



## DIAGNOSTIC VALUE OF INTRAOCULAR PRESSURE ASYMMETRY IN RURAL BASED HOSPITAL OF NORTH INDIA

<b>Dr. Manika Sharma</b>	MBBS, PG-Resident, NC Medical College and Hospital, Israna; Panipat.
<b>Dr. Bhawna Chawla</b>	MBBS, PG-Resident, NC Medical College and Hospital, Israna; Panipat.
<b>Dr. Kanav Gupta*</b>	MS Ophthalmology, FVR, NC Medical College and Hospital, Israna; Panipat. *Corresponding Author
<b>Dr. Brij K. Gupta</b>	MS Ophthalmology, NC Medical College and Hospital, Israna; Panipat.

### ABSTRACT

**Purpose** To Check the importance of Intraocular Pressure Asymmetry In Rural-Based Hospitals In North India. **Methods** A prospective study was conducted on all the patients above the age of 40 years who attended ophthalmology OPD of NC Medical College and Hospital, Israna. The study was conducted for a period of 6 months from December 2022 to May 2023. A total of 200 patients were taken for the study. The purpose of this study was to investigate the importance of IOP asymmetry in patients visiting hospitals in north India. Intraocular pressures were measured by Non-contact tonometry (NCT) for both eyes in each case two times. The ones with IOP asymmetry of more than 3mmHg is measured again with Goldmann applanation tonometry (GAT). The amount of absolute IOP asymmetry between the 2 eyes was calculated by subtracting the lower IOP from the higher IOP, which were hence compared to see the percentage difference of IOP asymmetry present in glaucomatous and non-glaucomatous patients. Glaucoma was diagnosed if the intraocular pressure asymmetry difference was > 5 mm hg with significant glaucomatous optic disk and field changes. **Results** A difference of >3mmHg is associated with 19% probability of having glaucoma and a difference of >5mmHg with 50% probability of having glaucoma. **Conclusions** Inter-eye Intraocular pressure (IOP) asymmetry is a regular finding in glaucoma patients. There is a direct relationship between the amount of IOP asymmetry between fellow eyes and the probability of having glaucoma.

**KEYWORDS :** Glaucoma, Asymmetry, IOP, visual field VF

### AIM

To quantify the diagnostic value of intraocular pressure asymmetry in rural based hospital of north India

### INTRODUCTION

Glaucoma is defined as a disease that results in progressive retinal ganglion cell death, producing a specific pattern of optic nerve head and visual field (VF) damage.<sup>1-2</sup> Glaucomatous damage is commonly due to raised IOP, although it is only a risk factor and not the disease itself. Also, IOP reduction remains the only available proven treatment for the disease.<sup>3</sup>

Studies show that the IOP is symmetrical in fellow eyes. The relative rates of aqueous formation and regulation of its outflow are physiologically important in determining IOP<sup>4</sup>. Asymmetry of IOP in glaucoma patients may indicate asymmetric outflow impairment and asymmetric optic nerve damage. The studies on this subject have yielded varied results, as some have observed significant differences in intraocular pressure (IOP) between paired eyes, while others have noted similarity in IOP.

IOP asymmetry is the differences in IOP between the eyes which may be due to measurement error, asymmetry of central corneal thickness, or other structural differences. If asymmetry of IOP were an accurate indicator of the presence of glaucoma, then recognizing such asymmetry might be a useful way to diagnose glaucoma, and noting the symmetry of IOP might help rule out the presence of glaucoma.<sup>5</sup>

Asymmetric intraocular pressure (IOP) readings have been considered a hallmark of open-angle glaucoma.<sup>6</sup> IOP asymmetry in a large group of ethnically diverse primary open-angle glaucoma (POAG). It is defined as the difference of IOP of more than 3mmHg and Open-angle glaucoma is diagnosed if glaucomatous visual field loss was congruous with optic disc cupping and rim thinning.<sup>7-9</sup>

Studies have proved a direct relationship between the amount

of IOP asymmetry and the probability of having glaucoma. Intraocular pressure asymmetry between the fellow eyes has been identified as another risk factor for visual field progression in patients with glaucoma, as well as a sign of undiagnosed glaucoma.<sup>10</sup> specifically, the greater the difference in pressure between fellow eyes, the more likely the patient is to have glaucoma. Also, one study documented greater glaucomatous damage in eyes with higher pressures. Many clinicians are interested in identifying other risk factors for glaucoma progress.

We investigated Low-pressure glaucoma IOP asymmetry, postural differences in IOP asymmetry, diurnal IOP fluctuation, and Visual field indexes in patients.

Low-pressure glaucoma (LPG) or Normal tension glaucoma represents a subgroup of open-angle glaucoma with measured untreated IOP in a statistically normal range, and has proved to play a role in its pathogenesis. LPG patients with asymmetric IOP tend to have greater VF loss in the eye with high pressure.<sup>11</sup>

Latent asymmetric IOP is defined when asymmetry is seen while the patient is in a supine position but not while sitting, which places the patient at increased risk of glaucomatous damage.<sup>12</sup>

Therefore IOP asymmetry between the fellow eyes has been a major risk factor for visual field defect progression in patients with glaucoma as well as a sign of undiagnosed glaucoma.

### MATERIALS AND METHODS

The Study done was a prospective study conducted on all the patients above the age of 40 years who attended ophthalmology OPD of NC Medical College and Hospital, Israna. The study was conducted for a period of 6 months from December 2022 to May 2023. Total of 200 patients were taken for the study.

### Inclusion criteria

1. All patients above the age of 40 years who attended

ophthalmology OPD.  
 2. Diagnosed cases of primary open-angle glaucoma.

**Exclusion criteria**

1. Patients with previous ocular surgery.
2. Patients with congenital glaucoma, angle closure glaucoma, pigmentary glaucoma, glaucoma in association with the exfoliation syndrome, or secondary glaucoma.
3. Patients who were on long-term topical anti-glaucoma medications

The purpose of this study was to investigate the diagnostic value of IOP asymmetry in patients of rural- based hospitals in north India. Intraocular pressure asymmetry was defined for differences > 6 mm hg; glaucoma was diagnosed if glaucomatous optic disk and field changes were significant.<sup>10</sup>

200 Patients were enrolled for the study. Intraocular pressures were measured by Non-contact tonometry for both eyes in each case two times. The ones with IOP asymmetry of more than 3mmHg were again tested with Goldmann applanation tonometry (GAT). The amount of absolute IOP asymmetry between the 2 eyes was calculated by subtracting the lower IOP from the higher IOP, which were hence compared to see the percentage difference of IOP asymmetry present in glaucomatous and non-glaucomatous patients. Glaucoma was diagnosed if the intraocular pressure asymmetry difference was > 5 mm hg with significant glaucomatous optic disk and field changes.

Logistic regression was used to measure the asymmetry of IOP and its association with glaucoma (the dependent variable). The amount of IOP asymmetry was treated as a continuous independent variable with values of 0 to 7 mmHg. A group of patients with asymmetric IOP were identified.

**RESULTS**

Among 200 enrolled patients, 154 were non glaucomatous and 46 were glaucomatous (Figure 1)

Regarding the glaucoma patients, 65.21% were males and 34.78 were females; regarding controls: 21% were males and 34.78 were females (Figure 2)

The frequency of cases and controls with a particular amount of apparent asymmetry is shown in (Figure3, 4). These results show a direct relationship between the amount of IOP asymmetry between the fellow eyes and the likelihood of having glaucoma (p=0.001). Absence of IOP asymmetry between the fellow eyes is associated with a 2% probability of having glaucoma. A difference of 4 mmHg is associated with a 13.4% probability of having glaucoma, and a difference of more than 5 mmHg with a 50% probability of having glaucoma.

Same IOP: case 2.19%, control 12.7%;  
 1mmHg: case had 6.52%, control 20%;  
 2mmHg: case 8.69%, control 23.3%;  
 3mmHg: case 19.56%, control 19%;  
 4mmHg: case 13.04%, control 10%;  
 >5mmHg: case 50%, control 15%

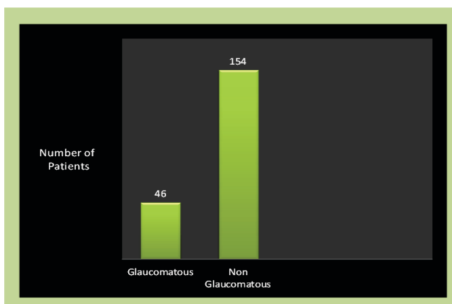


Figure 1

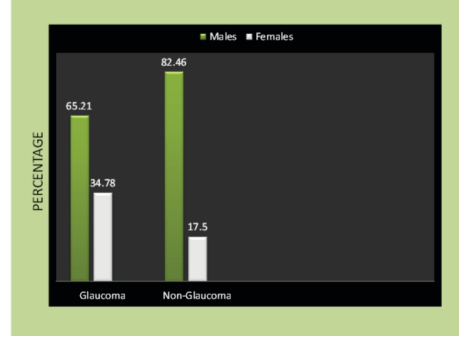


Figure 2

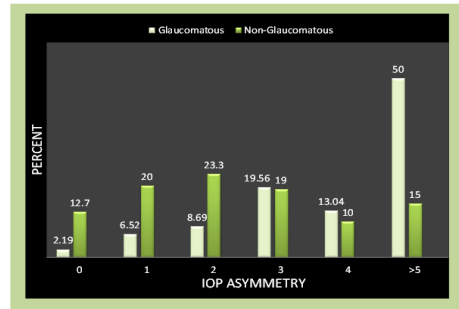


Figure 3

Asymmetry in IOP (mmHg)	Glaucomatous (%)	Non Glaucomatous (%)	P value
0	2.19	12.7	0.001 (S)
1	6.52	20	0.001 (S)
2	8.69	23.3	0.001 (S)
3	19.56	19	0.75
4	13.04	10	0.53
>5	50	15	0.02(S)

Figure 4

**DISCUSSION**

Asymmetry of IOP is considered while screening a population for glaucoma. IOP asymmetry is a risk factor for glaucoma, an inter-eye IOP difference of 2 mm Hg or more was associated with a four-fold risk of having glaucoma, while an inter-eye difference of more than 5 mm Hg or more carried a twenty five-fold risk of having glaucoma. Few patients with glaucoma appear to have symmetric IOP, and few non-glaucomatous patients have asymmetric IOP. Detection of glaucoma can be done when the IOP asymmetry is marked.

But visual field and optic disc changes differ significantly between the groups. "The mean deviation and pattern standard deviation in the higher IOP eye was significantly worse in subjects with IOP asymmetry"

When the whole population is considered, IOP asymmetry reaches statistical significance in both males and females. Statistical significance is just lost in the group of IOP asymmetry of 3mmHg and 4mmHg, but remains strong in IOP difference of 1mmHg, 2mmHg, and in more than 5mmHg explaining the diagnostic value of IOP asymmetry in glaucoma patients.

**CONCLUSION**

The present study found that the likelihood of having primary open-angle glaucoma increased as inter-eye IOP asymmetry increased. This seems to be a definite finding, leading to the conclusion that cases with IOP difference of 5 or more mmHg should be considered to be at great risk for having glaucoma, whereas those with symmetric pressures are not likely to have the disease

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