INTRODUCTION

Glaucoma stands only second to cataracts in the cause of blindness throughout the world. Tonometry and visual field examinations are an integral part of glaucoma diagnosis and follow-up. Visual field (VF) test documenting functional loss and progression is critical. The sole established measure targeted in glaucoma therapy is Intraocular pressure (IOP). As a result, its measurement during the consultation directly affects the course of IOP-lowering medications.

The impact of Visual field testing on IOP is a topic of debate at the moment in the literature. According to some findings VF testing alters IOP, which could prompt a therapeutic adjustment in glaucoma treatment.

The objective of this study was to determine how visual field testing and test duration affected glaucoma suspects’ and glaucoma patients’ intraocular pressure.

METHODS

This was a quantitative cross-sectional hospital-based study from October 15, 2020, to September 15, 2021, carried out at BP Koirala lions center for ophthalmic studies. The institutional review committee of the Institute of Medicine at Tribhuvan University provided their ethical clearance with Reference No. 100(6-11) E 077/078. Convenience sampling was done. The sample size was calculated by using a population size of 2000, a 95% confidence interval, a 5% margin of error, a population proportion of 50%, and an additional 10% addition for nonresponse. The calculated total size was 357. All patients were informed of the purpose of the study, and their consent was obtained. Individuals over the age of 18 with ocular hypertension and glaucoma, and suspects undergoing VF testing were included in the study. Both eyes were taken for the study.

Three readings of the IOP measurement were taken with noncontact tonometry both before and after Visual field testing. The mean of three readings was taken for the study parameter to avoid both subjective and measurement biases. Noncontact tonometry was used for IOP measurement as it is fast, easy to perform, and does not require the use of topical anesthetic
eye drop before taking tonometry. As Goldman applanation tonometry (GAT) requires the instillation of anesthetic eye drops, this might decrease blinking rate and might cause epithelial toxicity resulting in epithelial punctuate defects which can alter the VF test result. Those with difficulty in IOP measurement, with corneal pathology that might influence IOP measurement, and patients receiving pilocarpine or mydriatic agents that affected pupil diameter or accommodation were excluded from the study.

Patients meeting inclusion criteria were subjected to IOP measurement five minutes before and after VF tests. Detailed history and clinical examination were done including visual acuity and anterior and posterior segment evaluation. Keller pulse air desktop (2013 Keller Ltd SL 4AA UK) tonometry was used for every patient before and after the VF testing. All VF tests were performed in the same room and under the same condition of illumination in a dark room. The VF examination duration and the IOP readings before and after the VF examinations were recorded. Swedish Interactive Threshold Algorithm (SITA) Fast 24-2 perimetry (2010 Carl Zeiss Meditec HFAII750-41686-5.12) was used. The test was done in the undilated pupil as well as those not on miotic agents. Normally, SITA Fast 24-2 perimetry takes 2-3 min per eye.

Data was entered and analyzed in IBM SPSS 20.0 version. The median value was calculated for age, and intraocular pressure. Kruskal Wallis test was used for the comparison of intraocular pressure between categories of diagnosis. Wilcoxon signed-ranks test was used for the comparisons of IOP before and after the Visual field test in the two groups. Mann-Whitney test was done for comparison between the right and the left eye, and Kruskal Wallis test for the comparison between categories of diagnosis. A p ≤ 0.05 was considered statistically significant. Spearman rank correlation was done to look at the association between the duration of AVF and Post AVF intraocular pressure.

RESULTS

A total of 357 individuals were included in the study and their data was analyzed. The minimum age of presentation was 18 years and the maximum age at presentation was 81 years. The median age was 43 years. Among 357 patients, 181 were females (51%) and 176 were males (49%) with a Female: Male ratio was 1.03:1. Among 357 patients, 255 (71%) were Glaucoma suspects, 68 (19%) were Primary open angle glaucoma, 31 were Normal tension glaucoma (9%), 3 were Ocular hypertension. 102 (28%) were using glaucoma medication and 255 were not using glaucoma medications. The demographic characteristics of study participants are outlined in Table 1.

### Table 1: General information among patients with Glaucoma and suspects attending tertiary eye care center in Kathmandu (n=357)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Category</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age groups in years</td>
<td>18-40</td>
<td>168(47)</td>
</tr>
<tr>
<td></td>
<td>41-60</td>
<td>137(38.5)</td>
</tr>
<tr>
<td></td>
<td>61-80</td>
<td>50(14)</td>
</tr>
<tr>
<td></td>
<td>81-100</td>
<td>2(0.5)</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>439(30)</td>
<td>Min/Max= 18/81</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>176(49)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>181(51)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>POAG</td>
<td>68(19)</td>
</tr>
<tr>
<td></td>
<td>GS</td>
<td>255(71)</td>
</tr>
<tr>
<td></td>
<td>NTG</td>
<td>31(9)</td>
</tr>
<tr>
<td></td>
<td>OH</td>
<td>3(1)</td>
</tr>
<tr>
<td>Use of medication</td>
<td>Yes</td>
<td>102(28)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>255(72)</td>
</tr>
</tbody>
</table>

### Table 2: Comparision of IOP between before and after VF test among patients with Glaucoma and suspects attending tertiary eye care center in Kathmandu (n=357)

<table>
<thead>
<tr>
<th>Types of eye</th>
<th>Intraocular pressure</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median (IQR)*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Before After</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>357 16(4) 16(5)</td>
<td>0.22</td>
</tr>
<tr>
<td>Left</td>
<td>357 16(4) 16(4)</td>
<td>0.11</td>
</tr>
</tbody>
</table>

*Median and IQR were used for comparison since data were not distributed normally

There was no significant difference in IOP measured before the VF test and after the VF test in both eyes. (Wilcoxon signed rank test p>0.05) as shown in Table 2. The average change in IOP was 0.2 ± 2.9 mmHg in the right eye and 0.3 ± 3 mm Hg in the left eye. The baseline IOP before undergoing VF test, was not significantly different between various categories of diagnosis.
in the right eye diagnosis (Kruskal Wallis test, >0.05) however, it was significantly different between the various categories of diagnosis in the left eye. (Kruskal Wallis test, p<0.05)

After the VF test, IOP was not significantly different between the two eyes (Mann-Whitney U test, P> 0.05) and categories of diagnosis. (Kruskal Wallis test, >0.05)

The median time duration for the VF taken in each eye was 244 and 221 seconds respectively. There was no significant difference found in test duration between the two eyes (Mann-Whitney U test, P> 0.05). However, it was significantly different among different categories of diagnosis. (Kruskal Wallis test, p<0.05).

Spearman rank correlation test showed that there was no significant correlation between the duration of the VF test and Post VF intraocular pressure in both eyes (p> 0.05).

DISCUSSION

In the present study, we found that VF testing did not significantly influence IOP fluctuation, before and after VF examination in the examined group. There has been no definite consensus in the past regarding this matter and various theories have been proposed for IOP fluctuation seen after the VF test though, no clear mechanism explains this IOP fluctuation seen following VF testing. 6-11

The findings of the study are in line with the studies conducted in other parts of the world.9-11,14,15 In our study though IOP fluctuation was seen, it was however not significantly different from the baseline IOP before the VF test. More so, no differences were seen between the patients with overt glaucoma and the patients with ocular hypertension or suspected glaucoma and between the right eye and the left eye. We had taken both eyes of the same patients for the study. Various studies have taken both eyes of the same patients for a study like ours.9,10,18 While some had taken only the right eye of patients, 13, 19

Rebolleda et al, also did a similar study where IOP did not vary significantly immediately after VF testing compared in 27 POAG patients.9 No significant differences in IOP values between immediately before and immediately after routine VF testing in 40 treated glaucoma patients and 21 untreated ocular hypertension or suspected glaucoma in another study.10 Sawada et al also concluded that VF testing did not lead to an increase in IOP in most glaucoma eyes.11 On the contrary, Recupero et al, found that IOP varied significantly and tended to increase immediately after visual field examination in 49 patients (94 eyes) with primary open-angle glaucoma (POAG).12 Related results were seen in a retrospective study done by Ni et al, in 109 right eyes of patients with POAG, where more than 20% increase of IOP was obtained after VF testing compared with IOPs from the previous and next visits without VF testing in 22% of cases. However, this IOP increase was small on average.13

Various studies have used various tonometry tools for IOP measurement.10, 14-18 Rebolleda et al. used Goldman tonometry while Lee et al. used iCare® rebound tonometer.9, 19 Since, the non-contact tonometry has been demonstrated to have similar accuracy to the Goldman applanation tonometry.15-17 In our study, the IOP was measured by a noncontact tonometer at each time point to avoid any contact-related damage to the cornea, similar to studies done by Li et al and Bertaud et al.14, 15 Also, most of these studies, IOPs were measured only at two or three time points similar to our study however, Li et al measured IOP multiple time points after automated VF examination, 12-14

The test duration varied in different studies, ranging from 4-21 minutes. The difference in the VF examination time may be the reason for the varied results and varied mechanisms have been explained.9-12 However, no correlations were found between IOP change and the VF test duration in similar studies.10, 14, 15 This corroborated with the result seen in our study where the visual field time was 3-4 min for each eye which indicates that the VF with shorter examination time does not cause fluctuation in IOP. However, in another study with a test duration ranging from 7 to 21 min, using the central 30–2 full-threshold program, which is a VF test with a longer duration, had a significant mean increase in IOP was seen after the automated VF testing in glaucomatous eyes.12

The major limitation of this study is, it is a hospital-based study, so the result may not reflect the population as a whole. It is not a randomized trial. The small number of patients in the glaucoma subgroup did not allow subgroup analysis for severity in our study. Moreover, there was no appropriate control group in our study. However, this study had taken included glaucoma suspects besides glaucoma patients while most of the previous studies conducted evaluated only glaucoma patients and compared them with healthy subjects.

CONCLUSION

This study found that there is no effect of the short-duration visual field testing on the intraocular pressure in both glaucoma patients and glaucoma suspects. Fluctuation in IOP obtained after VF test alone, should not be taken into account for medication adjustment. As it is convenient for the patient as well as the eye care physicians, for routine practice visual field testing could be done just before the glaucoma clinic consultation.

ACKNOWLEDGEMENT

The authors wish to acknowledge Tara Suwal and for her help in the data collection for the study.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None
REFERENCES: