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Profile and Clinical Characteristics of Newly Diagnosed Glaucoma in Tertiary Eye Hospital in North India

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ABSTRACT

PURPOSE: This study aims to assess the clinical profile and characteristics of newly diagnosed glaucoma in tertiary eye hospital in North India.
METHODS: All the newly diagnosed glaucoma patients were enrolled in this study who came for the routine eye examination at our tertiary eye Hospital, Dr Shroff's Charity Eye Hospital, New Delhi between November 2021 and October 2022. A detailed history was obtained and all the glaucoma investigations were performed including best corrected visual acuity, Van Herrick grading, gonioscopy, optic disc assessment with 90D lens, applanation tonometry, Cirrus HD OCT and automated perimetry. Various parameters like visual field index (VFI), retinal nerve fire layer (RNFL), intraocular pressure (IOP), rim area, disc area, average and minimum ganglion cell complex-inner plexiform layer, average cup disc ratio, vertical cup disc ratio and cup volume were evaluated.
RESULTS: In this study, we recruited total 79 subjects who were able to complete all the investigations and fulfilled the inclusion criteria. 65.82 % subjects were diagnosed as primary open-angle glaucoma (POAG). We found that 83.5% patients were having vision equal or better than 6/18 and 81.01% had IOP up to 21 mmHg. VFI had positive correlation with average RNFL thickness, rim area, disc area, average and minimum GCC-IPL. It also had negative correlation with average Cup disc ratio, vertical cup-disc ratio and cup volume. On the basis of mean deviation, half of the subjects had mild glaucoma.
CONCLUSIONS: A thorough literature search revealed that no similar studies correlating VFI with OCT parameters had been conducted in the past. Among the newly diagnosed primary glaucoma patients most cases had mild glaucoma followed by moderate glaucoma and severe glaucoma. Patients with a better VFI showed a better RNFL thickness and had larger discs as compared to those with a poorer VFI. POAG was the most frequently observed glaucoma subtype among primary glaucoma in tertiary eye Hospital in north India.
Keywords: Glaucoma, Glaucoma screening, Visual field analyzer, Optical coherence tomography, VFI

INTRODUCTION

In this era leading causes of blindness are cataract and glaucoma in India[1]. It is estimated that 66.8 million people are affected by primary glaucoma worldwide, with 6.7 million persons being bilaterally blind due to the disease. The reported prevalence of Primary open angle glaucoma

(POAG) from various population- based studies among Caucasians varies between 1 and 3%[2-5]. Recent epidemiological studies in India have reported a higher prevalence, ranging from 3.6% in the Andhra Pradesh Eye Disease study (APEDS)[6,7] to 4.73% in the Vellore Eye Study (VES)[8]. However, a comparison of these studies reveals differences in the population selection, clinical methodology and definition of disease. Different definitions for occludable angle and angle closure glaucoma are used in APEDS and VES, which may explain the difference in the prevalence of POAG & PACG (primary angle closure glaucoma) found.

Any health care programme aimed at identifying and treating glaucoma in the community must first include a true estimate of the prevalence of disease. This requires a good methodology comprising appropriate population selection, examination techniques and criteria for defining the disease. This project aims to study the profile and clinical characteristics of newly diagnosed glaucoma in tertiary hospital in North India.

Figure: **This Figure shows specially the North India zone in Indian Political map.**

MATERIALS & METHODS

The study procedure is hospital-based clinical examination and diagnostic procedures. Clinical examination commenced in November, 2021 and completed in October, 2022.

STUDY DESIGN This is a population based cross- sectional study.

SAMPLE SIZE The sample size required for a precise estimate of the profile and clinical characteristics of newly diagnosed primary glaucoma was calculated. Assuming a 3% prevalence of glaucoma based on the APEDS and VES, a relative precision of 25%, 85% compliance and a design effect of 2, we calculated a required sample size of 79. Therefore, 100 subjects each from the random populations will be enumerated.

STUDY AREA The study area consists of rural and urban areas surrounding central, west, east & south Delhi.

INCLUSION CRITERIA All newly diagnosed primary glaucoma between the time period of November 2021 to October 2022 with age of 18 years and more were taken.

EXCLUSION CRITERIA Those patients have old glaucoma history and congenital glaucoma patients are excluded from the study. Those patients where HVF (Humphrey Visual Field Analyzer) and OCT (Optical coherence tomography) reports are missing they were also excluded.

HOSPITAL BASED CLINICAL EXAMINATION AND DIAGNOSTIC PROCEDURES

OVERVIEW On arrival at the examination center the subjects are registered and issued the previously assigned 12-digit EMR number. Before generating OPD slip patient is asked to sign on signature pad (which is scanned) and also the receptionist take a photo of the patient for recognition purpose of that particular patient for optometrist, ophthalmologists and other medical staffs in OPD and diagnostic part. Then they proceed through various ophthalmic examination and diagnostic procedures in the following order: (a) Ocular and medical history (b) Refraction and recording of the best corrected visual acuity, (c) Slit lamp biomicroscopy, (d) Applanation tonometry (e) Gonioscopy (f) Visual field test (through Humphrey Field Analyzer 3) (g) Glaucoma OCT (GCC & ONH-RNFL)[9]

OCULAR AND MEDICAL HISTORY A detailed history pertaining to medical and ophthalmic problems is elicited. This includes details regarding use of glasses, any present or past ocular problems any history of trauma, surgery or laser procedures to either eye, history of use of steroids and any other ocular and/ or systemic medications, family history of ocular disease, details of any systemic illness and personal history.

VISUAL ACUITY AND REFRACTION The Snellen chart is used to test the distance visual acuity. Distance visual acuity Landolt's C chart (broken C chart) is used for subjects who cannot read English, Hindi alphabets[10]. The chart is placed at 3 metre and is illuminated from above so that the illumination in front of the chart is about 900 lux[11]. Visual acuity is checked either unaided or with the subject's spectacle, if he or she is using any. If the visual acuity is less than 20/20, then the pinhole visual acuity is assessed. Objective refraction is performed with a streak retinoscope (Heine, Germany) followed by subjective refraction.

SLIT LAMP BIOMICROSCOPY The Zeiss SL 130 slit lamp is used. Using a moderately wide beam, the eyelids, margins, lashes, canthi and puncta are systematically examined, followed by the palpebral and bulbar conjunctiva, sclera and cornea. Then using a narrow parallelopiped beam, the cornea, anterior chamber and iris are examined for any abnormalities. Grading or peripheral anterior chamber depth is done according to the Van Herick System[12].

APPLANATION TONOMETRY Intraocular pressure (IOP) recording with the Goldmann applanation tonometer[13] (Zeiss AT 030 applanation tonometer) is performed on all subjects except in those eyes where distorted mires preclude reliable readings. After applying 0.5% proparacaine eye drops for topical anaesthesia and staining the tear film with a 2% fluorescein strip, the IOP is recorded in each eye.

GONIOSCOPY Gonioscopy is performed in dim ambient illumination with a shortened slit that does not fall on the pupil. A Sussmann type 4 mirror hand – held gonioscope (volk optical Inc) is used. The angle is graded according to the Spaeth Shaffer system[14] and the peripheral iris contour, degree of trabecular meshwork pigmentation and other angle abnormalities recorded. An angle is considered occludable if the pigmented trabecular meshwork is not visible in > 180◦ of the angle in dim illumination. If the angle is occludable, indentation gonioscopy is performed and the presence or absence of peripheral anterior synechiae is recorded.

HUMPHREY VISUAL FIELD ANALYSER Visual field evaluation is

done with HVF (Zeiss Humphrey Field Analyser), 24-2 test mostly done for glaucoma diagnosed patients. In some cases, 10-2 is required. In this study mostly viewed MD, PSD, VFI and GHT value.

CIRRUS HD- OCT Through Cirrus HD-OCT average RNFL thickness, rim area, disc area, average cup-disc ratio, vertical cup- disc ratio, cup volume, RNFL thickness quadrant wise were evaluated.

DATA MANAGEMENT

DATA COLLECTION History, examination findings and the results of all diagnostic procedures are entered on MS Excel sheet, which is maintained as a permanent record for every individual. At the end of the examination, all the records are checked for completeness before the subject leaves the examination center.

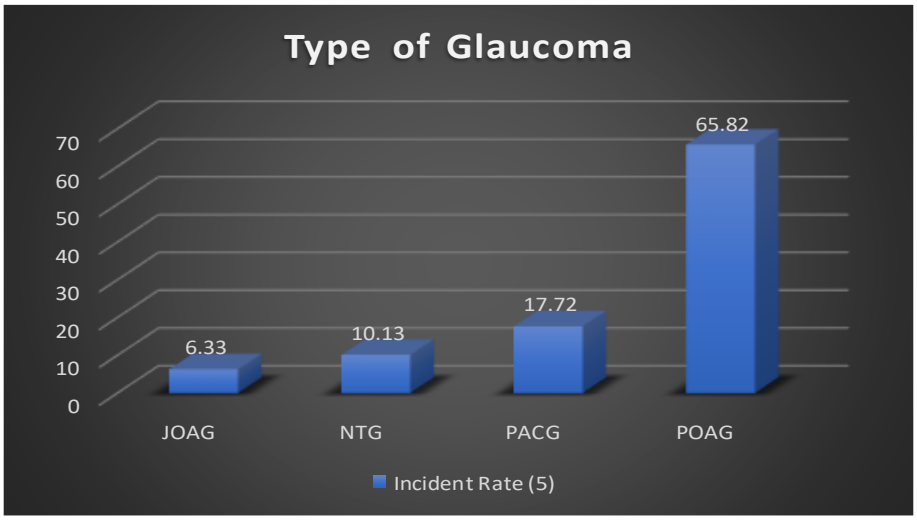
DATA ENTRY AND PROCESSING The data collected from Electronic Medical Record System of the patient diagnosed with glaucoma and entered into a computerized database using MS Excel.

DATA ANALYSIS Data analysed on

- Percentage of different primary glaucoma
- Percentage of patient presenting with vision <6/18, vision < 6/60 and vision < 3/60
- Percentage of patients presenting with IOP <21 mmHg
- Percentage of patients presenting with mild, moderate and severe glaucoma, on the basis of VFA MD (>-6 db, -6 to -12 db, <-12 db)
- VFI in patients with mild, moderate and severe glaucoma
- Correction of VFI with average RNFL thickness, rim area, average CDR, cup volume, average and minimum GCC-IPL.

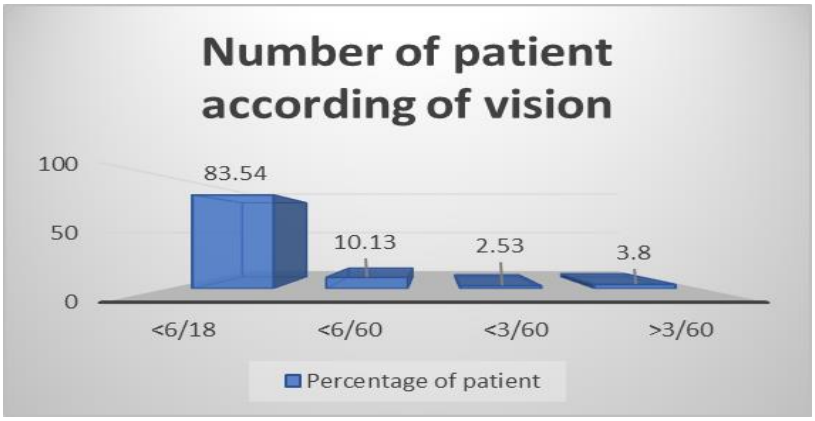
RESULT

During the study period, a total of 102 eyes were newly diagnosed with primary glaucoma. Out of 102 eyes, 79 eyes were included in the study (data with unreliable VFA & OCT reports were excluded). The mean age of the newly diagnosed glaucoma patients was 55.08 out of which 67 were male and 35 were female respectively. The proportions of the glaucoma subtypes are shown in Graph 1. The most frequently observed glaucoma subtypes were primary open-angle glaucoma (65.82%), primary angle closure glaucoma (17.72%), normal tension glaucoma (10.13%), juvenile open angle glaucoma (6.33%).



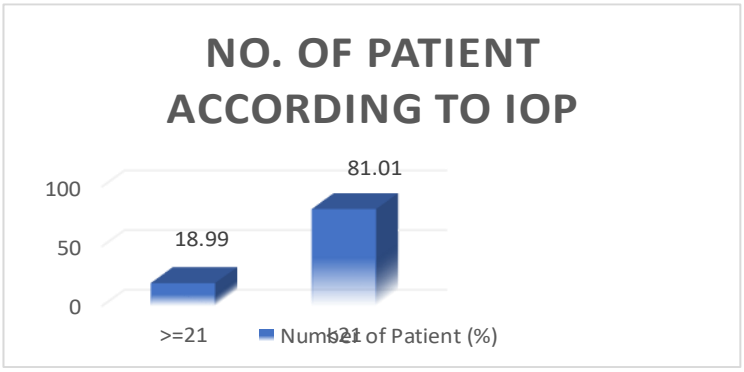
***Graph1*: This graph shows that which type of glaucoma is more prevalent in this project study. This graph represents that POAG has the highest bar (65%) out of 79 data.**

The proportions of the vision criteria are shown in Graph 2. According to vision criteria as per World health organization (WHO) 83.5% patients with <6/18 vision, 10.13% patients with <6/60 vision, 2.53% patients with <3/60 & 3.8% patients with >3/60 of newly diagnosed primary glaucoma.



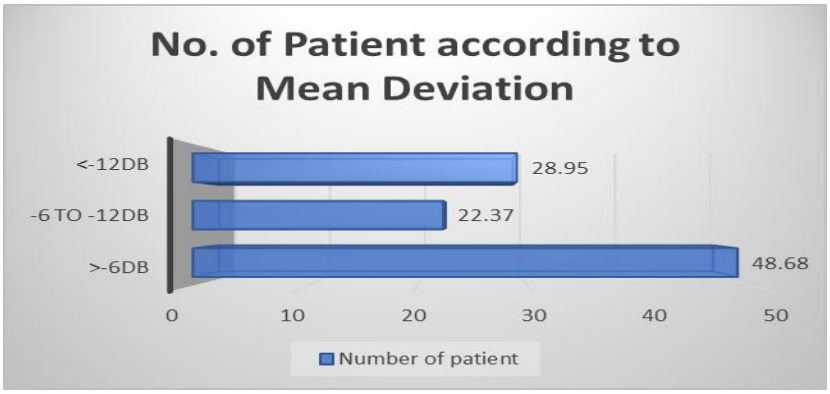
***Graph2*: This graph shows that out of 79 data the prevalence rate of newly diagnosed glaucoma having vision <6/18 comparing to the other vision criteria.**

In Graph-3, IOP category <21 mmHg patients of newly diagnosed primary glaucoma are more prevalent in this project.

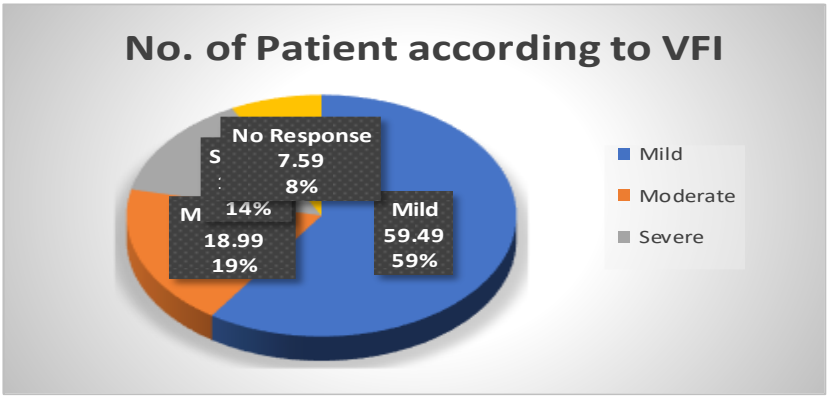


***Graph3*: This graph shows that number of patient (%) of newly diagnosed glaucoma have IOP <21 mmHg.**

According to the mean deviation, most of the eyes (48%) had a mean deviation of <6dB at the time of diagnosis and approximately 28% had a mean deviation of >12.00dB. We correlated the VFI with mean deviation of all patients.



***Graph4*: This graph shows that according to mean deviation (MD value in VFA) most of the newly diagnosed glaucoma patients have >-6db (48.68%).**

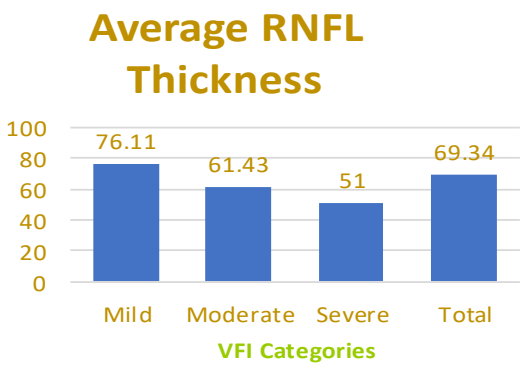


***Graph5*: This pi chart shows that according to Visual field Index (VFI) mild glaucoma are more prevalent.**

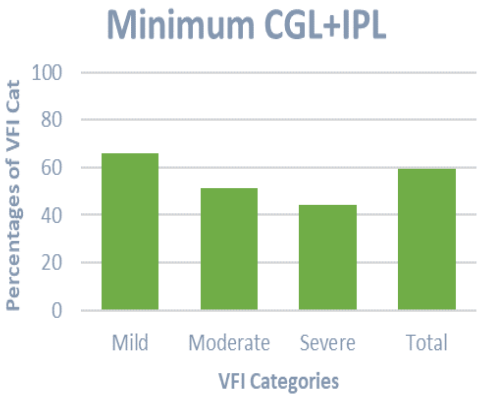
In patients with mild glaucoma, the average VFI was found to be 59%, while it was found to be 18% and 14% respectively in moderate and severe glaucoma cases. Correlations of VFI with OCT parameters showed that VFI is positively associated with Average RNFL thickness, Rim area, Disc area, Average and minimum GCC-IPL and also negatively associated with Average Cup disc ratio, vertical cup-disc ratio and cup volume which shows higher prevalence in mild to moderate and to severe glaucoma.

Correlations of VFI with OCT parameters are given in table-	
VFI is positively associated with	VFI is negatively associated with
Average RNFL Thickness	Average CDR
Rim Area	VCDR
Disc Area	Cup Volume
AVGCGLIPL	
MINCGLIPL	

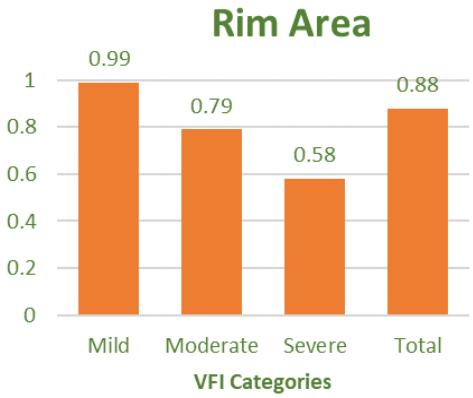
	Mild	**Moderate**	**Severe**	**Total**
Average RNFL Thickness	76.11	61.43	51	69.34
Rim Area	0.99	0.79	0.58	0.88
Average CDR	0.73	0.8	0.82	0.76
Disc Area	2.31	2.38	1.9	2.26
Average VCDR	0.72	0.82	0.83	0.76
Cup Volume	0.6	0.64	0.49	0.59
Average CGL+IPL	73.52	60.14	53	67.37
Minimum CGL+IPL	65.98	51.57	44.4	59.56



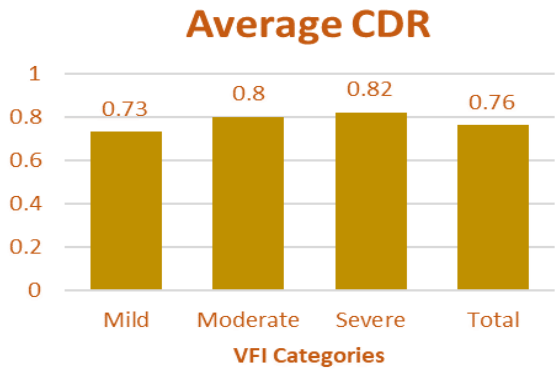
The graph shows OCT parameter Avg. RNFL thickness, mild glaucoma prevalence correlating to VFI



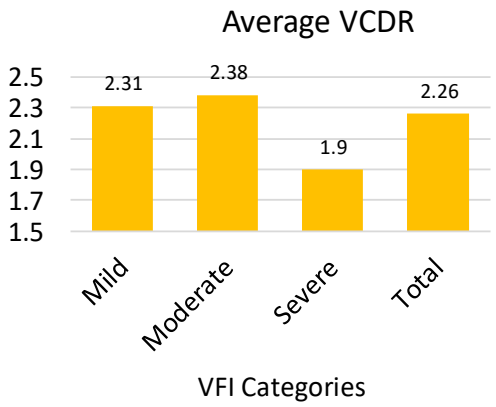
The graph shows OCT parameter, Minimum CGL+IPL mild glaucoma prevalence correlating to VFI categories



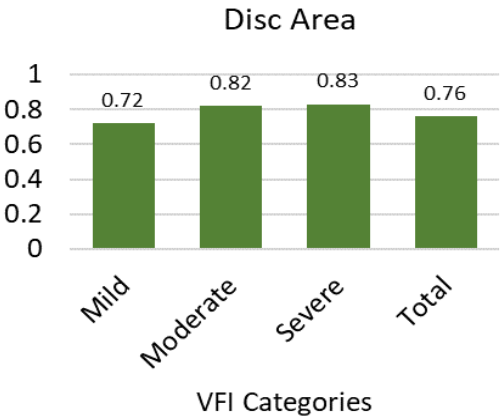
The graph shows OCT parameter Rim area, mild glaucoma prevalence correlating to VFI categories



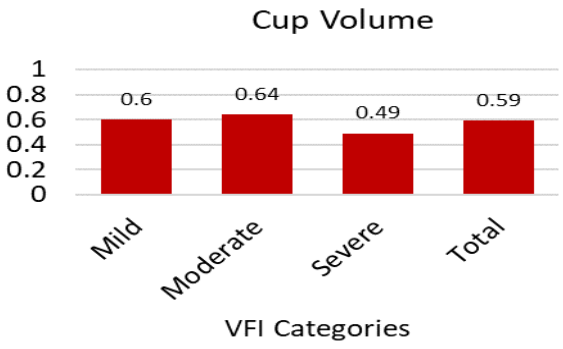
The graph shows OCT parameter Avg. CDR, sever glaucoma prevalence correlating to VFI categories



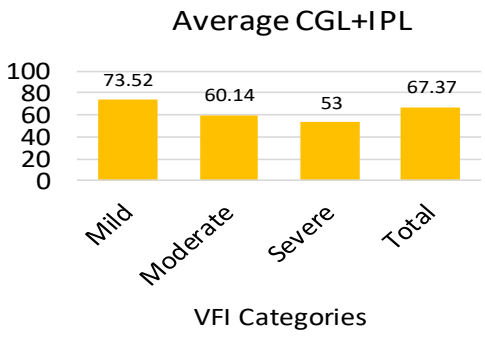
The graph shows OCT parameter Avg. VCDR, moderate glaucoma prevalence correlating to VFI categories



The graph shows OCT parameter Disc area, moderate glaucoma prevalence correlating to VFI categories



The graph shows OCT parameter Cup volume, moderate glaucoma prevalence correlating to VFI categories



The graph shows OCT parameter Avg. CGL+IPL, mild glaucoma prevalence correlating to VFI categories

***TABLE*:** This table shows that VFI is positively associated with Average RNFL thickness, Rim area, Disc area, Average GCC-IPL, Minimum GCC-IPL. VFI is negatively associated with Average Cup-disc ratio, vertical cup-disc ratio and cup volume.

DISCUSSION

A thorough literature search revealed that no similar studies correlating visual field parameters with OCT parameters had been conducted in the past. Among the newly diagnosed primary glaucoma patients most cases had mild glaucoma followed by moderate glaucoma and severe glaucoma.

As per the hospital-based studies among primary glaucomas, POAG was more common followed by PACG and Presenting IOP was higher in PACG compared to POAG with nearly equal severity of disc damage by Khandelwal *et al*[15] in India and reports from Nigeria,[16] Ghana,[17] and Ethiopia.[18] These differences in prevalence could vary based on the racial differences and patterns of patients referred to these centers.

The strength of the study is comparison data of VFI with OCT parameters which is not captured in previous studies. Mild, moderate and severe glaucoma were calculated on the basis of MD and VFI was also calculated on the basis of mild, moderate and severe glaucoma. Then, VFI was compared with the OCT parameters where we found Patients with a better VFI showed a better RNFL thickness and had larger discs as compared to those with a poorer VFI. VFI is positively associated with Average RNFL thickness, Rim area, Disc area, Average GCC-IPL, Minimum GCC-IPL. VFI is negatively associated with Average Cup-disc ratio, vertical cup- disc ratio and cup volume.

Creating public awareness, emphasis on comprehensive evaluation when patient visits any ophthalmologist for a spectacle correction or any other complaint would help with earlier detection of glaucoma. Appropriate care or timely referral would help care for the deserving patients and prevent blindness due to glaucoma.

CONCLUSION

This study is expected to result in an estimation of the profile and clinical characteristics of newly diagnosed primary glaucoma, prevalence rate of newly diagnosed glaucoma in north India and also the correlation of VFI and OCT parameters. The newly diagnosed one are found to have POAG, where the vision is <6/18, having IOP>21mmHg also performing VFA test to analyze according to VFI resulting in mild to moderate then to sever glaucoma inconsideration with correlating OCT parameters where it seen as VFI is positively associated with Average RNFL thickness, Rim area, Disc area, Average GCC-IPL, Minimum GCC-IPL. VFI is negatively associated with Average Cup-disc ratio, vertical cup- disc ratio and cup volume.

In summary, we have attempted to define the pattern of glaucoma in North India. The main drawback is the hospital and speciality clinic-based data analysis. The data needs validation by population-based epidemiologic studies. Nevertheless, this study could provide useful background information for planning glaucoma surveys in this region.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Quigley HA. Number of people with glaucoma worldwide. Br J Ophthalmol. 1996; 80:389–393.
2. Tielsch JM, Sommer A, Katz J, et al. Racial variations in the prevalence of primary open angle glaucoma – The Baltimore Eye Survey. J Am Med Assoc. 1991; 266:369–374.
3. Dielemans I, Vingerling JR, Wolfs RCW, et al. The prevalence of primary open angle glaucoma in a population based study in the Netherlands – The Rotterdam Study. Ophthalmology. 1994; 101:851–855.
4. Mitchell P, Smith W, Attebo K, Healey PR. Prevalence of open angle glaucoma in Australia – The Blue Mountains Eye Study. Ophthalmology. 1996; 103:1661–1669.
5. Wensor MD, McCarty CA, Stanislavsky YL, Livingston PM, Taylor HR. The prevalence of glaucoma in the Melbourne

Visual Impairment Project. Ophthalmology. 1998; 105:733–739.
6. Dandona L, Dandona R, Mandal P, et al. Open-angle glaucoma in an urban population in Southern India – The Andhra Pradesh Eye Diseases Study. Ophthalmology. 2000;107: 1702–1709.
7. Dandona L, Dandona R, Srinivas M, et al. Angle-closure glaucoma in an urban population in Southern India – The Andhra Pradesh Eye Diseases Study. Ophthalmology. 2000;107: 1710–1716.
8. Jacob A, Thomas R, Koshi SP, Braganza A, Muliyil JP. Prevalence of primary glaucoma in an urban South Indian population. Indian J Ophthalmol. 1998; 46:81–86.
9. https://pubmed.ncbi.nlm.nih.gov/14566635/
10. Ferris FL, Kassoff A, Bresnick GH, Bailey I. New visual acuity for clinical research. Am J Ophthalmol. 1982; 94:97–98.
11. Ferris FL, Sperduto RD. Standardized illumination for visual acuity testing in clinical research. Am J Ophthalmol. 1982; 94:97–99.
12. Van Herick W, Shaffer RN, Schwartz A. Estimation of width of angle of anterior chamber: incidence and significance of the narrow angle. Am J Ophthalmol. 1969; 68:626–629
13. Kass MA. Standardizing the measurement of intraocular pressure for clinical research – Guidelines from the Eye Care Technology Forum. Ophthalmology. 1996;103: 183–18.
14. Shaffer RN. Symposium: primary glaucomas. III. Gonioscopy, ophthalmoscopy and perimetry. Trans Am Acad Ophthalmol Otol. 1960; 62:112.
15. Khandelwal RR, Raje D, Khandelwal RR. Clinical profile and burden of primary glaucoma in rural camp patients attending a tertiary care center in India. J Clin Ophthalmol Res 2019; 7:55–60.
16. Ezinne NE, Ojukwu CS, Ekemiri KK, Akano OF, Ekure E, Osuagwu UL. Prevalence and clinical profile of glaucoma patients in rural Nigeria-A hospital based study. PLoS One 2021; 16: e0260965
17. Nelson-Ayifah D, Mashige KP. Demographic and clinical characteristics of patients with glaucoma in a tertiary eye facility in Ghana. Afr Vision Eye Health 2020; 79:1–6
18. Wubet GM, Assefa AA. Glaucoma and its predictors among adult patients attending ophthalmic outpatient department: A hospital-based study, North West Ethiopia. BMC Ophthalmol 2021; 21:400

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