetic rats compared to those of non-diabetic control rats. Elevated glucose levels in aqueous humor of diabetic patients may induce increased ECM accumulation in the trabecular meshwork contributing to resistance in aqueous outflow and elevated IOP.

## AIM OF THE WORK

The aim of this study was to evaluate the relation between blood sugar level and the intraocular pressure in diabetic patients.

## SUBJECTS AND METHODS

This prospective cross – sectional observational study was carried out on two hundred patients divided into one hundred diabetic patients, type II, as a case group and one hundred normal populations as a control group. Patients aged between 40-70 years old were included. Patients diagnosed with any type of glaucoma or on any glaucoma medications were excluded. A written informed consent was obtained from all participants. Full history and compelete opthalamological examination of the anterior and posterior segments was done with assessment of the optic nerve head and cup / disc ratio.

Intraocular pressure was measured using Goldmann Applanation Tonometry between 8:00 AM and 11:00 AM three times and the mean value was taken. Central corneal thickness (CCT) was evaluated via anterior segment OCT. Fasting blood sugar and HbA1C level were assessed for the case group and fasting blood sugar for the control group.

## RESULTS

**Table1:** Comparison between the two studied groups according to IOP, Cup /disc (C/D) ratio and CCT

| | Cases (n = 100) | Control (n = 100) | Test of Sig. | P |
|---|---|---|---|---|
| **IOP** | | | | |
| **Min. – Max.** | 12.50 – 26.0 | 10.50 – 22.50 | U= 1932.50 | <0.001* |
| **Mean ± SD.** | 19.85 ± 3.24 | 15.74 ± 3.31 | | |
| **Median (IQR).** | 20.50(17.50 – 22.50) | 15.50 (13.0 – 18.50) | | |
| **Cup disc Ratio** | | | | |
| **Min. – Max.** | 0.20 – 0.85 | 0.20 – 0.70 | U= 3200.0 | <0.001* |
| **Mean ± SD.** | 0.48 ± 0.16 | 0.38 ± 0.12 | | |
| **Median (IQR).** | 0.45 (0.35 – 0.60) | 0.35 (0.30 – 0.50) | | |
| **CCT** | | | | |
| **Min. – Max.** | 405.0 – 586.5 | 405.0 – 586.5 | t= 0.965 | 0.336 |
| **Mean ± SD.** | 522.6 ± 41.70 | 528.2 ± 39.78 | | |
| **Median (IQR).** | 541.8 (489.3 – 552.8) | 540.8 (512.0 – 554.5) | | |

IQR: **Inter quartile range** SD: **Standard deviation** **t: Student t-test** **U: Mann Whitney test**
p: p value for comparing between the two studied groups *: Statistically significant at $p \leq 0.05$

**Table2:** Showing relationship between HbA1c levels and IOP for cases groups (n = 100)

| Serial | HbA1c range (%) | No. of Individuals | Average CCT | Average IOP |
|---|---|---|---|---|
| 1 | 5.5 – 6 | 10 | 519.70 | 17.35 |
| 2 | 6.1-6.5 | 5 | 495.90 | 17.20 |
| 3 | 6.6-7 | 13 | 517.08 | 17.50 |
| 4 | 7.1-7.5 | 14 | 525.50 | 18.93 |
| 5 | 7.6-8 | 10 | 522.45 | 20.20 |
| 6 | 8.1-8.5 | 8 | 537.38 | 21.75 |
| 7 | 8.6-9 | 7 | 538.57 | 21.86 |
| 8 | 9.1-9.5 | 10 | 510.30 | 21.35 |
| 9 | 9.6-10 | 6 | 530.75 | 21.0 |
| 10 | 10.1-10.5 | 9 | 532.11 | 21.44 |
| 11 | 10.6-11 | 7 | 517.64 | 21.86 |
| 12 | 11.6-12 | 1 | 514.50 | 22.15 |

- The mean values of IOP, central corneal thickness and cup /disc ratio of both eyes of each patient were detailed. It was observed that diabetic patients had mean IOP (19.85±3.24 mmHg, P value<0.001) higher as compared to mean IOP of the control group (15.74±3.31, P value<0.001) with a statistically significant difference. Mean cup /disc ratio of case group was higher (0.48±0.16, P value<0.001) than in the control group (0.38±0.12, P value <0.001) with a statistically significant value. and there was no significant difference between the two groups in central corneal thickness (CCT) (P value 0.336 ).
- By categorizing the case group into twelve subgroups, it was found that patients belonging to the category with higher HbA1c had higher mean IOP as compared to the patients belonging to the category with lower HbA1c levels.

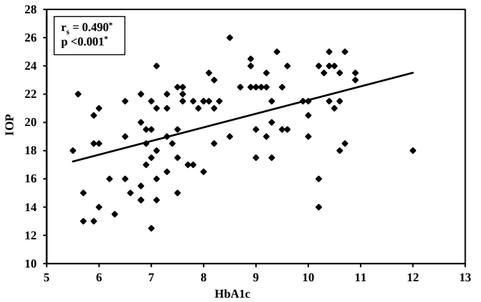


**Figure:** Relationship between HbA1c levels and IOP for case groups (n =100).

## CONCLUSION

Our results showed that hyperglycemic levels as determined by increased HbA1c levels and serum fasting glucose were found to be associated with increased IOP in patients with Type II diabetes mellitus than in control group and by categorizing case group; It was also found that cases with high uncontrolled HbA1c showed higher IOP than those with low levels of HbA1c and this supports the idea of the relation between uncontrolled blood sugar level and increase IOP in diabetic patients. So poor glycemic control in Type II diabetic patients may be a risk factor for glaucoma development.



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