

# Correlation of Intraocular Pressure with Visual Field Defects in Glaucoma Patients

M Balasubramanian

Associate Professor, Department of Ophthalmology, Government Tiruvannamalai Medical College and Hospital, Tiruvannamalai, Tamil Nadu, India

## Abstract

**Introduction:** Glaucoma is a chronic, progressive optic neuropathy caused by a group of ocular conditions that damage the optic nerve with loss of visual function. The most common risk factor is raised intraocular pressure (IOP). Hence, the present study was performed to study the correlation of IOP with visual field (VF) defects in glaucoma.

**Methodology:** This is an observational, cross-sectional case series study. Patients diagnosed with glaucoma in the outpatient department of tertiary care hospitals were included in the study. In the present study, a total of 50 subjects with glaucoma were enrolled. IOP measurement, VF test, visual acuity assessment, and optic disc changes were measured during 1 year of the study.

**Results:** Of all patients, 42 (84%) patients were new diagnosed subjects. The majority of patients were found to be male, 39 (78%), compared to females 11 (22%). The majority of patients were observed with glaucoma suspects 23 (46%), whereas only 2 (4%) were observed with neovascular glaucoma. The majority of the patients, 41 (82 eyes), were observed with normal IOP, whereas 9 (18 eyes) patients were reported with increased IOP. A total of 68 eyes were found with glaucomatous optic nerve head changes, 26 eyes with the normal optic nerve. However, six eyes were also reported with vision loss in the present study. In the present study, maximum patients, 60%, were observed with normal VF followed by severe tubular vision/poor vision with 28% of patients. Whereas only 6% of patients were found with mild paracentral scotomas and moderate arcuate, respectively.

**Conclusion:** Raised IOP was one of the major risk factors leading to VF defects and complete vision loss in our society. Visual blindness was more prevalent in glaucoma patients who did not get anti-glaucoma therapy. The present awareness and knowledge should be enhanced through glaucoma awareness programs.

**Key words:** Glaucoma, Intraocular pressure, Angle closure, Optic neuropathy

## INTRODUCTION

As elevated intraocular pressure (IOP) is a major risk factor in the development of glaucoma that can severely threaten our visual function, accurate IOP measurements are essential for the daily management of this disease.<sup>[1,2]</sup>

IOP, on the other hand, is a highly variable and dynamic parameter that is influenced by a variety of variables, including measurement parameters (such as the tonometer and examiner), ocular factors (such as corneal thickness,

corneal hysteresis, and dehydration), and individual characteristics (such as accommodation, circadian cycle, body position, mental stress, and blood pressure).<sup>[3,4]</sup>

It is critical for ophthalmologists to understand IOP changes and their impact on clinical therapy and follow-up of glaucoma patients.<sup>[5,6]</sup> Visual field (VF) examination is another critical component of the clinical evaluation of glaucoma or glaucoma suspects and is often performed concurrently with IOP readings. The cause of glaucomatous optic neuropathy is unknown. Numerous risk variables have been suggested, but the two most persistent seem to be IOP and age. Direct correlations between the extent of VF loss and the level of pretreatment IOP at presentation have been found to be weak for primary open-angle glaucoma (POAG).<sup>[5]</sup> This probably reflects the multiple interacting risk factors for damage that modifies the response of a particular nerve to a given IOP. At a certain IOP, the likelihood of getting glaucoma varies according to the

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**Corresponding Author:** Dr. M Balasubramanian, Department of Ophthalmology, Government Tiruvannamalai Medical College and Hospital, Tiruvannamalai, Tamil Nadu, India.

type of glaucoma. In pseudoexfoliative glaucoma, which was previously assumed to be a more pressure-dependent condition, stronger relationships between VF defect (VFD) and IOP have been seen than in POAG. Primary angle-closure glaucoma (PACG) is likewise a more strictly pressure-dependent condition than POAG.<sup>[7,8]</sup>

A significant association between pre-treatment IOP and the quantity of VFD present may indicate how pressure dependent a disease is. This finding may provide credence to the notion that the pathogenic processes behind PACG are more pressure dependent. This may have consequences for prognosis and the need for clinical studies to determine if pressure reduction alone effectively halts the development of optic nerve damage and subsequent VFD.<sup>[9]</sup> Hence, the present study was carried out to assess the functional defects, namely, VFDs in correlation with IOP in glaucoma patients.

## METHODOLOGY

Between December 2019 and November 2020, an observational, cross-sectional case series investigation was undertaken on patients presenting to the ophthalmology department of a tertiary care hospital. The research involved 50 participants who were diagnosed with glaucoma. Forty-two of the 50 participants were newly diagnosed with glaucoma in this research. Applanation tonometry was used to determine the patients' IOP, and automated perimetry was used to determine their VF. Glaucoma suspects constituted the majority of the glaucoma population. Severe VF abnormalities were more often seen in individuals with increased IOP and moderate-to-severe optic nerve head cupping. Blindness was prevalent in newly diagnosed glaucoma patients who had not begun therapy. Before the research began, authorization was obtained from the institutional ethics committee, and signed consent was obtained from all participants.

## RESULTS

In the present study, a total of 50 subjects with glaucoma were enrolled, of which 42 (84%) patients were new diagnosed subjects. The majority of patients were male, 39 (78%), compared to females 11 (22%). The type of glaucoma was observed in all patients, and it was found that most of the patients were glaucoma suspects 23 (46%), followed by normal-tension glaucoma 13 (26%), and POAG with 6 (12%) patients. However, only 2 (4%) were observed with neovascular glaucoma [Table 1].

The IOP has measured in all patients both eyes, and it was found that the majority of the patients, 41 (82 eyes), were

observed with normal IOP, whereas 9 (18 eyes) patients were reported with increased IOP [Figure 1].

The optic nerve integrity was examined in the present study; 68 eyes were found with glaucomatous optic nerve head changes, 26 eyes with the normal optic nerve. However, six eyes were also reported with vision loss in the present study [Table 2].

All 50 subjects were studied for any VFD, and it was observed that maximum patients 60% were observed with normal visual field followed by severe tubular vision/poor vision with 28% of patients. Whereas only 6% of patients were found with mild paracentral scotomas and moderate arcuate, respectively. [Figure 2].

## DISCUSSION

The present study was performed on 50 subjects with glaucoma, of which patients were found to be male 39 (78%).

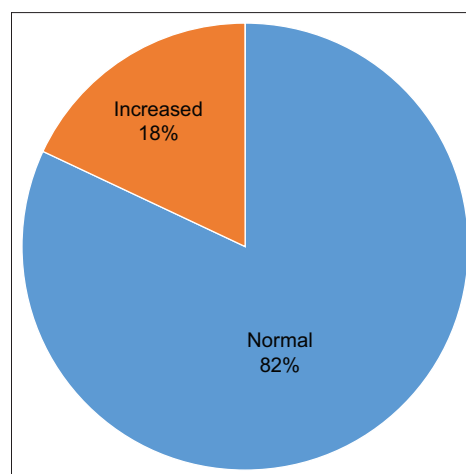
**Table 1: Observation of type of glaucoma in all enrolled patients**

| Type                           | Frequency | %    |
|--------------------------------|-----------|------|
| Normal-tension glaucoma        | 13        | 26.0 |
| Glaucoma suspect               | 23        | 46.0 |
| Primary open-angle glaucoma    | 6         | 12.0 |
| Primary angle-closure glaucoma | 6         | 12.0 |
| Neovascular glaucoma           | 2         | 4.0  |

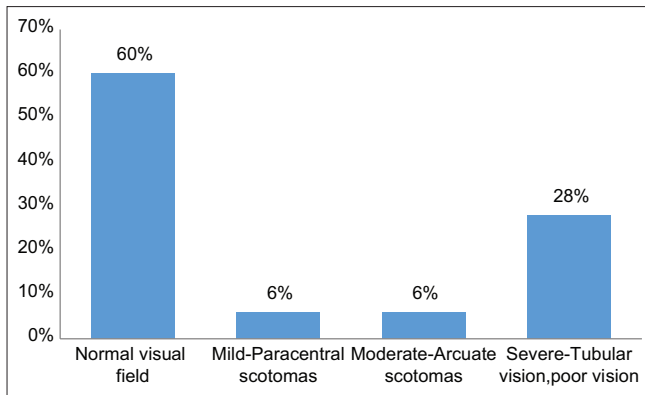
**Table 2: Observation of optic nerve changes in all subjects eyes**

| Fundus changes                        | Eyes with normal IOP | Eyes with increased IOP |
|---------------------------------------|----------------------|-------------------------|
| Glaucomatous optic nerve head changes | 54                   | 14                      |
| Normal optic nerve head               | 24                   | 2                       |
| No view                               | 4                    | 2                       |

IOP: Intraocular pressure



**Figure 1: Observation of intraocular pressure in all participating subjects**



**Figure 2: Observation of the visual field defect in all subjects**

Similar observations were also reported by Gazzard *et al.* in their study with 71% of males. In contrast, Mengwei *et al.* reported 57% of male patients in their study.<sup>[10,11]</sup>

Our study observed that most of the patients were glaucoma suspect 46%, followed by normal-tension glaucoma 26% and POAG with 6 (12%). In contrast, only 2 (4%) were observed with neovascular glaucoma. Hollows and Graham, in their study, also recorded predominant glaucoma patients in their study.<sup>[12]</sup>

The measured IOP among all patients with both eyes revealed that most patients, 41 (82 eyes), were observed with normal IOP, whereas 9 (18 eyes) patients were reported with increased IOP. These findings in the present study are in confirmation of earlier reported studies.<sup>[13]</sup>

Regarding the optic nerve head cupping, among patients with normal IOP, 68 eyes were found with glaucomatous optic nerve head changes, of which 14 eyes were found with increased IOP. A total of 26 eyes were reported with the normal optic nerve, of which two eyes were found with increased IOP. However, in the present study, six eyes were also reported with vision loss, with two eyes having increased IOP. These findings showed that glaucomatous nerve head changes were common in eyes with normal IOP and increased IOP. These findings in the present study are in confirmation of the earlier reported studies.<sup>[14]</sup>

All 50 subjects were evaluated for any VFD, and it was found that most of the patients, 60%, were observed with normal VF followed by severe tubular vision/poor

vision with 28% of patients. Whereas only 6% of patients were found with mild paracentral scotomas and moderate arcuate, respectively. Foster *et al.* also reported similar findings in their study.<sup>[15]</sup>

## CONCLUSION

Raised IOP was one of the major risk factors, leading to VFDs and complete vision loss in our society. Visual blindness was more common among the glaucoma patients who were not on anti-glaucoma treatment. The present awareness and knowledge should be enhanced through glaucoma awareness programs.

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