"A ONE YEAR CROSS SECTIONAL STUDY TO ASSESS THE CORRELATION AMONGST VISUAL ACUITY, CONTRAST SENSITIVITY AND VISUAL FIELD ANALYSIS IN PATIENTS WITH GLAUCOMA AT KLES DR. PRABHAKAR KORE HOSPITAL AND MRC, BELAGAVI"

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ABSTRACT

Purpose: To investigate the relationship between contrast sensitivity, high-contrast visual acuity, and visual field defects in glaucoma patients**.**

Method: Patients with a diagnosis of glaucoma, glaucoma suspect, or ocular hypertension whose visual acuity on better were included in the study. Patients who meet the above criteria will be enrolled in the study after receiving approval from the institutional review board, and demographic data will be recorded in a predesigned proforma. Snellen's visual acuity chart will be used to determine the best corrected visual acuity. The Pelli Robson chart will be used to assess contrast sensitivity. The letters are arranged in groups of three, with consistent contrast within each group. Patients will be asked to identify the letters and will be required to continue until two or more errors are made in a group. The contrast threshold will be determined by the last group in which at least two of the three letters are correctly identified. Intraocular pressure is measured using Goldmann Applanation Tonometer. Visual field is analysed using Humphrey Field Analyzer. Normality of variable is checked by Shapiro Wilk test. Mann Whitney U test is used to compare the distributions of contrast sensitivity over field changes. Chi-square test is used to check the dependency between categorical variables. P-value less than or equal to 0.05 indicates statistical significance.

Results: The data set includes measurements from 60 subjects ranging in age from 26 to 74 years, with a mean age of 54.87± 10.47 years. Anterior and posterior examination of the eye was carried out. According to the Chi square test, there is no discernible change in the distribution of variables over the eye. According to the Chi square test results, there is no conclusive evidence linking BCVA and field change. The Mann Whitney U test, with a p-value of 0.001MW*, demonstrates that the distribution of

contrast sensitivity over field changes differs significantly. Participants in the study experienced changes in their field and BCVA. The levels of acceptable contrast loss are as follows: profound loss at less than 0.48 log contrasts, severe loss at 0.52-1.00 log contrast, moderate loss at 1.04-1.48 log contrast, normal for people over 60 at 1.52-1.76 log contrast, and normal for people under 60 at 1.72-1.92 log contrast. Participants in our study suffered moderate losses.

Conclusion: If contrast sensitivity testing (CST) was more sensitive to glaucomatous damage than HFA (or discovered another pathway that eventually leads to classical abnormalities), it would identify more patients as abnormal compared to the current gold standard Humphrey Field Analyzer (HFA). Because this did not occur, it is unlikely that CST can detect illness faster than visual field analysis. After evaluating its effectiveness in glaucoma diagnosis, we determined that the sensitivity and specificity of contrast sensitivity tests were too high to be of any diagnostic utility. Similarly, we attempted to assess CST's capability for diagnosing field faults, and the results' sensitivity and specificity revealed significant variation.

Keywords: Snellen's visual acuity chart, Pelli Robson chart, contrast sensitivity, Goldmann Applanation Tonometer, Intraocular pressure, Humphrey Field Analyzer.

LIST OF ABBREVIATIONS USED

ACES	:	Aravind Comprehensive Eye Survey
ACG	:	Angle closure glaucoma
ADREV	:	Assessment of Disability Related to Vision
ADVS	:	Activities of Daily Vision Scale
APEDS	:	Andhra Pradesh Eye Diseases Survey
CGS	:	Chennai Glaucoma Study
CIGTS	:	Collaborative Initial Glaucoma Treatment Study
CS	:	Contrast sensitivity
CST	:	Contrast sensitivity testing
DI	:	Disability indices
FL	:	Fixation loss
FN	:	False-negative
FP	:	False-positive
HFA	:	Humphrey Field Analyzer
IOP	:	Intraocular pressure
MD	:	Mean depression
OAG	:	Open angle glaucoma
OHTS	:	Ocular Hypertension Treatment Study
PACG	:	Primary angle closure glaucoma
PCC	:	Partial correlation coefficient
POAG	:	Primary open angle glaucoma
PR	:	Pelli-Robson
QOL	:	Quality of life
RMSE	:	Root mean squared error
VA	:	Visual acuity
VF	:	Visual field
VFQ	:	Visual Function Questionnaire
VFQ	:	Visual Function Questionnaire
WGA	:	World Glaucoma Association
WGPA	:	World Glaucoma Patient Association

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INTRODUCTION

Glaucoma refers to a chronic eye condition that harms the optic nerve leading to disturbances in clear vision and visual field defects. A pressure in the eye that is excessively high frequently results in this injury. Glaucoma is one of the major reasons for vision loss above the age of 60 years. High pressure within the eyes is mainly what causes glaucoma. But diabetes can also increase the chances of developing glaucoma. The onset of symptoms is gradual and hence may be missed in early stages. A complete ocular examination along with applanation tonometry is essential to diagnose glaucoma. The initial clinical features of glaucoma include- Loss of side or peripheral vision and halos around lights.

Glaucoma Causes:

Aqueous humor is a gel like substance that occupies the anterior segment of the eye. The ciliary epithelium secretes it while drainage occurs through a tube known as the trabecular meshwork. Elevated secretion or drainage obstruction may cause the fluid to build up. Various factors can produce the obstruction including a heritable basis. A chemical or traumatic eye damage, a serious eye infection, clogged blood vessels inside the eye, and inflammatory disorders are a few less frequent causes of glaucoma. It's uncommon, but occasionally eye surgery to treat another problem might cause it. Usually, both eyes are affected, although sometimes one eye may be more severely affected [1].

Glaucoma Risk Factors:

Young people, kids, and even newborns can have it, although individuals over 40 are most commonly affected by it. African Americans are more likely to get it, earlier in life, and with more visual loss.

Types of Glaucoma:

Open-angle glaucoma: The trabecular meshwork is intact yet adequate drainage does not take place.[1] It is the commonest variant.

Glaucoma with an angle closure: Typically occurs amongst Asians. The iridocorneal angle reduces occluding effective drainage. It may lead to a sudden elevation in ocular pressure. It may be associated with an intumescent cataractous lens [1].

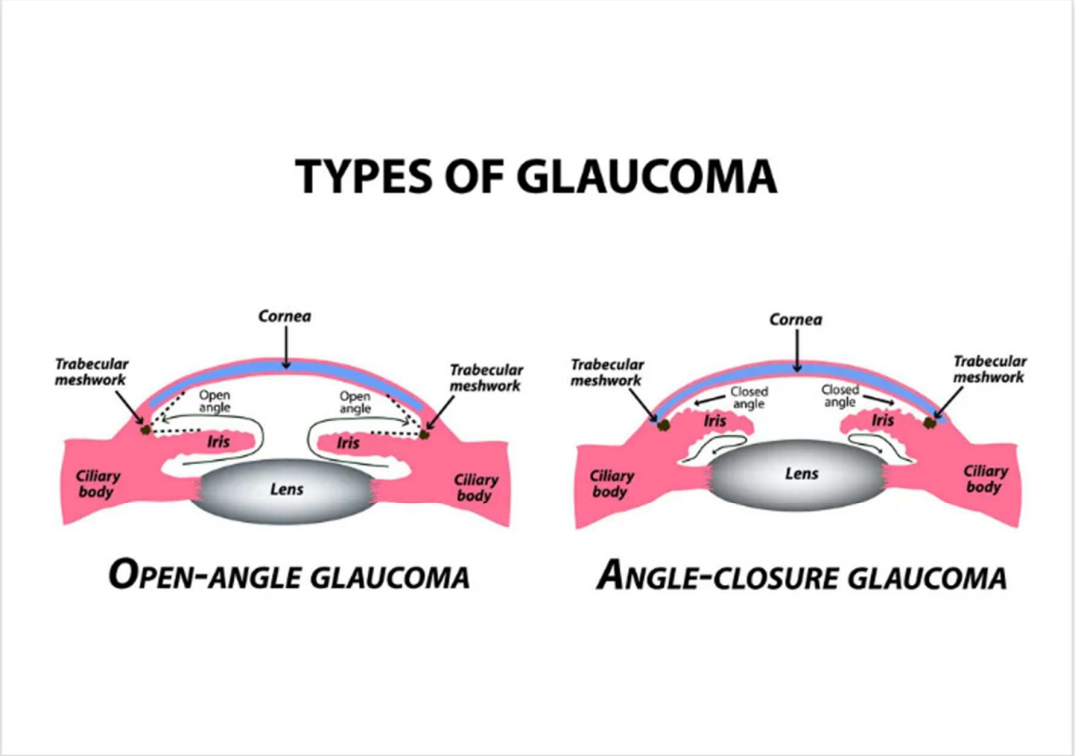


Figure -1 Showing types of Glaucoma

Among the less typical forms of glaucoma are:

Secondary glaucoma: This occurs when the eye develops more pressure due to a different ailment, such as diabetes or cataracts.

Normal-tension Glaucoma: In this type of glaucoma the ocular pressure is within the normal range but the patient may still experience blind spots or damage to the optic nerve.

Pigmentary Glaucoma: This kind causes the drainage channels in the eye to get clogged with minute particles of pigment from your iris, the colored area of your eye [1].

Symptoms of Glaucoma

The majority of those who have open-angle glaucoma exhibit no symptoms. The onset of symptoms is typically late in the course of the illness. The primary symptom is typically a loss of peripheral vision.

It has long been believed that early-stage glaucoma affects peripheral vision while sparing central vision till the latter stages of the disease. The basis of this can be attributed to the use of Goldman-type perimetry which is relatively sensitive for evaluating peripheral visual function, and evaluating visual acuity using Snellen's chart which is relatively insensitive for evaluating central visual function. In glaucoma-affected eyes, histologic examinations of the nerve fiber layer indicate that there are fewer ganglion cells supporting macular function even in the initial phase of the disease. Additionally, early glaucoma-affected eyes may also have afferent pupillary abnormalities, an indicator of nerve function abnormalities at the macula.

Numerous studies have shown that glaucoma impairs colour vision, which is predominantly mediated by the fovea. Additionally, glaucomatous eyes and even certain eyes of people with suspected glaucoma have damaged chromatic and achromatic foveal perception pathways.

Contrast sensitivity is now understood to be a crucial aspect of visual function. Despite the fact that the Snellen visual acuity is still within normal limits, a reduction in contrast sensitivity may impair the quality of vision. Despite the macula not being completely responsible for contrast sensitivity, it may be reduced by even 3 degrees of macular disturbance (such as that caused by macular degeneration or an artificial central scotoma), indicating that this modality is in fact significantly mediated by this area of the retina. Patients with glaucoma appear to have decreased spatial contrast sensitivity.

The absence of precision in the current testing modalities prevents a definite separation of patients having glaucoma from the rest of the people. Although others have shown that glaucomatous eyes have diminished temporal contrast sensitivity, a large sample of individuals with glaucoma and those who are suspecting they may have the disease underwent a rigorous evaluation of this function [2].

OBJECTIVES

- To investigate the correlation amongst contrast sensitivity, visual acuity, and visual field defects in patients with glaucoma

REVIEW OF LITERATURE

Glaucomatous visual loss is generally defined as a loss of "peripheral vision" though this is usually not the most common symptom [3]. The two most frequent complaints glaucoma patient are a need for additional light and hazy vision [4]. In the initial period of the illness, despite having good visual acuity, glaucoma patients typically report having significantly worse vision than expected. This discrepancy might be caused by the glaucoma-induced loss of visual function. Two crucial everyday activities for people with glaucoma who have lost peripheral vision are having low-light vision and the recognition of low-contrast things [5].

Glaucoma may also be linked to higher self-reported reading difficulty [6] and somewhat slower reading speeds [7], according to recent research.

There are additional reports of colour vision impairments in glaucoma patients, particularly along the blue-yellow axis [8].

POAG is indicated by a decline in peripheral vision and an ophthalmoscopy image of the optic disc that is excavated. OAG produces a slowly progressive optic nerve atrophy [9]. An important risk factor for OAG is elevated intraocular pressure, however the exact cause for glaucoma is still unknown however an elevated intraocular pressure has shown to be an important risk factor. Since some people with OAG have IOP that is within the normal range, an elevated IOP does not form the basis for diagnosis [10].

The inability to identify those vulnerable to developing blindness as a result of glaucoma is due to the high expense of current glaucoma screening techniques. Its particular goals are to quantify the ethnic distribution of different types of glaucoma and taking age into consideration.

Prevalence of Glaucoma in India:

Amongst the most prominent reasons for avoidable blindness in India, glaucoma is placed second. Additionally, it is an important contributor to permanent blindness in the nation. By the year 2010, it is predicted that around 12 million Indians would be impacted. By 2020, this number will rise to 16 million due to a fast-ageing population.

It is a cause of concern that a vast majority of patients with glaucoma miss detection. [3-9] According to reports, in India, life's quality is more impacted by glaucoma than in the West. [10] According to researches involving the Indian population, most patients having glaucoma go untreated. In comparison, rates of undetected illness in more affluent nations range from 40 to 60%. [3-8] Significant amounts of glaucoma-related blindness result from these high rates of untreated glaucoma. [3-9]It is alarming to note that in a survey at Aravind eye hospital, 45% of glaucoma patients had previously undergone ocular examination. [5] In a study conducted at Chennai, patients having earlier received a diagnosis of PACG were now found to be suffering from POAG probably due to gonioscopy either not being done or not correctly interpreted. [9] Such data shows that even with ophthalmic examination, diagnostic rates are low. This can be due to inadequate examination techniques or an insufficient ophthalmic assessment. [11]

In a recent study regarding ophthalmic knowledge of the general population in the country, the country's persistently low educational levels proved discouraging in improving rates of diagnosis in the future. [12] However several developments in diagnostic and treatment modalities for glaucoma have been made. Modern diagnostic tools including perimetric instruments, RNFL analyzers, as well as optic disc analyzers are now widely accessible across the nation. There are several glaucoma

medications that can be used. Although the costs are reasonable by international standards, a sizable percentage of the Indian population still cannot afford them.

The general public's lack of understanding of glaucoma makes these issues even worse. [13] In a survey conducted at Andhra Pradesh, less than 1% of the rural population was aware of glaucoma in any way. Thus, a significant increase in awareness could help in increasing the rate of diagnoses. There is a dearth of information from India on patient follow-up after receiving a diagnosis of glaucoma and adherence to glaucoma treatments. Some of these issues are widespread worldwide and not exclusive to the nation. Better illness detection rates and patient compliance may come from raising knowledge of the condition. The “World Glaucoma Association (WGA)” and the “World Glaucoma Patient Association (WGPA)” have teamed together for worldwide initiation of a movement to increase knowledge regarding glaucoma by means of dedicating a day yearly for glaucoma. The date chosen for the inaugural “World Glaucoma Day” in 2008 was the sixth of march. Numerous events, including media campaigns, the issuance of commemorative stamps, public screenings, and institutional occasions, are scheduled across the world. The “Glaucoma Society of India” plans to raise awareness through the use of printed material Numerous individuals and organizations are organizing neighborhood activities like patient open houses and the formation of patient awareness clubs.

By 2020, the “World Glaucoma Association” hopes for the reduction in undetected glaucoma rate from 50% to ″No more than 20%″. In India, the rates of diseases that go untreated are considerably greater (90%). This objective can be achieved through teamwork. Additionally, it is important to make sure that all eye care specialists in the nation can provide and conduct high-quality eye exams.

Contrast sensitivity:

Contrast sensitivity is the power to perceive low contrast objects present around us, such as a street sign in the dark, a flower pot lying on the ground of a dark garage, or the sidewalk step's height at night.

Contrast sensitivity evaluates more than only a person's ability to recognize high contrast black characters on white background, which is how it differs from the "Big E Chart" visual acuity test. Contrast sensitivity analysis detects minute variations in vision, concealed by visual acuity when using low contrast images. This analysis can be used in refractory surgery and lasik patients, newer intraocular lenses, or recent advances in contact lenses. The test is particularly helpful for assessing patients' eyesight who have significant visual needs, such as Athletes, Pilots, Firemen, and Policemen.

How is acuity different from contrast sensitivity?

The Snellen visual acuity test was created in 1862 by Dr. Snellen of Utrecht, Holland, primarily as a tool for prescribing eyeglasses. Snellen's "Big E Chart" features different-sized, sharply contrasted black-on-white letters. This test is quite helpful in explaining changes in vision brought on by spherical blur since it can identify relatively tiny changes in refractive state. Snellen acuity is an unsatisfactory measurement for many forms of visual loss that are not brought on by spherical blur, such as cataracts, glaucoma, irregular astigmatism, etc.

Measures of Contrast Sensitivity in Real-World Vision:

While the only characters used in acuity testing are those that are black and white, the actual surrounding is filled with many tones of grey. Patients' visual abilities under low contrast settings seen in everyday life are also assessed during CS testing. The images below compare the same landscape as seen in low contrast, which

is typical of early morning fog or glare, and high contrast which is typical of daylight settings.

Figure -2 Showing contrast sensitivity

How is Contrast Sensitivity examined?

The contrast sensitivity of targets is often tested using a variety of target sizes. Contrast sensitivity differs from acuity in this sense. Acuity just measures size, whereas both size and contrast are measured by contrast sensitivity.

Comparable to auditory testing, which determines whether a patient can recognize the least level of different frequencies of sound, a patient's capacity to perceive contrast is measured by contrast sensitivity. When the tone is scarcely audible, the patient is told to click a button and let go once he cannot hear the sound anymore. This technique evaluates the auditory system's receptivity to various sound frequencies. All sound frequencies would be examined at one loud volume if auditory testing were assessed similarly to visual acuity.

Accurate Testing Utilizes Sine-Wave Gratings:

A genuine contrast sensitivity test can be performed by using sinusoidal patterns with variable brightness over a grating pattern as depicted by the picture beneath. The brightness of the grating varies between 0.5% and 90% contrast. The smallest amount of contrast a patient could possibly detect for a certain grating pattern size is determined by contrast sensitivity. Spatial frequencies refer to the various grating sizes [14].

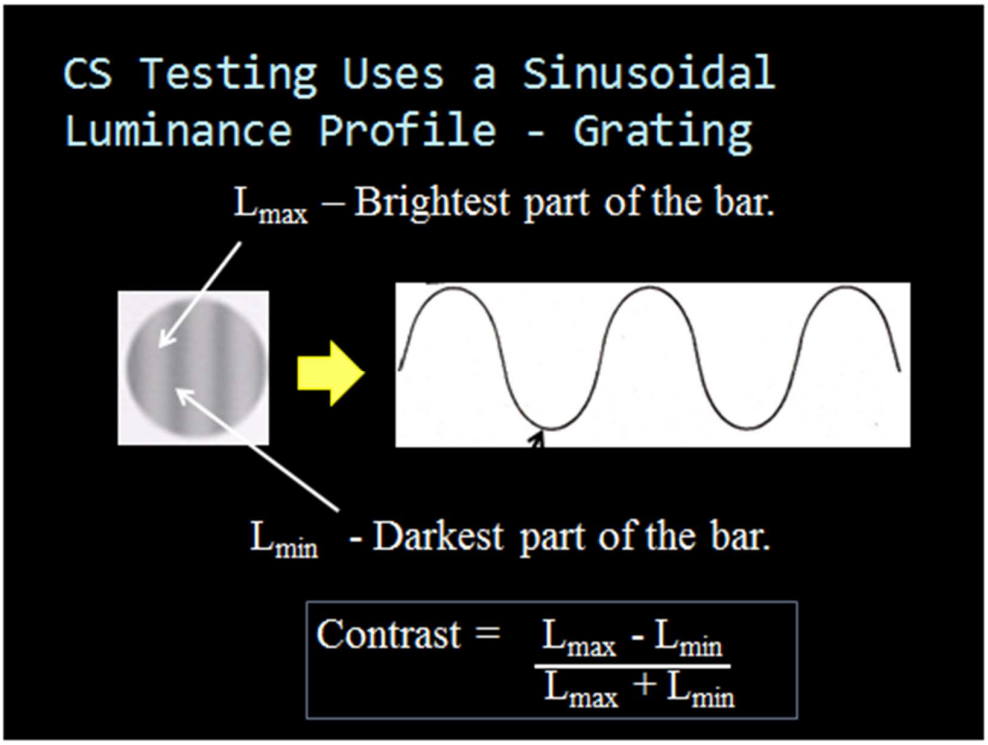
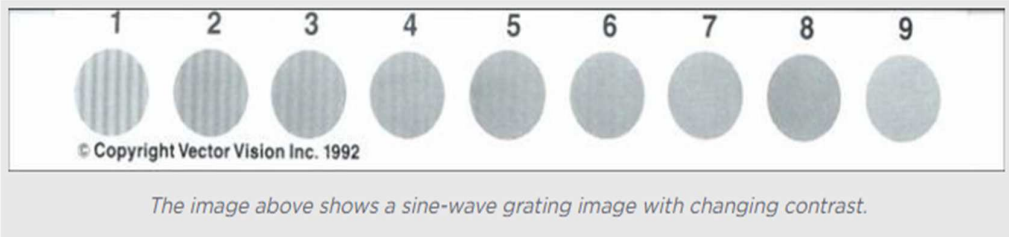


Figure -3: Showing Contrast sensitivity



The image above shows a sine-wave grating image with changing contrast.

Task of detection is contrast sensitivity:

Contrast sensitivity is comparable to auditory testing and perimetry in that it is a detection task as opposed to an identifying job like acuity. Contrast sensitivity is a considerably more accurate predictor of vision compared to acuity for a number of reasons because identification tasks are inherently less sensitive than detection ones.. As shown in the graph contrasting the entire range of vision tested by contrast sensitivity to the constrained range of vision assessed by 20/20 acuity, contrast sensitivity assesses a considerably greater range of vision than acuity does. If a participant was asked to name a tone or song rather than just a specific frequency during a hearing test, the test would be meaningless while pattern recognition in glaucoma subjects rather than just seeing light dots at various eccentricities in their peripheral vision would render perimetry useless [14].

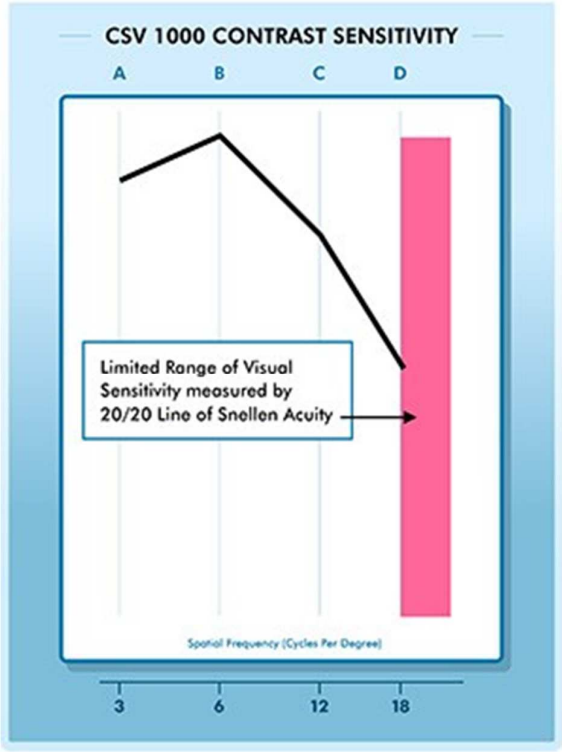


Figure -4: Showing CSV Contrast sensitivity

Contrast Sensitivity Curve:

Contrast sensitivity is depicted by a curve showing the least contrast required for a patient to detect an object of certain size. Contrast sensitivity is shown by the curve's y-axis, while the spatial frequency is represented by the x-axis. High spatial frequencies have thin gratings, whereas low spatial frequencies have thick ones.

The relationship between contrast intensity and contrast sensitivity is inverse. The level of contrast at which a patient can identify a target decreases as contrast sensitivity increases. According to the figure above, the grating's contrast is computed, and contrast sensitivity is the inverse of contrast threshold. If a patient can detect a grating at 1% contrast, for example, their contrast sensitivity at a certain spatial frequency is 100 or the opposite of 1% (1/.01). This is known as the contrast threshold [14].

Context Sensitivity Curve Plotting:

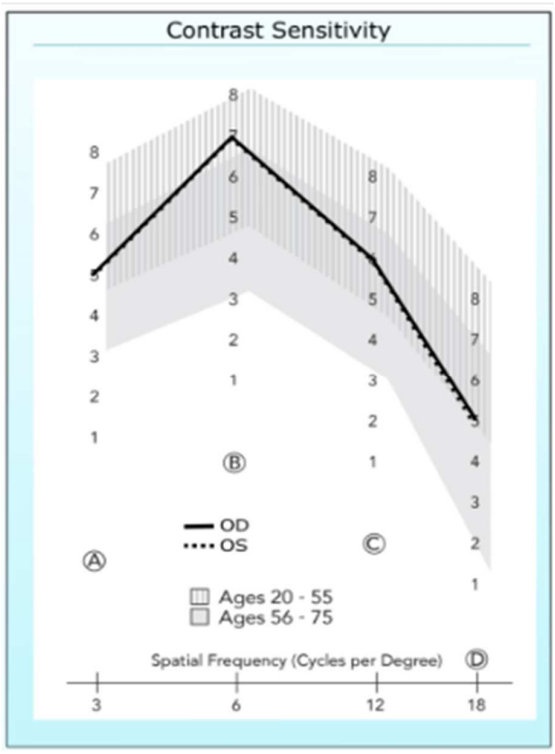


Figure-5: Showing sensitivity curve plot

On a contrast sensitivity graph, eight to ten contrast levels are used to illustrate spatial frequencies. The majority of contrast sensitivity tests that are marketed offer measurements for grating patterns of 4 or 5 (spatial frequencies). The curve is plotted by simply determining the lowest contrast threshold detected for each spatial frequency which also happens to be the highest contrast sensitivity level. This curve displays an illustration of the outcomes for both eyes in the Vector Vision contrast test. For example, in figure 4, the patient can detect a fifth level contrast sensitivity with both eyes on row A, the top level on row B is 7 and the highest levels on rows C and D are 6 and 5, respectively. A contrast sensitivity curve is created by connecting these points. Results from each eye are frequently distinct, hence the eyes should be plotted individually [14].

Measurement of visual acuity and fields in Patients suffering from Glaucoma:

Quigley et al in 1996 and Congdon et al in 2004 demonstrated that glaucoma which is one of the main reasons for blindness worldwide can seriously harm a patient's visual field (VF)[15-16]. The early identification of visual field progression in glaucoma is crucial since the damage produced by it is permanent.

The fixation loss (FL), false-positive (FP), and false-negative (FN) rates are commonly used to determine how reliable VF measurements are. Jansonius et al observed that in VF series with poor repeatability [17], the detectability of advancement is significantly diminished. Sanabria et al found that fixational instability can be seen even in expert observers, and mis localization of the blind area [18] can lead to a high rate of FL which was also confirmed in 1994 by [19-20]. Bengsten et al proved that false negatives, on the other hand, are inextricably linked to the decline of VF [21]. In conclusion, as shown by Artes et al, VF reproducibility

deteriorates as glaucoma worsens [22]. Asaoka et al [23] conducted a study that showed sensitivity in the centre region of the measured VF, which is often spared preserved till end stages of the illness, are highly connected with visual acuity (VA). As a result, VA and VF repeatability may be tightly connected.

The inclusion criteria for many studies that use VF testing include VA, however, there is no agreement on what VA's suitable cutoff level should be. Previous studies have used a wide range of VA inclusion criteria, including equal to or better than 6/24,[24-34] Some other studies like The Collaborative Initial Glaucoma Treatment Study, The Ocular Hypertension Treatment Study, The United Kingdom Glaucoma Treatment Study, The Blue Mountains Eye Study, Collaborative Normal-Tension Glaucoma Study, Advanced Glaucoma Intervention Study and The Beijing Eye Study, have also used a wide range of visual acuities.[35-50]

The optic nerve is often damaged in some way by the diverse group of illnesses known as glaucoma. The damage often produces standard alterations to the visual field and optic disc anatomy. The main priority in treating glaucoma sufferers has been the protection of the optic nerve from continuous harm and the resulting reduction of visual field. Glaucoma-related visual field abnormalities often first impair the mid peripheral visual field; subsequently in the course of the disease, fixation and central vision are affected. The perception that glaucoma patients are asymptomatic until late in the course of the disease is a result of this pattern of vision field loss in glaucoma. Only when central vision is affected or involved do people realize functional deficiency due to visual field loss. How much intraocular pressure there is, how the optic nerve looks, and how the visual field is doing are all crucial objective end points in the care of glaucoma patients.

Additionally, during the past several years, a greater understanding of how glaucoma affects a patient's quality of life (QOL) has emerged which is in line with a growing interest in ophthalmology on how illness and treatment affects QOL. On QOL, the effects of cataractous changes [51-54], choroidal melanoma [55-56] macular degeneration, [54,57-60] diabetic retinopathy [61-62], refractive error, corneal illness [63], and macular degeneration, [54,57,58-60], have all been studied. QOL in ocular illness patients can be assessed using either vision-specific measures or generic instruments intended to assess general health. Sherwood and his collaborators [64] used a standard tool to assess people with glaucoma. They et al. [65] discovered that the scores were lowest for glaucoma patients, middle for glaucoma suspects, and highest for controls (those without glaucoma) after administering the SF-36 instrument to glaucoma patients, glaucoma suspects, and controls (those without glaucoma). They did not, however, note the degree of damage among the glaucoma patients, which again constrained their ability to draw conclusions. Other researchers have studied the quality of life (QOL) of glaucoma patients using vision-specific measurements. The idea that there was a linear link between visual field loss and QOL responses and that changes in QOL were noticeable even with minor visual field losses was particularly noteworthy. These results are mentally intriguing because they imply that even early visual field loss may have an impact on patients' quality of life (QOL) and that visual field loss need not endanger fixation or impair the complete hemifield to have an impact on patients' functional well-being.

Previous studies:

A case control study conducted by Deb et al., 2014[66] found glaucoma prevalence to be same in hypertensive and non-hypertensive subjects. Patients on antihypertensive drugs had odds ratios of 1.56 and 1.85 that were nearly twice as high for POAG and suspected glaucoma, respectively. Additionally, for every 1 mm Hg increase in MOPP, there was a 31% and 12% reduction in the likelihood of having POAG and becoming glaucoma suspects respectively. Higher ocular thus perfusion pressure provides some protection from glaucomatous damage in subjects on antihypertensive drugs.

In population based study conducted by Tham et al., 2014[67] involving patients between the ages of 40 and 80 years, it was found that 3.54% of people worldwide suffer from glaucoma. Africa and Asia have the highest prevalence rates of POAG (4.20%) and PACG (1.09%) respectively. Glaucoma currently affects an estimated 64.3 million persons worldwide (aged 40 to 80), and that figure is predicted to climb to 76.0 million by 2020 and 111.8 million by 2040.

In the Bayesian meta-regression model, men were found to be more likely than women to have POAG (odds ratio = 1.36) and after adjusting for age, gender, habitation type, response rate, and year of study, it was discovered that people of African ancestry were more likely than those of European ancestry to have POAG (OR=2.80). Globally, there will be 111.8 million cases of glaucoma by 2040, with people in Asia and Africa being disproportionately affected. These estimates can serve as the foundation for the planning of glaucoma screening, treatment, and related public health efforts.

A study conducted in 2003 by Hawkins et al.[68] that showed contrast sensitivity to be more commonly affected by the glaucoma illness process than visual acuity and in individuals with early glaucomatous alterations, contrast sensitivity was demonstrated to be more closely connected to real-world function than visual acuity. 144 patients at Chicago College of Medicine had their 250 eyes evaluated. Participants confirmed to have glaucoma, a suspicion of glaucoma, or ocular hypertension were included. The evaluation of visual acuity at a distance of 4 meters was done using the rear-illuminated Lighthouse Visual Acuity Chart. Pelli-Robson Chart was used to assess contrast sensitivity. Humphrey Visual Field Analyzer was used to assess visual fields. A significant correlation was found between contrast sensitivity values and mean deviations in visual fields. The association between the visual field mean deviation and the log MAR visual acuity values was weaker than the correlation between the contrast sensitivity scores and the log MAR visual acuity values. Reduced contrast sensitivity was strongly linked to visual field impairments in glaucoma patients with 20/40 or better visual acuity.

Mathai et al., 1997[69] proposed the use of contrast sensitivity as a screening and diagnostic test for POAG. Contrast sensitivity (CS) was assessed using Vistech charts. Confirmed cases of primary open angle glaucoma, suspects and controls who were matched for age made up the three groups that were evaluated. The three groups' distributions of contrast sensitivity were comparable. While the median contrast sensitivity of the POAG group fell along the lower range of normal, that of glaucoma suspects and controls was well within normal bounds. A decline in contrast sensitivity was also noted with ageing. The test had a sensitivity of 55.4% and a specificity of 69.5%. With a maximum sensitivity of 47.3% and a specificity of 73.3%, contrast sensitivity testing was also shown to be of limited use in identifying field flaws. Thus,

they concluded that Vistech contrast sensitivity testing is not an effective tool for diagnosing or screening POAG.

In a study conducted by McKendrick et al.[70] where established steady- and pulsed-pedestal method was used to test contrast sensitivity for spatial frequencies ranging from 0.25 to 2 cyc/deg. Participants included 16 glaucoma sufferers and 16 control volunteers that were roughly age-matched. Patients with glaucoma underwent testing foveally and at two midperipheral sites. Over the whole spatial frequency range, sensitivity was decreased in the midperiphery and at the fovea. The low-spatial-frequency sensitive parts of the Magnocellular and Parvocellular pathways saw a decline in contrast sensitivity with age. Early glaucoma affected both routes' low-spatial-frequency-sensitive channels roughly equally.

Wilensky et al in 2001[71], conducted a study wherein the PR contrast sensitivity score showed a stronger correlation with the MD of the visual field than did the logMAR visual acuity testing. The connection was significantly higher for the PR score (r =.638) when only the eyes with open-angle glaucoma were taken into account. The correlations to PR and logMAR in ocular hypertensive eyes were similar. Phakic eyes (r =.591) showed a stronger correlation than pseudophakic eyes (r =.335). In glaucomatous eyes with a visual acuity of at least 20/40, decreased contrast sensitivity was linked to increased visual field defects and it was hypothesized that glaucoma patients' decreased contrast sensitivity may be the cause of their problems with blurry vision while having normal or nearly normal visual acuity.

A study done by Jampel et al.[72] concluded that two utility tests, the linear rating scale and the time trade-off test, as well as two quality-of-life tools, the National Eye Institute Visual Function Questionnaire (VFQ) and the Short Form

36(SF-36), were used to assess the vision of 237 glaucoma patients. Subjects with normal eyesight assessed their vision higher on a scale of 0 (blind) to 100 (perfect) than did glaucoma individuals and suspects and "blind" subjects, P =<.001. The linear rating scale and the total VFQ score had a strong correlation while some SF-36 categories had a moderate correlation. The test also concluded that clinical test designs will continue to be a challenge since patient views change over time.

In a study done by Richman et al., 2010[73] at the Wills Eye Institute which concluded that binocular visual acuity and contrast sensitivity are the components of visual function that most accurately predict a glaucoma patient's capacity to carry out activities of daily life. 192 individuals with a broad range of glaucomatous vision loss were chosen. Clinical visual evaluations including visual acuity, contrast sensitivity, visual field, stereopsis, the Disc Damage Likelihood Scale, and intraocular pressure were used to examine the patients. Patients were assessed objectively using the Assessment of Disability Related to Vision (ADREV), a thorough performance-based assessment of visual function, and subjectively using the 25-item National Eye Institute Visual Function Questionnaire. The data were subjected to statistical studies, such as regression analysis and Spearman correlation coefficients. Binocular visual acuity (r = 0.79; P .001) and binocular contrast sensitivity (r = 0.80; P< .001) had the strongest correlations with performance on the ADREV. Results from the monocular and binocular visual field tests showed a strong correlation with performance on the ADREV tasks, however this correlation was substantially less (P <.05) when compared to visual acuity and contrast sensitivity

In a case control study done by Teoh et al. [74] contrast, brightness and visual acuity were measured in 28 chronic cases of open angle glaucoma and compared with 41 age matched, healthy controls having similar visual acuity. The study showed that brightness ratio can be used to screen chronic cases of open angle glaucoma in case of normal visual acuity. Of the 28 glaucoma patients, between both the eyes, 24 reported a noticeable difference in brightness consistent with visual field defects. Additionally, the variance in the two eyes' respective levels of visual field loss and interocular differences in brightness perception were strongly correlated.

A prospective cross-sectional research was conducted by Bambo et al.[75] on 121 chronic open angle glaucoma patients. The CSV1000E test and the Pelli-Robson Chart were used to evaluate contrast sensitivity. Software called Vision Color Recorder was used to evaluate chromatic vision using the Farnsworth-panel D15 and L'Anthony D15 tests. The Radner-Vissum exam was used to evaluate reading ability. Significant contrast sensitivity differences exist between patients with early and intermediate visual field impairments. There was little difference in the two groups' results on reading comprehension and colour vision tests. There was substantial and moderate Spearman correlations between analysis of contrast sensitivity and glaucomatous field defects. Patients with glaucoma in the initial stages have considerably higher contrast sensitivity.

In a cross sectional study by Fatehi et al.[76] on 65 patients who underwent assessment of contrast, optical coherence tomography and visual field analysis (24-2). A decent association between structural and functional parameters and contrast sensitivity was evident but contrast sensitivity did not prove to be an efficient severity indicator for glaucoma.

Inferotemporal and inferonasal macular sectors' ganglion cell/inner plexiform layer thicknesses showed significant associations with CS at 6 cpd. Complete macular thickness measurements revealed stronger connections with CS at 6 cpd; the strongest of these was with the superior 6* 3-degree area's central macular thickness. Among the four central VF sites, the contrast sensitivity at 6 cpd and mean deviation had the strongest association. At 6, 12, and 18 cpd, the relationship between contrast sensitivity and logMAR visual acuity was statistically significant.

In 2015, Matsuura et al. [77] evaluated, 627 eyes belonging to open-angle glaucoma patients. The root mean squared error (RMSE) of the sensitivity of each Humphrey VF test point was used to determine the repeatability of two Humphrey VFs (24-2 or 30-2 Swedish Interactive Threshold Algorithm tests) that were assessed twice over a period of three months. At the time of any of the VF assessments, visual acuity was tested once. The repeatability of VF tests (RMSE) and the following factors were examined using linear modelling: mean total deviation value (mTD), fixation losses (FLs), false positives (FPs), false negatives (FNs), refractive error, age, and VA. Age, VA, mTD, and FNs were included as dependent factors in the most effective model to predict test-retest variability (RMSE) of VFs. In comparison to eyes with logMAR VA 0, eyes with logMAR VA > 0.5 had considerably higher root mean squared error. With the decline in VA, VF test reproducibility gets worse. When a patient's logMAR VA is greater than 0.5, careful evaluation is required.

Sumi et al., 2003[78] conducted a study by computing the Pearson's correlation coefficients amongst the visual fields, visual acuity assessments and the visual disability indicators in 2003. Using stepwise variable selection and multiple regression analysis, causes of vision impairment were identified. The measured visual

acuity and visual field were shown to have a significant correlation with visual impairment. Retinal sensitivity in the lower hemifield within 5 degrees of the fixation and visual acuity in the better eye were the factors that significantly contributed to the disability indices (Dis). Degree of visual disability was determined by a questionnaire. Retinal sensitivity in the lower hemifield within 5 degrees of the fixation, visual acuity in the better eye, and visual acuity in the worse eye are the main factors that account for the visual handicap of Japanese glaucoma patients.

MATERIALS AND METHODS

Study design:

A one-year Prospective, Cross sectional, Hospital based study.

Study duration:

One year from the first of January, 2021 to the thirty first of December, 2021

Study population:

The source of data for the study are patients who have been diagnosed to have ocular hypertension, suspected glaucoma or glaucoma

Sample size:

Formula used for sample size calculation

$$n = \left[\frac{(Z_{\propto/2} + Z_{\beta})}{C}\right]^2$$

Where C is

$$C = 0.5 \times log_e \left[{(1+r)}/{(1-r)}\right]$$

In the above formula, r is the correlation coefficient, at 95% confidence level $Z_{\propto/2}$ is 1.96 and Zβ value for 80%, 85% powers are 0.8416, 1.0364, respectively.

A positive correlation has been assumed to be present between visual field and COPG. Correlation coefficient assumed as 0.35. This correlation coefficient is used sample size calculation for this study

With 80% power, 95% confidence level and with above correlation coefficient, sample size required is 58.77≈ 59. Minimum sample size required is 59 subjects which will be rounded off to 60.

Sampling procedure:

Universal sampling

Instruments used:

Snellens visual acuity chart, Pelli Robson chart, Humphrey's Field Analyser

Tonometer

Selection criteria:

Inclusion criteria:

- POAG
- Glaucoma suspects
- Ocular hypertension

Exclusion criteria:

- Refractive surgery
- Minimal capsular opacification

- Heavy smoking
- Multiple sclerosis
- Diabetic retinopathy
- Optic neuritis
- Papilledema
- Visual pathway lesions
- Hard cataract where fundus details are not visible
- Age related maculopathy
- Patients suffering from Alzheimer's or Parkinson's disease

Methodology:

After the approval from the institutional review board, patients who satisfied the above mentioned criteria were enrolled into study and demographic data was noted in a predesigned proforma.

Consent was taken from all participants after thoroughly explaining the tests they would be subjected to in this study and providing all the information regarding the same

Detailed history was taken from the participants, which comprised patient particulars, eye complaints, status of systemic diseases and other co- morbidities which were duly filled in the proforma.

The best corrected visual acuity was checked with Snellen's visual acuity chart. Pelli Robson chart was used to test contrast sensitivity. The chart consists of letters in triplets with each triplet having the same contrast. The patients have to correctly appreciate all letters within the triplet. Contrast threshold is determined by the last set wherein two letters amongst the triplet are accurately identified.

Detailed anterior and posterior segment examination and slit lamp evaluation was done.

Assessment of IOP was done with a tonometer.

The visual fields were plotted using the Humphrey Visual Field Analyzer

Gonioscopy was done

Statistical analysis

Microsoft Excel and the statistical software R version 4.2.1 were used for data analysis. Both frequency and percentage are used to express categorical data. Continuous variables are presented as Mean SD/Median (IQR) values. Normality of variable is checked by Shapiro Wilk test. Mann Whitney U test is used to compare the distributions of contrast sensitivity over field changes. To examine the relationship between categorical variables, the chi-square test was utilized. A P-value of 0.05 or less denotes statistical significance.

RESULTS

60 subjects between 26 to 74 years were included in this study. The mean age was 54.87 ± 10.47 years. The following table gives the distribution of subjects according to variables.

Table 1: Distribution of subjects according to different variables.

Variables		Sub Category	Number of subjects (%)
Age in years		Mean ± SD Median (Min, Max)	54.87 ± 10.47 57 (26, 74)
Gender		Male	35 (58.33%)
		Female	25 (41.67%)
Previous Glaucoma treatment On-going drugs		No	38 (63.33%)
		Yes	22 (36.67%)
Family history		No	58 (96.67%)
		Yes	2 (3.33%)
Personal history	Alcohol	No	58 (96.67%)
		Yes	2 (3.33%)
	Smoking	No	59 (98.33%)
		Yes	1 (1.67%)
Systemic illness	Diabetes	No	44 (73.33%)
		Yes	16 (26.67%)
	Hypertension	No	42 (70%)
		Yes	18 (30%)
	Asthma	No	60 (100%)
	Other	Membranous nephropathy on HCQ	1 (1.67%)
		No	59 (98.33%)

SEX DISTRIBUTION

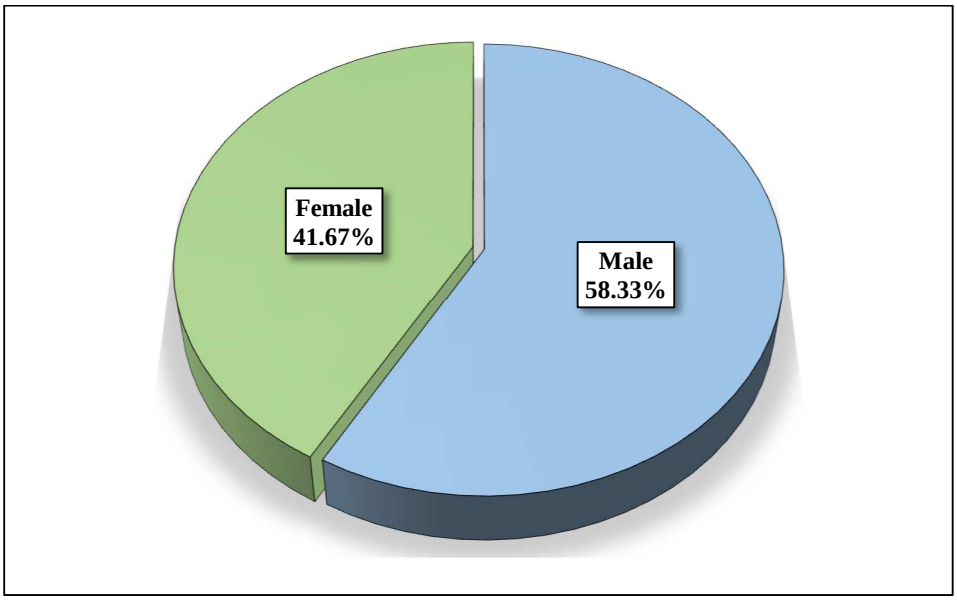


Figure 1: Distribution of subjects according to gender.

The proportion of males (58.33%) was higher than females (41.66%) as shown in Table 01 and Figure 01

PREVIOUS GLAUCOMA TREATMENT

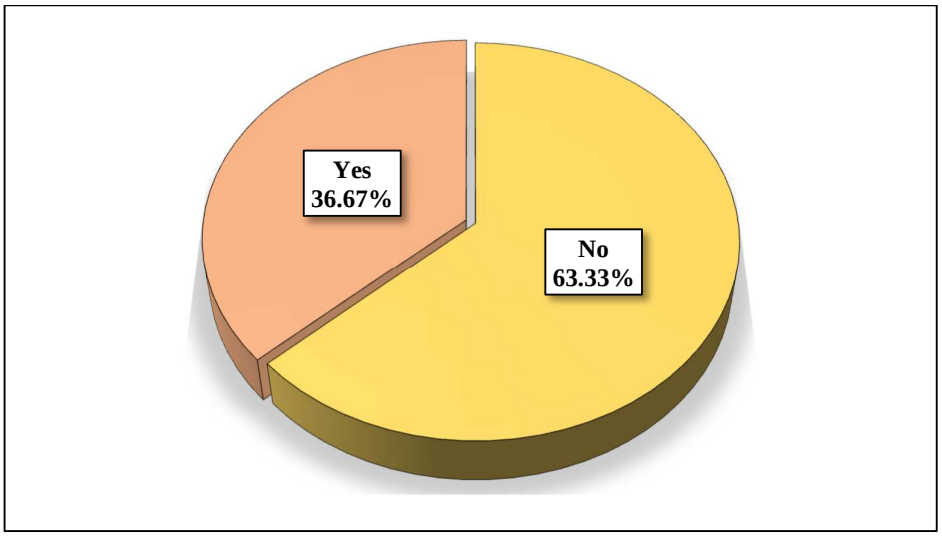


Figure 2: Distribution of subjects according to ongoing drug of previous glaucoma treatment.

Figure-2 Shows 36.67% of the participants had undergone previous glaucoma treatment.

FAMILY HISTORY

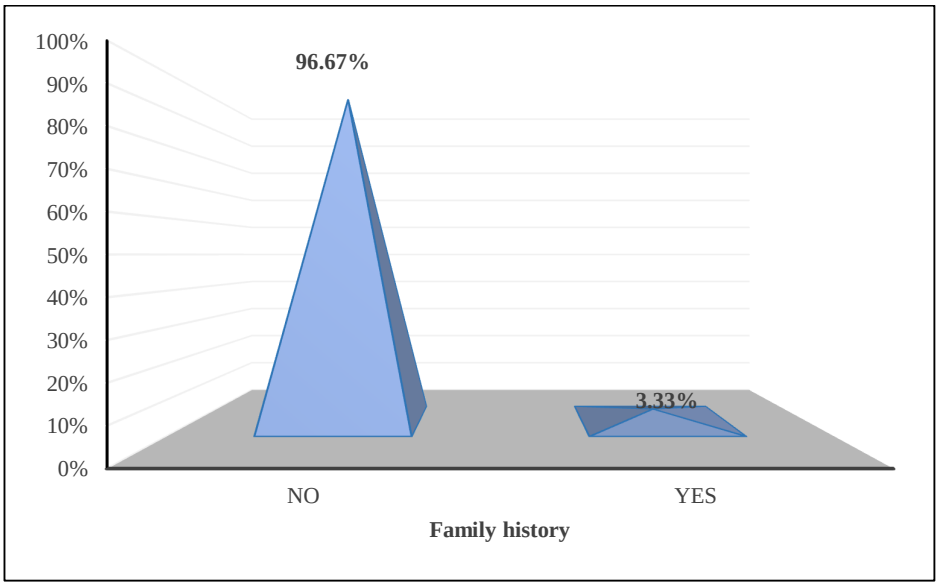


Figure 3: Distribution of subjects according to family history.

Figure-3 Shows 3.33% of the study participants are distributed based on family history.

ALCOHOL

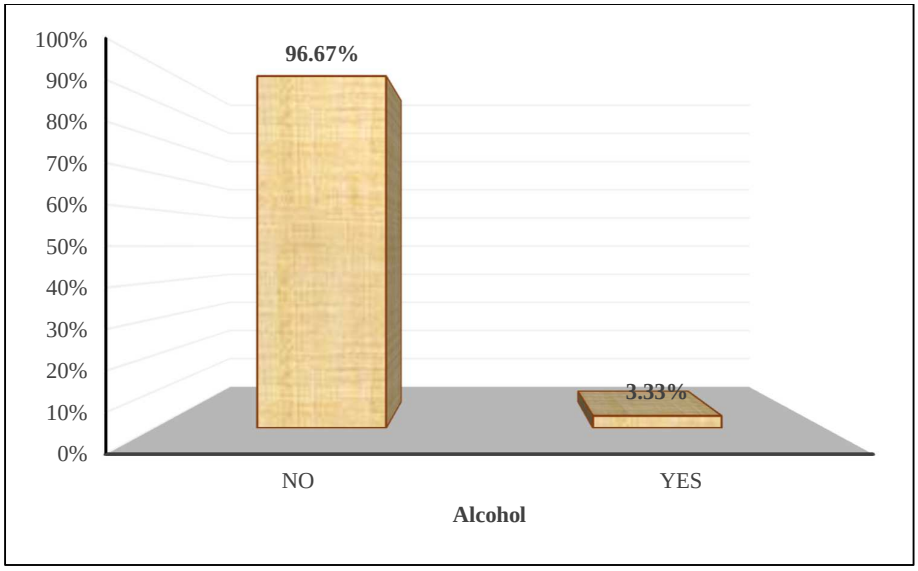


Figure 4: Distribution of subjects according to alcohol habit.

Figure-4 Shows 3.33% of the study participants are distributed based on alcohol habit.

SMOKING

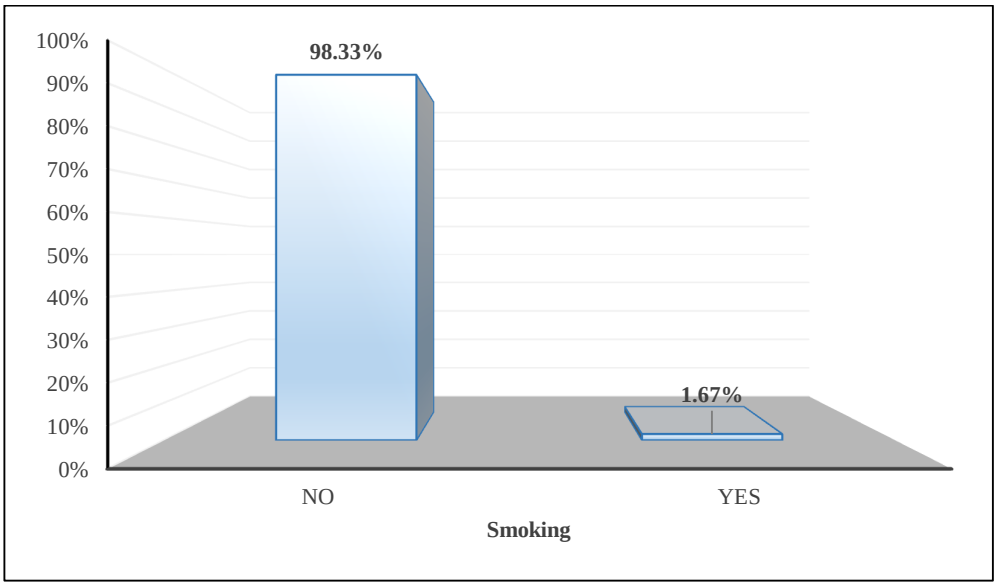


Figure 5: Distribution of subjects according to smoking habit.

Figure-5 Shows 3.33% of the study participants are distributed based on to smoking habit.

SYSTEMIC ILLNESSES

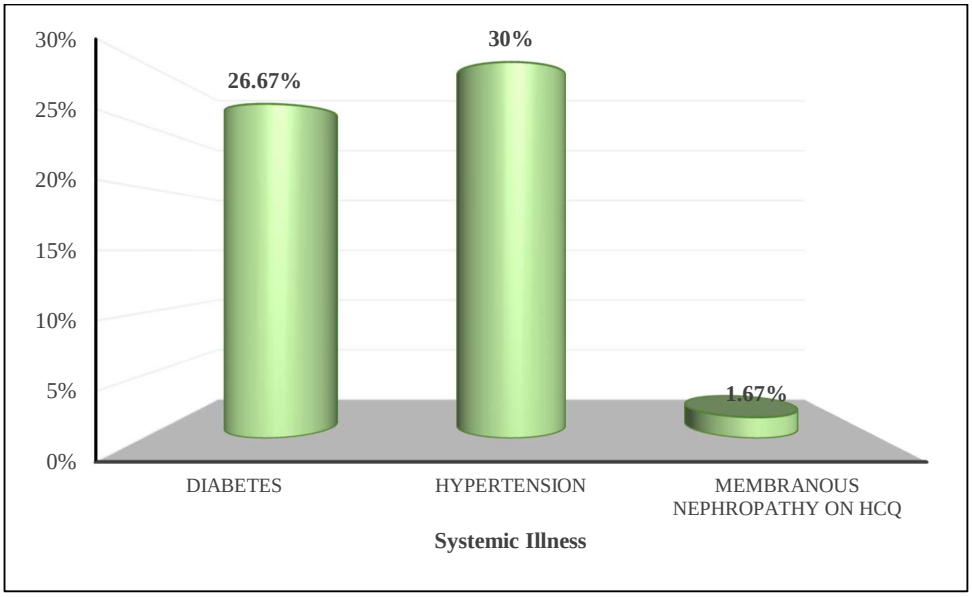


Figure 6: Distribution of subjects according to systemic illness.

Figure-6 Shows 26.67% of the study participants are having diabetes and 30% are having hypertension

Note: There were 120 eyes included in the study. Further analysis is based on 120 eyes.

The following table gives the distribution of different variables with eye.

EYE VARIABLES

Table 2: Distribution of different variables with eye.

Variables	Sub Category	Eye		Total	p-value
		Left	Right		
BCVA	6/6	17 (28.33%)	14 (23.33%)	31 (25.83%)	0.5057^{MC}
	6/6(P)	8 (13.33%)	9 (15%)	17 (14.17%)	
	6/9	7 (11.67%)	8 (13.33%)	15 (12.5%)	
	6/9(P)	4 (6.67%)	8 (13.33%)	12 (10%)	
	6/12	6 (10%)	5 (8.33%)	11 (9.17%)	
	6/12(p)	3 (5%)	5 (8.33%)	8 (6.67%)	
	6/18	4 (6.67%)	5 (8.33%)	9 (7.5%)	
	6/18(p)	2 (3.33%)	(0%)	2 (1.67%)	
	6/24	3 (5%)	(0%)	3 (2.5%)	
	6/24(p)	(0%)	1 (1.67%)	1 (0.83%)	
	6/36	2 (3.33%)	1 (1.67%)	3 (2.5%)	
	6/60	1 (1.67%)	(0%)	1 (0.83%)	
	cf 2m	(0%)	2 (3.33%)	2 (1.67%)	
	cfcf	(0%)	1 (1.67%)	1 (0.83%)	
	HMCF	(0%)	1 (1.67%)	1 (0.83%)	
	PL+ Pracc	2 (3.33%)	(0%)	2 (1.67%)	
	PL-ve	1 (1.67%)	(0%)	1 (0.83%)	
Surgical treatment	No	59 (98.33%)	58 (96.67%)	117 (97.5%)	1^{MC}
	Yes	1 (1.67%)	2 (3.33%)	3 (2.5%)	
Sclera and conjunctiva	Diffuse bleb	(0%)	1 (1.67%)	1 (0.83%)	1^{MC}
	Spheroidal degeneration	1 (1.67%)	(0%)	1 (0.83%)	
	N	59 (98.33%)	59 (98.33%)	118 (98.33%)	

cornea	N	60 (100%)	60 (100%)	120 (100%)	1^{MC}
AC	deep	5 (8.33%)	7 (11.67%)	12 (10%)	0.9245^{MC}
	shallow	3 (5%)	3 (5%)	6 (5%)	
	N	52 (86.67%)	50 (83.33%)	102 (85%)	
Iris	N	59 (98.33%)	59 (98.33%)	118 (98.33%)	1^{MC}
	PI	1 (1.67%)	1 (1.67%)	2 (1.67%)	
Pupil	N	59 (98.33%)	59 (98.33%)	118 (98.33%)	1^{MC}
	srtl	1 (1.67%)	1 (1.67%)	2 (1.67%)	
Lens	N	55 (91.67%)	53 (88.33%)	108 (90%)	0.7836^{MC}
	pciol	5 (8.33%)	7 (11.67%)	12 (10%)	
pxf	No	60 (100%)	60 (100%)	120 (100%)	1^{MC}
Optical media	Clear	58 (96.67%)	58 (96.67%)	116 (96.67%)	1^{MC}
	Mild hazy	2 (3.33%)	2 (3.33%)	4 (3.33%)	
Vitreous haze	Absent	60 (100%)	60 (100%)	120 (100%)	1^{MC}
Bayonetting	No	31 (51.67%)	29 (48.33%)	60 (50%)	0.8676^{MC}
	Yes	29 (48.33%)	31 (51.67%)	60 (50%)	
Baring	No	26 (43.33%)	25 (41.67%)	51 (42.5%)	1^{MC}
	Yes	34 (56.67%)	35 (58.33%)	69 (57.5%)	
C:D	0.3	5 (8.33%)	5 (8.33%)	10 (8.33%)	0.998^{MC}
	0.4	6 (10%)	6 (10%)	12 (10%)	
	0.5	8 (13.33%)	7 (11.67%)	15 (12.5%)	
	0.6	16 (26.67%)	15 (25%)	31 (25.83%)	
	0.7	16 (26.67%)	15 (25%)	31 (25.83%)	
	0.8	5 (8.33%)	6 (10%)	11 (9.17%)	
	0.9	4 (6.67%)	6 (10%)	10 (8.33%)	
Shift	No	26 (43.33%)	27 (45%)	53 (44.17%)	1^{C}
	Yes	34 (56.67%)	33 (55%)	67 (55.83%)	
Cup	Deep cup	2 (3.33%)	2 (3.33%)	4 (3.33%)	0.998^{MC}
	Inferior notching	4 (6.67%)	4 (6.67%)	8 (6.67%)	
	Laminar dot	4 (6.67%)	3 (5%)	7 (5.83%)	
	Notching	1 (1.67%)	1 (1.67%)	2 (1.67%)	
	Pale	5 (8.33%)	5 (8.33%)	10 (8.33%)	

	Pale, LD	3 (5%)	5 (8.33%)	8 (6.67%)	
	PPA	2 (3.33%)	2 (3.33%)	4 (3.33%)	
	Temporal pallor	0 (0%)	1 (1.67%)	1 (0.83%)	
	Tilted, PPA	1 (1.67%)	1 (1.67%)	2 (1.67%)	
	N	38 (63.33%)	36 (60%)	74 (61.67%)	
NRR	Healthy	25 (41.67%)	25 (41.67%)	50 (41.67%)	1^{C}
	Thinning	35 (58.33%)	35 (58.33%)	70 (58.33%)	
Rnfl defect	No	33 (55%)	33 (55%)	66 (55%)	1^{C}
	Yes	27 (45%)	27 (45%)	54 (45%)	
BG	N	49 (81.67%)	49 (81.67%)	98 (81.67%)	1^{C}
	Tessellated	11 (18.33%)	11 (18.33%)	22 (18.33%)	
Vessels	AA	5 (8.33%)	5 (8.33%)	10 (8.33%)	1^{C}
	N	55 (91.67%)	55 (91.67%)	110 (91.67%)	
Macula	Fr +	6 (10%)	6 (10%)	12 (10%)	1^{C}
	FR dull	54 (90%)	54 (90%)	108 (90%)	
Field Changes	N	25 (41.67%)	25 (41.67%)	50 (41.67%)	1^{C}
	Present	31 (51.67%)	32 (53.33%)	63 (52.5%)	

Abbreviation: C – Chi square test, MC – Chi square test with Monte Carlo simulation

BCVA and contrast sensitivity with field changes.

Table 3: Comparison of BCVA and contrast sensitivity with field changes.

Variables	Sub Category	Field Changes		p-value
		N	present	
BCVA	6/6	16 (32%)	14 (22.22%)	0.6977[MC]
	6/6(P)	9 (18%)	8 (12.7%)	
	6/9	7 (14%)	8 (12.7%)	
	6/9(P)	4 (8%)	7 (11.11%)	
	6/12	3 (6%)	8 (12.7%)	
	6/12(p)	3 (6%)	5 (7.94%)	
	6/18	3 (6%)	6 (9.52%)	
	6/18(p)	1 (2%)	1 (1.59%)	
	6/24	2 (4%)	1 (1.59%)	
	6/24(p)	1 (2%)	(0%)	
	6/36	1 (2%)	2 (3.17%)	
	6/60	(0%)	1 (1.59%)	
	cf 2m	(0%)	2 (3.17%)	
Contrast sensitivity	Mean ± SD Median (Min, Max)	2 ± 0.21 2.1 (1.5, 2.25)	1.6 ± 0.22 1.65 (1.05, 2.1)	**< 0.001[MW]***

*Abbreviation: MC – Chi square test with Monte Carlo simulation, MW – Mann Whitney U test, * indicates statistical significance.*

Table-3 Shows comparison of BCVA with Contrast sensitivity with visual field changes. From Chi square test, it is observed that, there is no significant association of BCVA with field change. From Mann Whitney U test, a significant change in distribution of contrast sensitivity over field changes was observed p- **< 0.001[MW]*.**

BCVA AND FIELD CHANGES

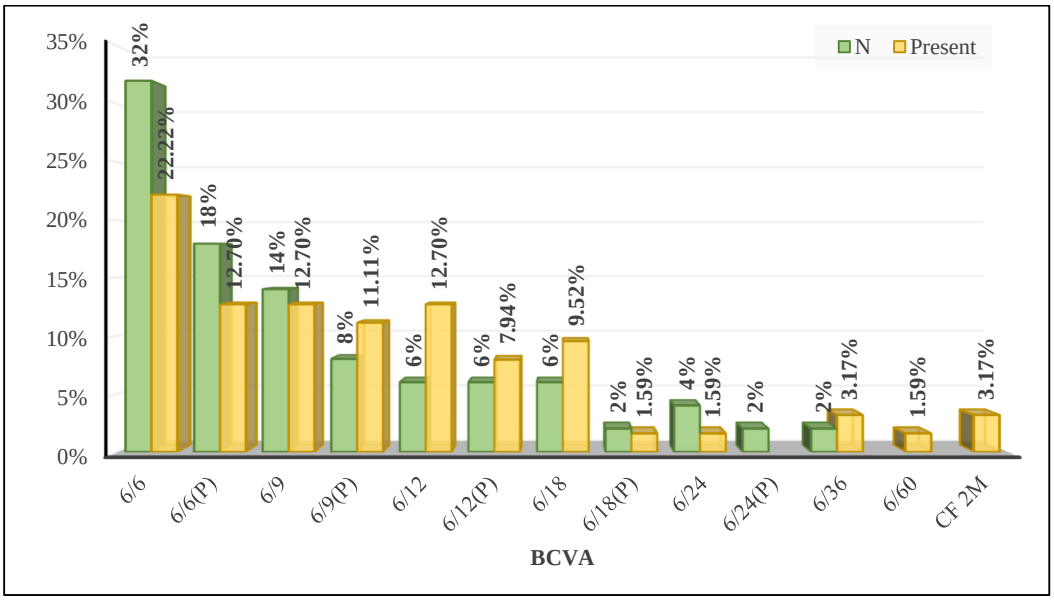


Figure 7: Distribution of subjects according to BCVA and Field changes.

CONTRAST SENSITIVITY AND FIELD CHANGES

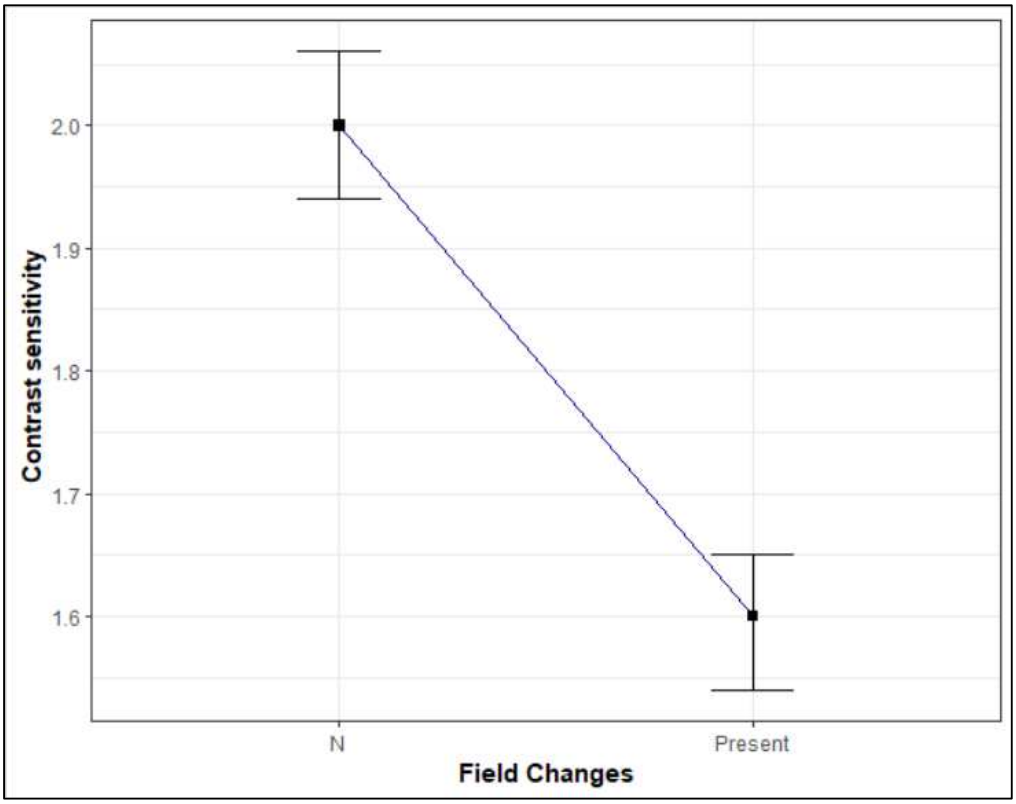


Figure 8: Mean plot of contrast sensitivity over Field changes.

As shown in the figure-8 Contrast sensitivity is displayed along the vertical axis, and field change is represented along the horizontal axis. The range of acceptable contrast loss includes < 0.48 log contrasts accounting for profound loss, 0.52-1.00 log contrast making up the severe loss group, 1.04-1.48 log contrast for moderate loss, 1.52-1.76 log contrast and 1.72-1.92 log contrast was considered normal for above 60 years and below 60 years respectively. In this study the participants are in the range of moderate loss.

Table-4: Different types of field changes with contrast sensitivity

Different types of field changes	Contrast sensitivity	
	Mean ± SD	Median (Min-Max)
Baring of Blindspot (n=9)	1.7 ± 0.1	1.7 (1.3-1.95)
Isopteric Contraction (n=28)	1.65 ± 0.2	1.60 (1.3-1.9)
Siedel scotoma (n=1)	1.6	
Arcuate scotoma (n=5)	1.5 ± 0.08	1.5 (1.5-1.6)
Double arcuate scotoma (n=2)	1.30	
Tubular vision (n=7)	1.5 ± 0.1	1.5 (1.2-1.8)
Severely depressed (n=9)	1.3 ± 0.2	1.3 (1-1.9)
Unreliable	1.6	

From table-4 the participants were analysed for different types of field defects

DISCUSSION

This study was conducted to assess the correlation amongst BCVA, contrast sensitivity and field defects in Glaucoma patients at "KLES DR. Prabhakar Kore Hospital and MRC, Belagavi". The components studied include the age, sex, Previous Glaucoma treatment, Family history, Systemic illness- Diabetes, Hypertension, Asthma, Membranous nephropathy on HCQ.

In this study 60 subjects between 26 to 74 years were included. The mean age was 54.87 ± 10.47 years. In a study conducted by Deb et al in 2014, 208 participants were enrolled (108 had hypertension while 100 were controls) whose mean age ranged from 55.1±7.1 for normotensive and 55.5±6.2 for hypertensive individuals. Hawkins et al. [68] conducted a similar study in 2003 at the glaucoma service of the University of Illinois at Chicago College of Medicine. In this study a larger sample size of 250 eyes belonging to 144 individuals were evaluated.

Compared to this study, Mathai et al [69] in 1997 conducted research on a slightly older population wherein POAG group's age varied from 45 to 75 years, the age range of the glaucoma suspects was 39 to 68 years, while that of the control group was 39 to 71 years. In a similar manner, 16 patients with POAG along with16 healthy controls of comparable age participated in a study done by McKendrick et al., [70]. Glaucoma patients had a mean age of 72±10 years and ranged in age between 52 to 87 years, while amongst the controls the age in years varied from 53 to 81 and the mean age was 68±7 years. Between these groups, the mean age did not differ significantly.12 young adults, with ages ranging between 20 to 35 with a mean age of 26 ±5 years, served as controls.

Age proved to have no baring on the prevalence or progression of glaucoma. However, an older age has a confounding effect on contrast sensitivity.

Males made up a greater percentage than females in this study. Male and female distributions were 58.33% and 41.67%, respectively. However, sex proved to have no statistical significance.

A similar sex ratio was present in a study done in 2001 by Wilensky et al. [71] on 120 patients and by Jampel et al. [72] on 237 glaucoma patients wherein 101[42.6%] were male and 136[57.4%] were females.

However different from the other studies, in 2014, in a study done by Deb et al. [66] only male patients were included.

With respect to ongoing treatment, only 36.67% of the individuals in this research had previous history of therapy for glaucoma.

According to the study done by Hwang et al., [81] 759 (24.2%) of the glaucoma patients kept taking their medicine for a minimum of two years following getting the original prescription. In contrast, during the follow-up, 2375 individuals stopped getting their prescriptions renewed for more than 90 days. The majority of non persistent cases (91.7%) stopped taking their medications in the first year, and 57.7% of these patients resumed using them during the follow-up.

Similarly, in a study conducted by Leung et al., [82] for analysis, 61 patients were included. The average age was 72 years, 61% of the patients were men, and 71% were using one glaucoma medication. Over the course of the 1-year trial period, 54 percent of patients (n=33) did not take their glaucoma prescriptions consistently.

In a study by Kashiwagi et al.,[83] they included 1305 female patients (47.8± 14.1 years old) and 1494 male patients (46.9± 13.6 years old). Many patients stopped using the antiglaucoma medicine soon after starting it. The persistence rates were 73.2, 68.1, 60.9, and 52.5%, respectively, after the drug's first three months, six months, twelve months, and three years of initiation. The number of prescriptions

prescribed, the younger patients and the hospital's size were all significantly connected with how persistently they took their meds.

In this study, 3.33 percent of the individuals had a history of glaucoma in their families which was not significant to comment on the correlation of ancestry with glaucoma and its parameters.

In a study by Green et al. in 2007, 1014 participants in total (59.6%) came from homes with sick members (familial glaucoma). 656 cases (or 64.8%) of the 1014 familial situations involved a first-degree relative. There were two to 29 impacted family members in each family group. Among the 638 participants, there was no history in the family for POAG (sporadic glaucoma). This proved that POAG patients having a history in the family of the condition were far more prevalent than amongst the TEST subjects.

Similarly in a study Tielsch et al[84] in a family having a history of POAG, siblings had a greater age-adjusted odds ratio (OR) of 3.69 than did parents (2.17) or children (1.12). However, selection bias existed as patients who were aware of having glaucoma had a greater odds ratio (OR=4.72) compared to the participants who were diagnosed during the study (OR=2.77).

In this study, the distribution of study participants according to alcohol use is 3.33 %.

From 1980 to 2002, Kang et al., [86] monitored male and female healthcare workers. Using biannual surveys, data on alcohol intake, possible confounders, POAG diagnoses were updated. Alcohol use had no effect on the risk of POAG in this significant prospective investigation of both men and women.

A systemic review was done by Stuart et al [87] comprising 34 papers in total. Persistent alcohol use was associated with higher IOP, according to data from 10

researches that reveal an association with IOP. Pooled effect estimates with similar values for prevalent and incident OAG demonstrated a positive relationship between any alcohol intake and OAG

In contrast, 265 of the 445 POAG patients in a study by Han et al [88] claimed not drinking (abstinence group), while another 180 stated they drank. 147 of the 180 patients were classified as mild drinkers, whereas 33 were classified as heavy drinkers. 39 individuals met the threshold for binge drinking, whereas 141 patients did not meet this standard. Patients who used alcohol were substantially smaller in age (52.5 ±13.6 years) compared to those who abstained from alcohol (55.1± 12.8 years) as well as being predominantly men (62.8%).

In this study, the distribution of study participants according to Smoking use is 3.33 %.

In a study by Lee et al., 2003, [89] Smokers mean intraocular pressures were somewhat higher (16.34 mm Hg) than those who didn't smoke (16.04 mm Hg). Significant correlation was found between intraocular pressure and current smoking (P = 0.03).

Similarly in a study by Wilson et al [90] Glaucoma was also correlated with current cigarette smoking.

In a study done by Klein et al., [91] in Beaver Dam, Wisconsin, based on survey results, alcohol use and smoking history were determined. It was compared to the prevalence among people who did not report excessive drinking to see how common glaucoma is among "strong drinkers," and whether they do it now or in the past. They compared prevalence among never, former, and current smokers. Frequency of glaucoma was not affected by drinking status. Cigarette smoking did not affect the prevalence of glaucoma.

In a 1977 study by Reynolds et al., hypothesizing risk factors for the condition were investigated in a sample of 87 patients with chronic open-angle glaucoma and 87 matched controls. A history of smoking was not shown to be significantly associated.

Further proving the same, Kang et al., [92] conducted the largest prospective research to date that included 111,215 health professionals from throughout the United States and evaluated cigarette smoking exposure over a decade has shown that smoking does not raise the chance of getting POAG.

In a study done by Quigley et al [93], they concluded that greater research is required to understand why smoking does not negatively affect glaucoma because of the vast number of noxious compounds it contains.

In this current study, 26.67% of study participants have diabetes, 30% have hypertension, and 1.67% of people have membranous nephropathy.

According to the study done by, Midha et al.,[94] a review of 371 patients who had been given a glaucoma diagnosis was conducted. The most common systemic symptoms in the primary congenital glaucoma group were congenital heart disease and global developmental delay. Ten of the 63 individuals (15.8%) with congenital ocular abnormalities had a corresponding systemic disease. Patients with Axenfeld-Reiger syndrome, aniridia, and Peters' abnormalities frequently have systemic comorbidities in addition to congenital heart disease. Sturge-Weber and Down syndrome were the two most prevalent systemic symptoms among the 18 people in the group who had known systemic illnesses (100%) and had associated systemic symptoms. 9 of the 72 (12.5%) individuals with secondary glaucoma had some systemic signs and this was one of the most frequent causes following congenital cataract surgery. Due to congenital rubella and congenital CMV infection, these

children were born with congenital heart disease and a generalised developmental delay.

In a study conducted by Salim et al. [95] on 180 POAG patients with ages ranging from 36 to 106 years old on average, 73% of the population had some kind of systemic involvement, hypertension being the most common. Following this, 47% of people had hypercholesterolemia.

A thorough eye examination was performed by Mitchell et al., [96] on 3,654 residents in the west of Sydney, ranging in age from 49 to 96. People with diabetes (5.5%), whether it was determined by familial presence or increased blood glucose levels, had a greater prevalence of glaucoma than those without diabetes (2.8%) with OR= 2.12. Additionally, those with diabetes (6.7%) had a higher prevalence of ocular hypertension than individuals without diabetes (3.5%; OR 1.86, CI 1.09-3.20). As opposed to 6.9% of individuals without glaucoma, 13.0% of those with glaucoma had diabetes. The proportion of patients with prior glaucoma diagnoses that increased the most was 16.7% (OR 2.82, CI 1.35-5.87). However, glaucoma was identified in 67% of these individuals before diabetes.

In a cross-sectional observational cohort research, done by Khalil et al. [98] 23 healthy controls and 68 multiple sclerosis (MS) patients had thorough ophthalmologic and neurologic examinations, incorporating visual field testing, optical coherence tomography and visual acuity assessment for evaluating the integrity of the optic nerve. The retinal nerve fibre layer (RNFL) thickness was significantly decreased in MS eyes. Ganglion cell complex (GCC) had drastically diminished in MS eyes. Expanded disability status scale (EDSS) and illness duration were substantially inversely linked with RNFL thickness. The length of the condition was strongly inversely linked with GCC. The length of the MS was substantially linked with

BCVA and retinal sensitivity (MD). OCT is a potential method for Egyptian MS patients to identify subclinical RNFL and GCC alterations.

Participants in the research were evaluated on the basis of several eye variables such BCVA, history of surgical treatment for glaucoma, anterior segment findings (Sclera and conjunctiva cornea, AC, Iris, Pupil, Lens, pxf,), fundus findings (Optical media, Vitreous haze, Bayoneting, Baring, C:D, Shift, Cup, NRR, Rnfl defect, BG, Vessels, Macula) and field changes. There is no discernible change in the distribution of variables over the eye, according to the Chi square test.

In 2021, Shen et al. [97] studied 1004 eyeballs and found visual acuity between the two eyes to have a weak association.

In a study done in 2019 by Kim et al. [99] all 119 participants exhibited a unilateral acute CRAO and a visual field impairment. Five distinct VFDs were seen: no visual field (ten percent), paracentral scotoma (three percent), central and cecocentral scotoma (19%), temporal island (fifty nine percent), and peripheral constriction alone (8%). CRAO stages that are severe, a low baseline BCVA, the delayed arterial perfusion of the retina, and significant retinal morphologic changes on OCT were all related with severe VFDs. 39% of the patients had better visual fields during the follow-up periods. Significant improvements in the visual field were linked to modest CRAO phases, excellent baseline BCVA, mild changes in the structure of the retina, and mild early VFDs.

In this study, 12.70% of the participants had 6/6P vision, 11.11% of the participants had a vision of 6/9(P), 12.70% had a visual acuity of 6/12 and 7.94% had a visual acuity of 6/12(P). 9.52% had a visual acuity of (6/18) and 1.59% had a visual acuity of 6/18(P). 1.59% had a visual acuity of 6/24 and 2% had a visual acuity of

6/24 (P). 6/36 was the visual acuity of 3.17% while 6/60 was the visual acuity of 1.59%. 3.17% exhibited CF 2M.

In the graph representing Contrast sensitivity over Field changes, **t**he horizontal axis represents field change, while the vertical axis shows contrast sensitivity. The range of acceptable contrast loss includes < 0.48 log contrasts accounting for profound loss, 0.52-1.00 log contrast making up the severe loss group, 1.04-1.48 log contrast for moderate loss, 1.52-1.76 log contrast and 1.72-1.92 log contrast was considered normal for above 60 years and below 60 years respectively. Participants in our research have suffered moderate losses.

According to the results of the Chi square test, there is no conclusive evidence between BCVA with field change. The distribution of contrast sensitivity over field changes differs significantly, as shown by the Mann Whitney U test, with a $p< 0.001^{MW}*$.

The participants in this study were examined for several forms of field defects. With the Baring of the blind spot (n=9), which indicates that the blind spot is not included in the centre field because of the outer edge's 30° inward curve, the mean value was determined to be 1.7 ± 0.1. Isopteric Contraction (n=28) had a mean value of 1.65±0.2, in which a progressive constriction of peripheral visual fields was present. Seidels Scotoma (n=1, mean value 1.6) and Single arcuate scotomas (n=5, mean 1.5±0.08) are focal defects of specific nerve fibre damage in one quadrant of the optic nerve head , causing sickle shaped defects extending from blind spot in the former , which progresses to arc shaped defects in the latter. Double arcuate (n=2) and its mean value is 1.30, an arc shaped visual field impairment surrounding the macula and surrounded by a region of normal vision. Severely depressed fields (n=9) had a mean value of 1.3 ± 0.2. Participants showed Tubular vision (n=7) and the mean value

found to be 1.5 ± 0.1, a field of vision with a central island of vision, with marked loss of peripheries. Lastly, some research participants demonstrated a vision problem that makes it difficult to carry out everyday chores. The mean value in the case of these unreliable subjects was 1.6.

In 2017, Liu et al. [100] conducted a study on 94 participants who had primary open-angle glaucoma. Each subject underwent standard automated perimetry (SAP), Humphrey visual field testing, letter recognition, and visual acuity tests. All of the patients had a BCVA of 0.3 log MAR (20/40 Snellen equivalent) or higher and a reliable SAP (fixation losses, false positives, and false negatives, 33%). The contrast sensitivity functions (CSFs) were derived using the letter CS and BCVA readings. The CS and BCVA indexes were combined to form the area under the CSF (AUCSF), which was then examined. In terms of Snellen equivalent, the mean (SD) BCVA was 0.08 0.10 log MAR, the mean (SD) CS was 1.38± 0.17, and the mean HVF MD was 7.22 ±8.10 dB. Significant correlation existed between CS and HVF MD ($r = 0.51$; $p < 0.001$). BCVA strongly linked with large letter CS, but not with HVF MD ($r = 0.12$, $p = 0.26$). A portion of the subject sample (about 20%) showed low to no BCVA loss and moderate to no field loss (6 dB MD), but had subpar letter CS. HVF MD and AUCSF had a strong correlation ($r = 0.46$, $p < 0.001$)

In a study by Thakur et al. [101] in 2018, 135 patients were analyzed. 45 patients were taken from each of three groups- controls, disc suspects, and glaucoma. The glaucoma subset was further separated into mild, moderate, and severe subgroups based on the severity of visual field loss. SPARCS scores and Pelli Robson scores had a significant positive association (S = 0.807, P 0.001) between them. The Pelli Robson Test's intraclass correlation coefficient (ICC) was 0.952, whereas SPARCS' ICC was 0.988. Mean SPARCS had a coefficient of repeatability (COR) of 5.65%,

but the Pelli Robson Test had a COR of 12.44%. Based on COR values, it was discovered that SPARCS had a greater repeatability than the Pelli Robson Test. In comparison to SPARCS scores, the Pelli Robson score exhibited a sensitivity of 80% and a specificity of 65.6% for identifying glaucoma patients.

In a study by Chaturvedi et al., [102] 40 eyes with normal or nearly normal visual status that can be rectified by refraction were included as controls, whereas 30 eyes with glaucomatous damage and low vision (according to WHO) were recruited as cases. The contrast sensitivity and visual acuity underwent analysis. The BCVA of the control group was below 0.5 LogMAR units. In the cases, 5 eyes (16.7%) and 25 eyes (83.3%), respectively, showed BCVAs between 1.0 and 1.3 LogMAR units and thus considerably met the inclusion criterion (p value 0.001). Amongst the cases, a statistically significant (p 0.05) inverse association of contrast sensitivity ($r = -0.39$) and intraocular pressure ($r = -0.51$) was found. Additionally, there was a link between cup to disc ratio, uncorrected visual acuity, and best corrected visual acuity ($r = 0.8$), as well as between uncorrected near visual acuity and best corrected near visual acuity ($r = 0.73$).

CONCLUSION

A clinical diagnosis of glaucoma is necessary. For determining if the disease is present or is progressing, there is no perfect test. Regarding the relative sensitivity and specificity of the techniques used today, it is challenging to be definite due to the lack of a conclusive measure. In comparison to earlier, less precise, and more subjective methods of diagnosis and progression detection, functional and structural evaluation techniques have unquestionably advanced.

Investigations have shown that structural imaging technologies enable doctors to quantitatively analyse the retinal nerve fibre layer and optic disc that is universally accepted.

More assurance regarding the stability or advancement of glaucoma, as well as the health or glaucomatous condition, is made possible by the structural and functional assessments.

Unfortunately, both cross-sectional and longitudinal studies have demonstrated that the relationship between change in early glaucoma and identifiable structural and functional impairment is, at best, weak. At every stage of the disease, it is critical to assess glaucoma using both structural and functional tests.

Even the best parameter of the best instrument, however, does not likely have enough sensitivity or specificity to be used as the only screening approach in the overall population. However, if the procedure is quick and easy, it may be appropriate for screening in settings where access to therapy is limited (such as developing countries). Because of the low diagnostic concordance between devices, it is possible that different techniques will pick up on different aspects of glaucomatous damage.

Although the contrast thresholds of all the glaucoma patients studied in this investigation were exceptionally high, only half of the patients showed reasonable consistency with respect to changes in the visual field. In contrast to conventional visual field tests, contrast threshold elevations provide a more diversified assessment of visual function, despite being symptomatic of glaucomatous damage to vision. The results show that the contrast thresholds in response to sinusoidal grating patterns presented to peripheral areas of the visual field are consequently always abnormally elevated in cases of glaucomatous visual field loss. Visual field analysis cannot be substituted by contrast sensitivity testing. However, it might offer useful supplemental information that can be quickly and easily collected making it an effective screening tool.

SUMMARY

The present study titled, **"To investigate the correlation amongst contrast sensitivity, visual acuity, and visual field defects in patients with glaucoma"** was carried out at "**KLES DR. PRABHAKAR KORE HOSPITAL AND MRC, BELAGAVI".** This was a one-year Prospective, Cross sectional, Hospital based study. Any patient presenting to the hospital and diagnosed to have primary open angle glaucoma, ocular hypertension and suspected glaucoma were taken for the study. The study period spanned over one year from first of January to thirty first of December in the year 2021 until the required sample size was reached. This prospective observational study was performed after obtaining approval and signed informed consent form of the study participants. The total sample size was 60.

The key findings of the study are summarised as follows:

1. 60 people were studied, with an age range of 26 years to 74 years with mean being 54.87 ±10.47 years.
2. Males made up 58.33% of the subjects while females made up 41.67%. The proportion of males was higher than females with a gender ratio of 1.4:1. The distribution was however not statistically significant.
3. The distribution of participants according to the medications they were taking at the time revealed that 36.67% of the study participants had previously undergone glaucoma therapy.
4. A family history of glaucoma existed amongst 3.33 % of the study's participants.

5. 1.67% of participants were found to be smokers, while 3.33% were found to be alcoholic consumers.
6. Based on the distribution of systemic illnesses, 26.67% of study participants had diabetes, 30% have hypertension, and 1.67% has membranous nephropathy.
7. Anterior segment examination included sclera and conjunctiva, cornea, AC, Iris, Pupil, pxf, lens.
8. Fundus examination of the subjects included the following variables : Glow, optical media, vitreous haze, Bayonetting, Baring, C:D, nasal shift of vessels, Cup, NRR, Rnfl defect, blood vessels, background and macula. There is no discernible change in the distribution of variables over the eye, according to the Chi square test.
9. According to the results of the Chi square test, there is no conclusive evidence between BCVA with field change.
10. The distribution of contrast sensitivity over field changes differs significantly, as shown by the Mann Whitney U test, with a p-value of 0.001MW*.
11. The acceptable levels of contrast loss fall into the following categories: profound loss at less than 0.48 log contrasts, severe loss at 0.52-1.00 log contrast, moderate loss at 1.04-1.48 log contrast, normal for people older than 60 at 1.52-1.76 log contrast, and normal for people younger than 60 at 1.72-1.92 log contrast. Participants in our research have suffered moderate losses.
12. Several types of field defects with contrast were tested on the research subjects.

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ANNEXURE I

STUDY ID NO: _____

Title of the study

"A ONE YEAR CROSS SECTIONAL STUDY TO ASSESS THE CORRELATION AMONGST VISUAL ACUITY, CONTRAST SENSITIVITY AND VISUAL FIELD ANALYSIS IN PATIENTS WITH GLAUCOMA AT KLES DR. PRABHAKAR KORE HOSPITAL AND MRC, BELAGAVI"

Principal investigator: REG. NO. BK0120003

Guide: Dr. _____.

Introduction and Purpose:

This study is designed to investigate the correlation amongst visual acuity, contrast sensitivity and visual field analysis in patients with glaucoma. Contrast sensitivity in combination with visual acuity and visual field will give a better idea about functional vision and may help in early detection of POAG and assessing progression.

Procedure:

If you agree to participate in the study please provide the details pertaining to the study.

We will check visual acuity, contrast sensitivity, anterior segment, optic disc changes, intraocular pressure, bjerrum's charting and visual fields will be assessed.

Benefits: Results will help to study prevalence and risk factors of glaucoma in individuals.

Risks: No proven side effects

Alternatives

Taking part in this study is voluntary. You may choose not to take part in this study. If you decide to take part you can later change your mind and withdraw from the study. Your decision will not change the present or future health care or other services that you receive. The study doctor or sponsor may stop your participation in this study at any time. If you choose not to take part in the study, you will receive the standard treatment for patients with your condition.

Privacy and Confidentiality

All the information collected about you during the course of this study will be kept confidential to the extent permitted by law. The code numbers will identify you in this research record. Information from this study may be published but your identity will be confidential in any publication.

Institution / Sponsor's policy

Does not apply to this research

Financial incentives for participation You will not be paid / offered any gifts /incentives for participating in the study.

Authorization to publish the results

The results of the study would be forwarded to the KLE University, Belgaum as part of requirement towards the completion of MS degree, review and publishing. It may be published for scientific purpose or presented to a scientific group. Your identify however will always remain confidential.

CONSENT FORM

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicates that I have read this consent form, or it has been read to me and I have been explained in my vernacular language and I have had all the questions answered.

Participant's Name :
……

Signature/ Left Thumb impression:
……..…….

Name of the legally authorized representative:
…….

Signature/ Left Thumb impression:
……..…….

Witness' Name:
……..…….

Signature/ Left Thumb impression:
……

Investigators name and Signature:

……

Date and Place:

……...

QUESTION:

If any enquiries in the future or in case of research related injury illness, you may contact following person.

1) PRINCIPAL INVESTIGATOR: REG. NO. BK0120003

Post graduate student,

Department of Ophthalmology,

J N Medical College, Belagavi.

2) GUIDE: Dr. _____,

Professor,

Department of Ophthalmology,

J N Medical College, Belagavi.

Even if u have any queries in future, you may contact following person

3) DR. Harsha Hegde

CHAIRPERSON,

JNMC, IEC and Scientist D, ICMR,

National Institute of Traditional Medicine,

Belagavi

ANNEXURE II

PROFORMA

PATIENT INFORMATION:

OP/IP NUMBER:

NAME: AGE:

SEX: F ☐ M ☐

ADDRESS:

CONTACT NUMBER:

DATE OF EXAMINATION:

IS THE PATIENT ELIGIBLE FOR STUDY? YES ☐ NO ☐

HAS INFORMED CONSENT BEEN GIVEN? YES ☐ NO ☐

CHIEF COMPLAINTS:

1] DIMINUTION OF VISION YES ☐ NO ☐

RE ☐ Duration:_____days/ months/years

LE ☐ Duration:_____days/ months/years

DIMINUTION OF VISION Gradual ☐ Sudden ☐

Progressive ☐ Static ☐

2] HEADACHE YES ☐ NO ☐

Duration:_____days/ months/years

3] REDNESS YES ☐ NO ☐

Duration:_____days/ months/years

4] WATERING YES ☐ NO ☐

Duration:_____days/ months/years

PAST HISTORY:

TRAUMA TO THE EYE: Present ☐ Absent ☐

OCULAR SURGERY: Present ☐ Absent ☐

If yes then specify:

DIABETES: Present ☐ Absent ☐

Duration:_____months/years

HYPERTENSION: Present ☐ Absent ☐

Duration:_____months/years

MIGRAINE: Present ☐ Absent ☐

Duration:_____months/years

ANY OTHER MEDICAL DISORDERS:

FAMILY HISTORY:

H/O blindness among any family member Yes ☐ No ☐

If yes, details of the affected family member

S NO.	RELATION	AGE OF ONSET OF BLINDNESS	NATURE OF BLINDNESS	TREATMENT HISTORY

PERSONAL HISTORY:

Smoking: yes/no
Duration _____days/months/years

Alcoholism: yes/no
Duration _____days/months/years

Other addiction: yes/no
Duration _____days/months/years

DRUG HISTORY:

H/O any regular drug intake: YES ☐ NO ☐

H/O any steroid use: yes ☐ no ☐ if yes, systemic ☐ topical ☐

Name of the drug: 1] _____

Duration:_____months/years

2] _____

Duration:_____months/years

GENERAL PHYSICAL EXAMINATION

BUILT: WELL BUILT ☐ MODERATE ☐ POOR ☐

NOURISHMENT: GOOD ☐ MODERATE ☐ POOR ☐

Pallor: Present/Absent If present: Mild/Moderate/Severe

Pulse: _____beats/minute BP: _____mm Hg

Temperature: _____°F Respiratory rate: _____/minute

RBS = mg/dl

SYSTEMIC EXAMINATION:

CVS: Normal/Abnormal
Specify: _____

RS: Normal/Abnormal
Specify: _____

CNS: Normal/Abnormal
Specify: _____

GIT: Normal/Abnormal
Specify: _____

OCULAR EXAMINATION:

VISUAL ACUITY:

	RE	LE
DISTANT		
PINHOLE		
NEAR		
AIDED		

CONTRAST SENSITIVITY:

OD (Right Eye)				
Triplet			Triplet	Score
0.00	H S Z	D S N	0.15	
0.30	C K R	Z V R	0.45	
0.60	N D C	O S K	0.75	
0.90	O Z K	V H Z	1.05	
1.20	N H O	N R D	1.35	
1.50	V R C	O V H	1.65	
1.80	C D S	N D C	1.95	
2.10	K V Z	O H R	2.25	

OS (Left Eye)				
Triplet			Triplet	Score
0.00	V R S	K D R	0.15	
0.30	N H C	S O K	0.45	
0.60	S C N	O Z V	0.75	
0.90	C N H	Z O K	1.05	
1.20	N O D	V H R	1.35	
1.50	C D N	Z S V	1.65	
1.80	K C H	O D K	1.95	
2.10	R S Z	H V R	2.25	

ANTERIOR SEGMENT

	OD	OS
LIDS		
ADNEXA		
CONJUNCTIVA		
SCLERA		
CORNEA		
ANTERIOR CHAMBER		
IRIS		
PUPIL		
LENS		

POSTERIOR SEGMENT:

FUNDUS	RE	LE
GLOW		
MEDIA		
DISC		
C:D RATIO		
BLOOD VESSELS		
BACKGROUND		
MACULA		

FUNDUS DIAGRAM

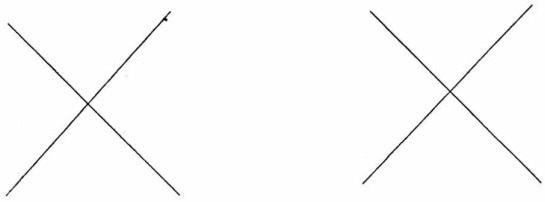
IOP MEASUREMENT:

RIGHT EYE:_____MM/HG. LEFT EYE:_____MM/HG

By non contact tonometer at _____

GONIOSCOPY:

OD **OS**



VISUAL FIELDS:

PATIENT CATEGORY:

A) PRIMARY OPEN ANGLE GLAUCOMA

B) GLAUCOMA SUSPECT

C) OCULAR HYPERTENSION

	VISUAL ACUITY	CONTRAST SENSITIVITY	VISUAL FIELD
PRIMARY OPEN ANGLE GLAUCOMA			
GLAUCOMA SUSPECT			
OCULAR HYPERTENSION			

SIGNATURE OF THE GUIDE:

ANNEXURE III

PHOTOGRAPHS

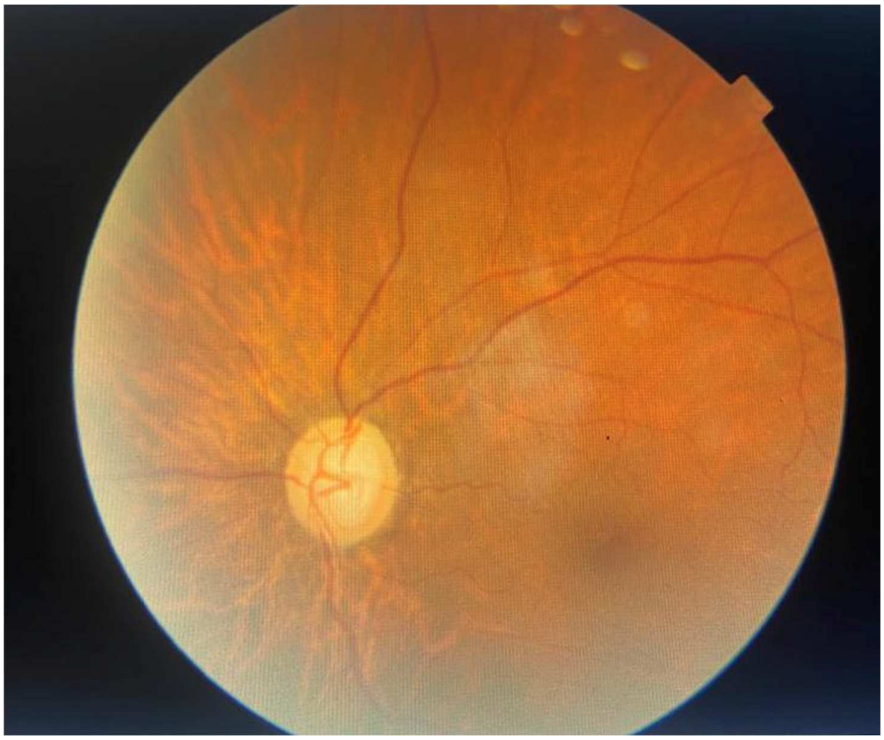
VISUAL ACUITY ASSESSMENT USING SNELLEN'S VISUAL ACUITY CHART

INTRAOCULAR PRESSURE MEASUREMENT USING NON CONTACT TONOMETRY

INTRAOCULAR PRESSURE ASSESSMENT USING GOLDMANN APPLANATION TONOMETER

CONTRAST SENSITIVITY ASSESSMENT USING PELLI ROBSON CHART

VISUAL FIELD ANALYSIS USING HUMPHREY FIELD ANALYZER



FUNDUS PICTURE SHOWING GLAUCOMATOUS OPTIC DISC CHANGES

KEY TO MASTERCHART

AA. arteriolar attenuation

AC. Anterior chamber

BCVA best corrected visual acuity

BG. Background

C:D. cup to disc ratio

Cf. counting fingers

Cfcf. Counting fingers close to face

Classification

1- Glaucoma suspect
2- Ocular hypertension
3- Primary open angle glaucoma

FR foveolar reflex

LD. Laminar dot

LE. Left eye

N. normal

NCT Non-contact tonometer

ND Normal depth

NRR neuroretinal rim

PPA peripapillary atrophy

Pxf Pseudoexfoliation

RE Right eye

Rnfl Retinal nerve fibre layer

Sics small incision cataract surgery

Srtl Sluggishly reactive to light

Trab Trabeculectomy

						Previous Glaucoma treatment			Family History	Personal History		systemic illenss				Anterior segment							Posterior segment examination														IOP		Classification	Contrast sensitvity	Field Changes		Gonioscopy grade	Final Treatment	
SL NO	**OP NO**	**AGE**	**SEX**	**EYE**	**BCVA**	**On going Drugs**	**Surgical treatment**			**Alcohol**	**Smoking**	**diabetes**	**hypertension**	**asthma**	**any other**	**sclera and conjunctiva**	**cornea**	**AC**	**iris**	**pupil**	**lens**	**pxf**	**optical media**	**vitreous haze**	**Bayonetting**	**Baring**	**C:D**	**Shift**	**Cup**		**Rnfl defect**	**BG**	**Vessels**	**Macula**	**Applanation**	**NCT**					**medical**	**surgical**
1	4051890	54	m	RE	6/6.	no	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	yes	no	0.4	no	N	healthy	no	N	N	FR dull	22	25.6	1	1.95	present	enlargement of blindspot	4	iotim eyedrops	
				LE	6/6(P)		no									N	N	N	N	N	N	no	clear	absent	yes	no	0.4	no	N	healthy	no	N	N	FR dull	21	22.8		1.95	present	peripheral constriction	4		
2	3563931	33	m	RE	6/6(p)	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	pale	thinning	yes	N	N	FR dull	11	11.6	1	1.5	present	peripheral constriction	4	travoprost eyedrops	
				LE	6/6(p)		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	pale	thinning	yes	N	N	FR dull	11	10.3		1.5	present	peripheral constriction	4		
3	5001605	64	m	RE	6/9(P)	yes	no		no	no	no	no	no	no	no	N	N	shallow	N	N	N	no	clear	absent	yes	yes	0.8	yes	pale, LD	thinning	yes	N	N	FR dull	17	17.2	1	1.2	present	tubular vision	4	combigan eyedrops	trab
				LE	6/9.		no									N	N	shallow	N	N	N	no	clear	absent	yes	yes	0.8	yes	pale, LD	thinning	yes	N	N	FR dull	15	14.2		1.2	present	double arcuate	4		trab
4	5992394	30	m	RE	6/12.	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	yes	0.6	yes	N	thinning	no	N	N	FR dull	15	15.9	1	1.65	present	baring of blindspot	4		
				LE	6/18.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.7	yes	N	thinning	no	N	N	FR dull	15	15.5		1.35	present	baring of blindspot	4		
5	5532537	54	m	RE	6/9.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	22	24.6	3	2.25	N		not done		
				LE	6/12.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	FR dull	22	21.8		2.1	N		not done		
6	608983	58	m	RE	6/9(P)	no	no		no	no	no	yes	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	FR dull	24	25.1	3	2.1	N		4		
				LE	6/9(P)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	FR dull	23	25.6		2.1	N		4		
7	6007930	52	m	RE	6/6.	no	no		no	no	no	yes	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.5	yes	N	thinning	no	N	N	FR dull	22	23.3	1	1.8	present	tubular vision	4		
				LE	6/60.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	N	thinning	yes	N	N	FR dull	40	41.4		1.2	present	severely depressed	4		
8	5898158	55	m	RE	6/12(p)	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	yes	N	N	FR dull	20	20.1	1	1.65	present	tubular vision	4		
				LE	6/9(P)		no									N	N	deep	N	N	pciol	no	clear	absent	no	yes	0.7	yes	N	thinning	yes	N	N	FR dull	25	27.8		1.65	present	unreliable	4		
9	5917532	57	m	RE	6/9.	no	no		no	no	no	no	yes	no	no	N	N	deep	N	N	pciol	no	clear	absent	no	no	0.6	no	N		no	N	AA	FR dull	16	17.3	1	1.65	present	baring of blindspot	4		
				LE	6/12.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	N		no	N	AA	FR dull	18	20.2		1.65	present	isopteric contraction	4		
10	5907317	68	m	RE	HMCF	yes	yes	trab	no	no	no	no	no	no	no	N	N	deep	N	N	pciol	no	clear	absent	yes	yes	0.9	yes	pale	thinning	yes	tesselated	N	FR dull	7	6.3	1	not assessed	not assessed	not assessed	4		
				LE	6/24.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	yes	pale	thinning	yes	tesselated	N	FR dull	10	11		1.65	present	tubular vision	4		
11	5921635	66	m	RE	6/9(P)	no	yes	trab sics	no	no	no	yes	no	no	no	N	N	deep	N	N	pciol	no	clear	absent	yes	yes	0.9	yes	pale	thinning	yes	N	N	FR dull	16	18.9	1	1.05	present	severely depressed	4		
				LE	6/18.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	pale	thinning	yes	N	N	FR dull	16	17.7		1.05	present	inferior arcuate scotoma	4		
12	4165677	51	m	RE	6/9.	yes	no		yes	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.6	yes	N	healthy	no	N	N	FR dull	20	21	1	1.65	present	isopteric contraction	4		
				LE	6/12.		no									N	N	N	N	N	N	no	clear	absent	no	yes	0.7	no	N	thinning	no	N	N	FR dull	20	20.4		1.65	present	siedel scotoma	4		
13	5419185	52	f	RE	6/6(P)	no	no		yes	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	no	N	healthy	no	N	N	FR dull	15	16.3	2	1.95	N		4		
				LE	6/36..		no									N	N	N	N	N	N	no	clear	absent	yes	no	0.7	no	N	healthy	no	N	N	FR dull	14	15.3		1.95	N		4		
14	5509372	55	m	RE	6/9(P)	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	20	20	1	1.8	present	baring of blindspot	4		
				LE	6/6(P)		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.5	yes	N	healthy	no	N	N	FR dull	16	17.1		1.65	present	g of blindspot, isopteric contr	4		
15	4092024	64	f	RE	6/12(p)	yes	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.6	yes	N	thinning	no	tesselated	AA	FR dull	8	8.9	2	1.65	present	generalised reduction	4	travoprost eyedrops	
				LE	6/12(p)		no									N	N	N	N	N	N	no	clear	absent	no	yes	0.7	yes	N	thinning	no	tesselated	AA	FR dull	12	13.4		1.65	present	generalised reduction	4		
16	6133358	70	f	RE	6/9(P)	yes	no		no	no	no	yes	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	N	healthy	no	N	N	FR dull	16	17.5	1	1.8	present	g of blindspot, isopteric contr	4	brimolol eyedrops	
				LE	6/9(P)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	N	healthy	no	N	N	FR dull	17	18.7		1.8	present	g of blindspot, isopteric contr	4		
17	6033076	64	m	RE	6/18.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	yes	0.8	yes	N	thinning	yes	N	N	FR dull	14	16.7	1	1.5	present	isopteric contraction	4		
				LE	PL+ Pracc		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.9	yes	N	thinning	yes	N	N	FR dull	22	25.6		not assessed	not assessed		4		
18	3904062	62	m	RE	6/12.	yes	no		no	no	no	yes	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	yes	0.7	no	pale, LD	thinning	yes	N	N	FR dull	16	18.9	1	1.5	present	double arcuate	4	dorsun t and brimolol eyedrops	
				LE	PL-ve		no									N	N	N	N	N	N	no	clear	absent	no	no	0.7	no	pale, LD	thinning	yes	N	N	FR dull	40	46.5		not assessed	not assessed		4		
19	4423219	59	m	RE	6/6(P)	yes	no		no	no	no	no	yes	no	no	N	N	shallow	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	yes	N	N	FR dull	21	22.8	1	1.65	present	teric contraction, arcuate scot	4	travosum eyedrops	
				LE	6/6.		no									N	N	shallow	N	N	N	no	clear	absent	yes	yes	0.6	yes	N	thinning	yes	N	N	FR dull	10	11.6		1.65	present	teric contraction, arcuate scot	4		
20	1985786	63	f	RE	6/6(P)		no		no	no	no	yes	yes	no	nephro	N	N	deep	N	N	pciol	no	clear	absent	no	no	0.6	no	tilted, PPA	healthy	no	tesselated	AA	FR dull	11	13.7	2	2.1	N		not done		
				LE	6/6(P)		no									N	N	deep	N	N	pciol	no	clear	absent	no	no	0.6	no	tilted, PPA	healthy	no	tesselated	AA	FR dull	11	12.8		2.1	N		not done		
21	5098616	41	m	RE	6/18.	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.9	yes	deep cup	thinning	yes	N	N	FR dull	20	22.4	1	1.45	present	severely depressed	4	brimolol eyedrops	
				LE	6/9.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	yes	deep cup	healthy	no	N	N	FR dull	18	18.9		1.95	present	peripheral constriction	4		
22	5740884	45	f	RE	cf 2m	yes	no		no	no	no	no	yes	no	no	N	N	shallow		N	N	no	clear	absent	yes	yes	0.7	yes	pale	thinning	yes	N	N	FR dull	26	26.5	1	1.35	present	severely depressed	not done	iotim eyedrops	
				LE	6/9.		no									N	N	N	N	N	N	no	clear	absent	no	yes	0.6	yes	pale	thinning	yes	N	N	FR dull	10	10.9		1.5	present	isopteric contraction	not done		
23	610434	56	f	RE	6/6(P)	yes	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	inferior notching	healthy	no	N	N	FR dull	16	17.8	2	2.1	N		4	latanoprost eyedrops	
				LE	6/6(P)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	inferior notching	healthy	no	N	N	FR dull	15	16.1		2.1	N		4		
24	6415412	52	f	RE	6/6.	no	no		**no**	no	no	yes	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	N	healthy	no	tesselated	AA	FR dull	22	24.1	1	1.8	present	isopteric contraction	4		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	yes	0.6	no	N	healthy	no	tesselated	AA	FR dull	23	24.3		1.8	present	isopteric contraction	4		

						Previous Glaucoma treatment			Family History	Personal History		systemic illenss				Anterior segment							Posterior segment examination												IOP		Classification	Contrast sensitvity	Field Changes		Gonioscopy grade	Final Treatment	
SL NO	**OP NO**	**AGE**	**SEX**	**EYE**	**BCVA**	**On going Drugs**	**Surgical treatment**			**Alcohol**	**Smoking**	**diabetes**	**hypertension**	**asthma**	**any other**	**sclera and conjunctiva**	**cornea**	**AC**	**iris**	**pupil**	**lens**	**pxf**	**optical media**	**vitreous haze**	**Bayonetting**	**Baring**	**C:D**	**Shift**	**Cup**		**Rnfl defect**	**BG**	**Vessels**	**Macula**	**Applanation**	**NCT**						**medical**	**surgical**
25	6240383	57	m	RE	6/6.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	22	22	3	2.25	N		not done		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	25	25		2.25	N		not done		
26	6372503	53	f	RE	6/6(P)	no	no		no	no	no	yes	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	FR dull	20	22	3	2.1	N		not done		
				LE	6/18(p)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	FR dull	22	27		1.95	N		not done		
27	5453730	63	m	RE	6/9(P)	no	no		no	no	no	no	no	no	no	N	N	deep	N	N	pciol	no	clear	absent	no	yes	0.6	no	N	healthy	no	N	N	FR dull	24	24	2	1.95	N		not done		
				LE	6/6.		no									N	N	deep	N	N	pciol	no	clear	absent	no	no	0.6	no	N	healthy	no	N	N	FR dull	22	24		1.95	N		not done		
28	6556766	54	m	RE	6/9.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes		thinning	yes	tesselated	N	FR dull	20	20.1	1	1.65	N		4		
				LE	6/9.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	N	thinning	yes	tesselated	N	FR dull	20	21		1.65	N		4		
29	3689659	42	f	RE	6/6(P)	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	yes	N	N	FR dull	20	21.9	1	1.5	present	teric contraction, arcuate scot	4	latanoprost eyedrops	
				LE	6/6(P)		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	yes	N	N	FR dull	18	20.5		1.5	present	teric contraction, arcuate scot	4		
30	6431652	70	m	RE	6/9(P)	no	no		no	yes	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	22	25.1	3	2.1	N		not done		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	24	28.2		2.25	N		not done		
31	6234434	66	m	RE	6/9.	no	no		no	no	no	yes	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	N	thinning	yes	N	N	Fr +	23	25.3	2	2.1	N		4		
				LE	6/9.		no									N	N	N	N	N	N	no	clear	absent	no	yes	0.6	yes	N	thinning	yes	N	N	FR +	22	23.7		2.1	N		4		
32	3007573	65	m	RE	6/9.	yes	no		no	no	no	yes	yes	no	no	N	N	deep	N	N	pciol	no	clear	absent	yes	yes	0.7	yes	ppa	thinning	yes	N	N	FR dull	10	13	1	1.8	present	baring of blindspot	4	combigan eyedrops	
				LE	6/18(p)		no									N	N	deep	N	N	pciol	no	clear	absent	yes	yes	0.7	yes	ppa	thinning	yes	N	N	FR dull	10	12.4		1.5	present	isopteric contraction	4		
33	2726533	58	f	RE	6/6(P)	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.5	yes	N	healthy	no	N	N	FR dull	15	18.5	2	2.1	N		4	bimatoprost eyedrops	
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	yes	N	healthy	no	N	N	FR dull	16	19.6		2.1	N		4		
34	6317229	63	f	RE	6/12.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	yes	N	N	FR dull	24	29	1	1.65	present	isopteric contraction	4		
				LE	6/12.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	N	thinning	yes	N	N	FR dull	22	26		1.8	present	isopteric contraction	4		
35	6337267	46	f	RE	6/6.	no	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	30	28.9	3	2.25	N		not done		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	FR dull	30	30.4		2.25	N		not done		
36	4778265	60	m	RE	6/9.	yes	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	laminar dot	thinning	yes	N	N	FR dull	24	25	1	1.35	present	peripheral constriction	4	bimatoprost eyedrops	
				LE	6/6.		no									N	N	deep	PI	N	pciol	no	clear	absent	yes	yes	0.7	yes	laminar dot	thinning	yes	N	N	FR dull	22	24.2		1.35	present	peripheral constriction	4		
37	6230163	60	f	RE	6/6.	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	laminar dot	thinning	yes	N	N	FR dull	14	15.2	1	1.5	present	severely depressed	4	timolol eyedrops	
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	laminar dot	thinning	yes	N	N	FR dull	14	16.5		1.95	present	severely depressed	4		
38	6501857	65	f	RE	6/24(p)	no	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	temporal pallor	healthy	no	tesselated	N	FR dull	18	21	2	1.8	N		4		
				LE	6/18.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	N	healthy	no	tesselated	N	FR dull	18	20.4		1.8	N		4		
39	6456497	41	f	RE	6/6.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	no	N	thinning	yes	N	N	Fr +	18	18.5	1	1.65	present	baring of blindspot	4		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	no	N	thinning	yes	N	N	Fr +	20	21		1.8	present	baring of blindspot	4		
40	6450748	55	f	RE	6/6.	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	notching	healthy	no	N	N	FR dull	20	20.7	1	1.8	present	isopteric contraction	4	dorzolamide brimonidine	
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	FR dull	18	19.1		2.1	N		4		
41	6191935	58	f	RE	6/18.	no	no		no	no	no	yes	no	no	no	N	N	N	N	N	N	no	hild haz	absent	yes	yes	0.9	yes	ppa	thinning	yes	tesselated	AA	FR dull	30	32.1	1	1.35	present	severely depressed	4		
				LE	6/18.		no									N	N	N	N	N	N	no	hild haz	absent	yes	yes	0.7	yes	ppa	thinning	yes	tesselated	AA	FR dull	30	27.7		1.65	present	peripheral constriction	4		
42	6334811	61	m	RE	cfcf		no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.9	yes	pale, LD	thinning	yes	N	N	FR dull	42	45	1	not assessed	not assessed		4		
				LE	6/9.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	laminar dot	thinning	yes	N	N	FR dull	18	20		1.95	present	baring of blindspot	4		
43	6309648	53	m	RE	6/6.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	inferior notching	thinning	yes	N	N	FR dull	14	14.3	1	1.65	present	isopteric contraction	4		
				LE	PL+ Pracc		no									spheroidal degeneration	N	shallow	N	N	N	no	clear	absent	yes	yes	0.9	yes	inferior notching	thinning	yes	N	N	FR dull	22	25.3		not assessed	not assessed		4		
44	6334895	44	f	RE	6/36..	no	no		no	no	no	yes	no	no	no	N	N	N	N	srtl	N	no	hild haz	absent	yes	yes	0.7	yes	N	thinning	no	tesselated	N	FR dull	26	29	1	1.65	present	isopteric contraction	4		
				LE	6/36..		no									N	N	N	N	srtl	N	no	hild haz	absent	yes	yes	0.6	yes	N	thinning	no	tesselated	N	FR dull	24	25		1.65	present	isopteric contraction	4		
45	4647813	74	m	RE	6/6.	yes	no		no	no	no	no	no	no	no	diffuse bleb	N	deep	pi	N	pciol	no	clear	absent	no	yes	0.6	yes	laminar dot	thinning	no	tesselated	N	FR dull	15	16.4	2	2.1	N		4	brimatoprost	
				LE	6/6.		yes									N	N	N	N	N	N	no	clear	absent	no	yes	0.6	yes	laminar dot	thinning	no	tesselated	N	FR dull	14	15.3		1.95	N		4		
46	6026016	50	m	RE	6/12(p)	no	no		no	**no**	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.9	yes	pale, LD	thinning	yes	N	N	FR dull	40	46.4	1	1.35	present	severely depressed	4		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	notching	thinning	yes	N	N	FR dull	32	33.2		1.5	present	tubular vision	4		
47	1164730	60	m	RE	6/18.	no	no		no	no	no	yes	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	deep cup	healthy	no	tesselated	N	FR dull	10	11.2	2	1.95	N		4		
				LE	6/9.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	deep cup	healthy	no	tesselated	N	FR dull	8	9.3		1.92	N		4		
48	6342454	61	f	RE	6/12(p)	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	pale, LD	thinning	yes	N	N	FR dull	18	18.5	1	1.5	present	tubular vision	4	brinzolamide +brimonidine, dorzolamide	
				LE	6/6(P)		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.9	yes	pale, LD	thinning	yes	N	N	FR dull	20	21.6		1.8	present	peripheral constriction	4		
49	6571953	41	f	RE	6/6.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	no	N	thinning	yes	N	N	Fr +	10	10.8	2	2.1	N		4		

						Previous Glaucoma treatment			Family History	Personal History		systemic illenss				Anterior segment							Posterior segment examination													IOP		Classification	Contrast sensitvity	Field Changes		Gonioscopy grade	Final Treatment	
SL NO	**OP NO**	**AGE**	**SEX**	**EYE**	**BCVA**	**On going Drugs**	**Surgical treatment**			**Alcohol**	**Smoking**	**diabetes**	**hypertension**	**asthma**	**any other**	**sclera and conjunctiva**	**cornea**	**AC**	**iris**	**pupil**	**lens**	**pxf**	**optical media**	**vitreous haze**	**Bayonetting**	**Baring**	**C:D**	**Shift**	**Cup**		**Rnfl defect**	**BG**	**Vessels**	**Macula**	**Applanation**	**NCT**					**medical**	**surgical**
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	no	N	thinning	yes	N	N	Fr +	16	18.7		2.1	N		4		
50	6427808	58	m	RE	6/9(P)	no	no		no	no	no	no	yes	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	pale	thinning	yes	N	N	FR dull	14	14.3	1	1.5	present	peripheral constriction	4		
				LE	6/12.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.9	yes	pale	thinning	yes	N	N	FR dull	14	14.3		1.5	present	peripheral constriction	4		
51	6059440	26	m	RE	6/6.	no	no		no	yes	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	N	thinning	no	N	N	Fr +	24	26.7	2	1.95	N		not done		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.6	no	N	thinning	no	N	N	Fr +	27	29.2		2.1	N		not done		
52	6259728	62	f	RE	6/12.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	N	healthy	no	N	N	FR dull	26	28.4	3	2.1	N		not done	iotim eyedrops	
				LE	6/12(p)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	N	healthy	no	N	N	FR dull	26	28.7		2.1	N		not done		
53	6599478	60	m	RE	6/12(p)	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	N	healthy	no	N	N	FR dull	23	24.2	3	2.1	N		not done		
				LE	6/9(P)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.5	no	N	healthy	no	N	N	FR dull	24	24.4		2.1	N		not done		
54	6612049	57	f	RE	6/9.	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.6	yes	inferior notching	thinning	yes	N	N	FR dull	18	19.8	2	1.5	N		not done		
				LE	6/24.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	inferior notching	thinning	yes	N	N	FR dull	16	17.7		1.5	N		not done		
55	3635061	40	m	RE	6/6.	yes	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	no	N	N	FR dull	21	21.6	2	1.5	N		3	careprost eyedrops	
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	no	N	N	FR dull	22	23.1		1.5	N		4		
56	2532505	50	f	RE	6/18.	no	no		no	no	no	yes	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	Fr +	28	28.7	3	2.25	N		not done		
				LE	6/24.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	N	N	Fr +	26	27.7		2.25	N		not done		
57	6016902	68	f	RE	cf 2m	yes	no		no	no	no	yes	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.8	yes	inferior notching	thinning	yes	N	N	FR dull	18	18.1	1	1.35	present	severely depressed	not done		
				LE	6/12.		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	inferior notching	thinning	yes	N	N	FR dull	18	20.2		1.5	present	tubular vision	not done		
58	6641596	38	f	RE	6/6(P)	no	no		no	no	no	no	no	no	no	N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	no	N	N	FR dull	18	18.9	2	1.8	N		not done		
				LE	6/6(P)		no									N	N	N	N	N	N	no	clear	absent	yes	yes	0.7	yes	N	thinning	no	N	N	FR dull	16	17.4		1.8	N		not done		
59	6637793	55	m	RE	6/12.	no	no		no	no	no	yes	yes	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	tesselated	N	FR dull	24	25.5	3	1.95	N		not done		
				LE	6/12(p)		no									N	N	N	N	N	N	no	clear	absent	no	no	0.3	no	N	healthy	no	tesselated	N	FR dull	27	29.4		1.95	N		not done		
60		33	m	RE	6/6.	no	no		no	no	yes	no	no	no	no	N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	Fr +	26	27.5	3	2.25	N		not done		
				LE	6/6.		no									N	N	N	N	N	N	no	clear	absent	no	no	0.4	no	N	healthy	no	N	N	Fr +	24	25.4		2.25	N		not done		