



ASSOCIATION OF INTRAOCULAR PRESSURE AND HYPERGLYCEMIC LEVEL IN DIABETIC PATIENTS

Ophthalmology

Dr Shubhnav Jain* Department of Ophthalmology, RBH Hospital, Jaipur. *Corresponding Author

ABSTRACT

Background- To determine whether hyperglycemic levels as determined from high hemoglobin A1c (HbA1c) levels influence intraocular pressure (IOP) in patients with non-proliferative diabetic retinopathy (NPDR). **Methods-** A cross sectional Study was performed on subjects with a diagnosis of NPDR and a corresponding HbA1c level measured within 90 days before or after an IOP measurement. Exclusion criteria included a diagnosis of glaucoma or treatment with IOP lowering medications or oral or topical steroids. **Results-** Mean Hb1Ac in low IOP patients(<14.5) was 8.67±2.14% and high IOP patients was (>14.5) was 9.12±3.02%. **Conclusion-** In conclusion our findings in this study showed that diabetic subjects with elevated HbA1c levels exhibited significantly higher IOPs compared to those with lower HbA1c levels.

KEYWORDS

Hb1Ac, IOP, NPDR

INTRODUCTION

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin. In the past 3 decades the prevalence of type 2 diabetes has risen dramatically in countries of all income levels. Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin by itself. For people living with diabetes, access to affordable treatment, including insulin, is critical to their survival. There is a globally agreed target to halt the rise in diabetes and obesity by 2025. About 422 million people worldwide have diabetes, the majority living in low- and middle-income countries, and 1.5 million deaths are directly attributed to diabetes each year. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decade.¹

Diabetic retinopathy (DR) is a serious microangiopathic complication of diabetes mellitus and also prime cause of adult blindness. Besides diabetic retinopathy it is a known risk factor for development of raised intraocular pressure (IOP), cataract, rubeosis iridis causing decreased visual acuity during its course.² A number of studies have also shown the association of diabetes mellitus with glaucoma; where elevated IOP is a major risk factor. Many studies showed an increase in relative risk of development of ocular hypertension (OH) during the clinical course of disease favouring emergence of open angle glaucoma. Diabetic patients are twice likely to develop glaucoma compared to nondiabetics. Study also says significant raised IOP in uncontrolled diabetes than in controlled diabetes. There is association of diabetes with raised IOP and primary openangle glaucoma (POAG) in many studies. However some of the studies failed to establish a positive correlation between diabetes mellitus and open-angle glaucoma. So individual IOP determination is an important factor. The only effective treatment is the IOP reduction therapy which prevents proven effective treat glaucoma blindness due to DM and DR on early detection and intervention.³⁻⁵

METHODS

This study was a cross-sectional study. All patient records/information was anonymized and de-identified prior to analysis. As such, participants were not required to provide informed consent for their clinical records to be used in this study. Age, gender, medical conditions, use of medications, type of diabetes, blood pressure, and time of IOP measurement were documented. Individuals were excluded if they did not have an IOP measured by Goldmann applanation tonometer, had a diagnosis of glaucoma, were using or had ever used IOP lowering medications, or were using oral or topical steroids. The cut-off value of 14.5 mmHg for IOP level was chosen based on human and animal studies. A study investigating the efficacy of IOP lowering drugs used IOP level between 14 and 15 mmHg as the mean baseline value.

Data Analysis :

Data was recorded as per Performa. The data analysis was computer based; SPSS-22 was used for analysis. For categoric variables chi-

square test was used. For continuous variables independent samples' t-test was used. p-value <0.05 was considered as significant.

RESULTS

An analysis was performed from records of 100 subjects (26% male, 74% female) who met the inclusion criteria for the study. These subjects had a documented diagnosis of Type II diabetes,

Table 1. Outcome

Variable	Low IOP (<14.5)	High IOP (>14.5)	p-value
Mean age in yrs	53.21±10.36	52.19±10.318	0.36
Male : Female	13 : 37	13:37	0.99
Hb1Ac	8.67±2.14%	9.12±3.02%	0.01

Mean Hb1Ac in low IOP patients(<14.5) was 8.67±2.14% and high IOP patients was (>14.5) was 9.12±3.02%.

DISCUSSION

This is the first report indicating that long-term diabetic patients with elevated HbA1c levels exhibit significantly higher IOPs compared to those with lower HbA1c levels. In particular, findings indicate a statistically significant difference in HbA1c levels between diabetic subjects with low IOP and those with high IOP. In addition to the numerical values from regression analysis, it is particularly striking that it is unlikely for an individual to have a high HbA1c level with a low IOP. Retrospective chart analysis identified only one individual in the study group of 100 subjects who had a high HbA1c and a low IOP.

It is likely that patients with HbA1c above 9.5 were unable to maintain appropriate clinical/glycemic care. These results suggest an association between elevated glucose levels and increased IOP. In the current study, the exclusion criteria were carefully selected so as not to bias the results. The exclusion of patients with existing glaucoma avoids potential bias toward higher IOPs intrinsic to the diagnosis of glaucoma and not related to HbA1C level. The exclusion of patients using medications that lower IOP or topical or systemic steroids was necessary since these drugs add a potential confounding variable to the relationship between HbA1C and IOP being investigated. Overall, our findings are consistent with other reports in the literature. The Framingham Heart Study reported a positive correlation between blood glucose levels and IOP.⁶ The Rotterdam Study⁷ and the Wisconsin Study of Diabetic Retinopathy⁸ reported higher IOPs in diabetic patients compared to those in the non-diabetic individuals. Additionally, a recent report indicating that poor glucose control in diabetic patients can contribute to increased IOP⁹ highlights the possibility of this relationship. While there are reports that suggest outflow facility decreases with age and that aging may increase IOP¹⁰, other studies report no age-related IOP increase.

CONCLUSION

In conclusion our findings in this study showed that diabetic subjects with elevated HbA1c levels exhibited significantly higher IOPs compared to those with lower HbA1c levels.

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