

## **Effect and Relationship of Duration of Diabetes with Intra Ocular Pressure in Adults of Kashmir. A Study from a Tertiary Care Centre in North India**

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**Abstract:** Each year, about 1% of all individuals with increased IOP progress to glaucomatous damage. Elevated IOP level is a major risk factor for the development and progression of Primary open-angle glaucoma (POAG) and lowering the IOP in patients suffering from POAG slows up the disease progression. Therefore, potential risk factors for POAG need to be identified so that interventions are developed to reduce its incidence. It is postulated that damage to the microvasculature network and/or decreased nutritional supply to retinal ganglion cells (RGCs) axons is due to interference of blood regulation in optic nerve head area. This nutritional deficiency may lead to degeneration of RGCs and start glaucomatous impairment. Hence, any vascular related systemic disease, such as diabetes, which directly or indirectly disrupts nutritional supply to RGCs, may result in development of POAG. The study design involved 360 subjects, and were categorized into two groups, namely: Group A: This was an experimental group comprised of Diagnosed Type-2 Diabetic patients. Group B: This was a healthy controlled group, non diabetic (n-150). which were compared with Group A on similar parameters. Tonometry with Applanation tonometer was done which measures fluid pressure (IOP) in eyes. Our results showed that Increased IOP is significantly associated with duration of diabetes. With the increase in duration of diabetes intraocular pressure also rises with high IOP seen with duration more than 12 years. This was found to be true for their both eyes. Due to Lack of proper control of diabetes different parts of the body especially the eyes are exposed to the destructive effects of diabetes and hence impair their functioning.

**Key words:** Association of IOP with Duration of Diabetes, Glaucoma, Intraocular pressure (IOP), ocular hypertension,

**INTRODUCTION:**

Intraocular pressure (IOP) is a fluid inside the eye and may be defined as that pressure which does not lead to glaucomatous damage of the optic nerve head. The prevalence of glaucoma is higher with increasing IOP. One tenth of patients with ocular hypertension develop field loss within 10 years. Each year, about 1% of all individuals with increased IOP progress to glaucomatous damage. As many as 50% of patients with glaucomatous optic neuropathy or visual field changes have IOP of less than 21 mmHg on initial evaluation. Some eyes undergo damage at IOP of less than 18 mm Hg others tolerate IOP of more than 30 mmHg. A pressure of 10-21 mmHg is considered normal. About 2-6 mmHg diurnal variation of IOP is normal. Greater than 10 mmHg variation is suggestive of Ocular Hypertension. Peak usually occurs in the morning hours'.(1) IOP has been reclassified as a risk factor for the clinical process rather than a clinical feature of glaucoma.(2) Elevated IOP level is a major risk factor for the development and progression of Primary open-angle glaucoma (POAG) and lowering the IOP in patients suffering from POAG slows up the disease progression.(3) IOP is also an important consideration for diagnosis of glaucoma, as high IOP damages the sensitive optic nerve and results in vision loss.(4) However, there is no threshold at which the IOP value is defined as dangerous, as people have different susceptibility and vulnerability of the optic nerve head to a particular IOP level.(5) In addition, there is a racial difference in the degree to which elevated IOP causes POAG. Only 5.4% of whites with ocular hypertension (IOP>21 mmHg) progress to POAG, while 18.1% of blacks with ocular hypertension progress to POAG.(6) Aqueous humor was originally thought to be stagnant. It was not until 1921 that Seidel proved that the aqueous was, indeed, circulating. Using a needle, Seidel connected a reservoir contain inga blue dye to a rabbit eye. When the reservoir was lowered, clear fluid from the anterior chamber entered the tubing; when the reservoir was raised, the dye entered the eye and eventually appeared in the blood of the episcleral venous plexus (3)(4). Seidel concluded that aqueous humor must be continuously formed and drained'. From the work of the last half century it is clear that aqueous humor is a relatively cell-free, protein-free fluid that is formed by the ciliary body epithelium in the posterior chamber. It then passes between the iris and the lens, enters the anterior chamber through the pupil, and exits the eye at the anterior chamber angle through the trabecular mesh work, Schlemm's canal, and the aqueous veins. Aqueous humor formation averages about 2.6-2.8 l/min in normal humans during the daytime. The rate of formation at any given time is similar between the two eyes of the same individual (coefficient of variation =15%) (6). During its passage through the eye, the aqueous humor serves a number of important functions. It serves in lieu of a vascular system for the normally a vascular structures of the eye, including the cornea, lens, and trabecular meshwork. It brings to the internal eye essential nutrients, such as oxygen, glucose, and amino acids,(7) and removes metabolites and potentially toxic substances, such as lactic acid and carbon dioxide (8)(9).Aqueous humor provides the proper chemical environment for the tissues of the anterior segment of the eye and provides an optically clear medium to allow good visual function. It inflates the globe and maintains intraocular pressure (IOP), both of which are important for the structural and optical integrity of the eye. Under adverse conditions (e.g., inflammation, infection), it facilitates cellular and humoral immune responses. During inflammation, the rate of aqueous humor formation decreases. Several cross-sectional studies have documented that populations with high prevalence of diabetes or raised blood glucose level have an increased risk of elevated IOP .One study found that number of metabolic abnormalities related to insulin resistance were associated with elevated IOP In addition, several cross-

sectional studies have documented a correlation between elevated blood glucose or HbA1c levels and raised IOP in diabetic patients .

## MATERIAL AND METHOD

**Type of Study:** This was a comparative cross sectional analytical study based on prospective observation. The study was based primary data collected directly from the subjects. Written informed consent was obtained from all participants. Such data have proven helpful in understanding the association of IOP with duration of diabetes. **Place of Study;** The present study was conducted in the Post graduate Department of Physiology in collaboration with the postgraduate department of ophthalmology in Government Medical College, Srinagar. For the purpose, Institutional Ethical Clearance was obtained through proper channel. **Sample Size and Group:** The study design involved 360 subjects, and were categorized into two groups, namely: **Group A:** This was an experimental group comprised of Diagnosed Type-2 Diabetic patients. This study group was obtained from Outpatient department (OPD) at Shri Maharaja Hart Singh (SMHS) Hospital. Srinagar Patients who satisfied any one of the inclusion criteria were selected **Group B** This was a healthy controlled group, non diabetic (n-150). which were compared with Group A on similar parameters. **Sample:** Men as well as women comprised the sample. The age group under study were adults in both Group A as well as for Group B. **Inclusion Criteria:** > Diagnosed Type-2 diabetic Patients > IOP 21 mmHg (by Applanation Tonometry) > Normal IOP with asymmetry of IOP in both eyes of > 5 mmHg. Age >40 years **3.7 Exclusion Criteria** • Closed angle on gonioscopy • Drug induced (corticosteroids) • Myopia • Hypertension . Any Ocular Surgery • Other intra ocular pathology **Tools Used:** Tonometry with Applanation tonometer This test measures fluid pressure in your eye. The test involves using a slit lamp equipped with forehead and chin supports and a tiny, flat-tipped cone that gently comes into contact with cornea. The test measures the amount of force needed to temporarily flatten a part of cornea.

## RESULTS

### Association of IOP with Duration of Diabetes

**Table 1 and Figure 1** depict the association of IOP with duration of Diabetes. It was observed that majority i.e., 75.61 per cent (f=31) having duration 1-4 years, 71.95 per cent (f=59) under the duration of 4-8 years; 78.05per cent (f=32) having duration 8-12 years and 75 per cent (f= 12) under > 12 years reveal moderate IOP Right Eye. Whereas, 24.39 per cent (f=10) having duration 1-4 years: 20.73 per cent (f=17) under the duration of 4-8 Years.17.07 per cent (f=7) having duration 8-12years and 25 per cent (f=4) under >12 years revealed high IOP Right Eye. Meanwhile, considering the IOP Left Eye, majority i.e. 62.85 per cent (f=27) having diabetes for 1-4 years; 79.27 per cent (f=65) under the duration of 4-8 years: 60.98 per cent (f =25) having duration of 8-12years and 81.25 per cent (f= 13) more than 12 years of diabetes depicted moderate IOP Left Eye. Whereas, 29.27 per cent (f=12) having duration 1-4 years; 20.73 per cent (f =17) under the duration of 4-8 years; 31.71 per cent (f=13) having duration 8- 12years and 18.75 per cent (f =3) > 12 years of diabetes revealed high IOP Left Eye. In association of IOP with duration of diabetes, highly significant differences were observed between Right and Left Eye IOP of subjects.

### TABLE.1 ASSOCIATION OF IOP WITH DURATION OF DIABETES

IOP	1-4 Yrs.		4-8 Yrs.		8-12 Yrs.		>12 Yrs.	
	F	%	F	%	F	%	F	%
<b>IOP Right Eye</b>								
Low	-	-	6	7.32	2	4.88	-	-
Moderate	31	75.61	59	71.95	32	78.05	12	75.00
High	10	24.39	17	20.73	7	17.07	4	25.00
Chi Square Analysis	$\chi^2 = 4.867$ , $df = 6$ , $p\text{-value} = 0.001$							
<b>IOP Left Eye</b>								
Low	2	4.88	-	-	3	7.32	-	-
Moderate	27	65.85	65	79.27	25	60.98	13	81.25
High	12	29.27	17	20.73	13	31.71	3	18.75
Chi Square Analysis	$\chi^2 = 9.991$ , $df = 6$ , $p\text{-value} = 0.050$							

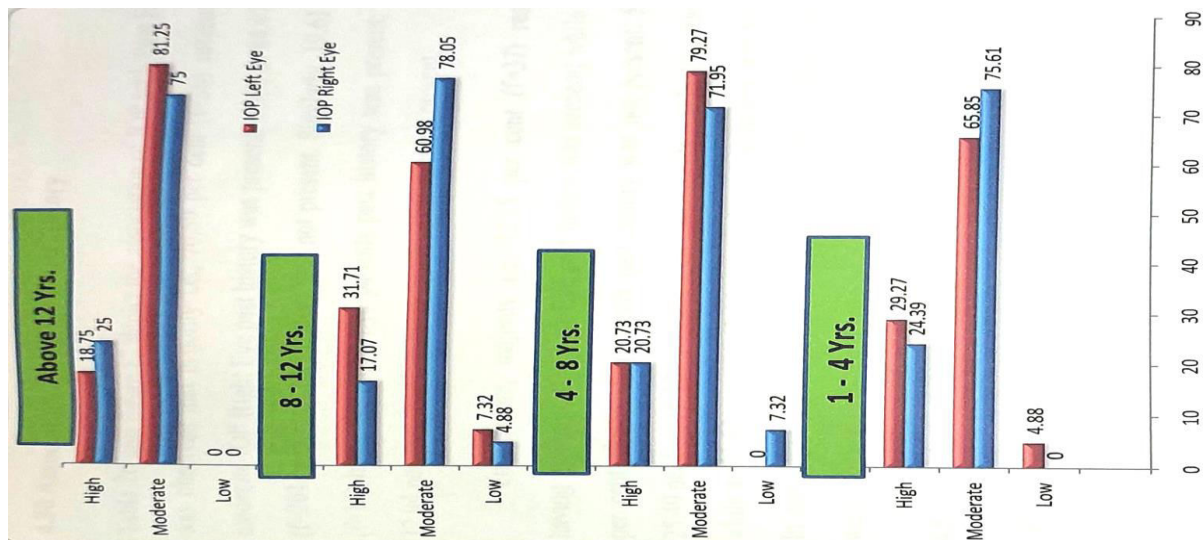


FIGURE.1 ASSOCIATION OF IOP WITH DURATION OF DIABETES

**DISCUSSION**

**Association of IOP with Duration of Diabetes :** Sreelakshmi (2013) (10) shows that as duration of diabetes increases ,there is also increase in risk of prevalence of glaucoma. In the Study of Kianersi [et.al.](#) (11)duration of diabetes and IOP was significantly correlated with the rate of 8%, which was statistically significant (P = 0.006). Duration of diabetes among patients has revealed mean score of 4-8 years. Duration of diabetes is correlated with age of subjects. Increased IOP is significantly associated with duration of diabetes. This was found to be true for their both eyes.

**CONCLUSION**

Due to Lack of proper control of diabetes different parts of the body especially the eyes are exposed to the destructive effects of diabetes and hence impair their functioning. .It is postulated that damage to the microvasculature network and/or decreased nutritional supply to retinal ganglion cells (RGCs) axons is due to interference of blood regulation in optic nerve head area. This nutritional deficiency may lead to degeneration of RGCs and start glaucomatous impairment. Hence, any vascular related systemic disease ,such as diabetes, which directly or indirectly disrupts nutritional supply to RGCs ,may result in development of POAG.

The present study shows an obvious association of duration of diabetes with increased IOP of diabetic patients.

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