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Diseases causing visual Field defects at Solan

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Abstract
Background: Measurement of the visual field is the most important component for preventing the potentially blinding diseases.
Materials and method: After obtaining the written informed consent, all subjects were made to undergo a comprehensive ophthalmic examination. The study population included the patients visiting the OPD of the Ophthalmology department, Solan with the eye disease in which it was necessary to examine visual fields. The study population included the eye diseases in which it was considered necessary to examine for the visual field defects. The study sample was selected as per the inclusion and exclusion criteria.
Results: Majority of the study population in present study belonged to 50-59 years (23.81%) and 40-49 years (20.95%) age groups. The major cause for the visual field defects was Glaucoma (55.2%) followed by Neurological causes (11.4%), Cataract (9.5%), ARMD (4.8%), BRVO, CRVO (3.8%) and Optic neuritis (1.9%).
Conclusion: Visual field defects have a significant impact on the quality of life and should be considered mandatory in the rehabilitation process especially if the patient can perform perimetry.

Keywords: Cataract, Glaucoma, Neurological causes, Visual field defects

Introduction

With rising sociodemographic status and life expectancy, many countries around the world are seeing more people live into old age and there is increase in the average age of the population, and a shift in the disease burden towards non-communicable diseases and disabilities. Most of the principal causes of vision impairment, including cataract and undercorrected refractive error, [1] are subject to this epidemiological transition[2] and carry significant individual and societal costs [3, 4].

The estimates have shown that about 324 million population could be either blind or visually impaired across the world and its distribution is in a non-proportionate form in the developing countries, that includes the country like India [5]. With 8 million people with blindness and 62 million having visual impairment, India has about one-fourth of world's blind and visually impaired population [5].

Measurement of the visual field is the most important component for diagnosing the potentially blinding diseases. Perimetry is used extensively in diagnosis and follows up of several eye diseases such as in glaucoma, diseases of retina and neurological diseases [6]. The use in glaucoma is often discussed and well understood, however it has various other applications that render it very useful in disease management and blindness prevention. These include the detection and/or management of conditions such as eye lesions, papilledema, retinitis pigmentosa, cranial tumours and others [7].

The monitoring of the visual field is useful for assessment of the progress or recurrence of disease and also provides the guidance for the treatment of conditions like idiopathic intracranial hypertension (IIH), optic neuropathy from multiple sclerosis, pituitary adenomas, and other sellar lesions. They are used as screening tools for toxic optic neuropathy from medications such as ethambutol and vigabatrin. Visual field defects can adversely affect activities of daily living such as personal hygiene, reading, driving and should be taken into consideration when planning rehabilitation strategies [8].

A detailed neuro-ophthalmic assessment of a patient with visual symptoms should include visual field testing. While there are clear guidelines for the performance and interpretation of visual fields in glaucoma, very few exist for neuro-ophthalmic disorders. Visual fields serve three important purposes in neuro-ophthalmology [8].

1. ***Diagnostic***: Visual field defects indicate involvement of the visual pathways and the pattern of visual field defects help in localizing site of the lesion.

2. ***Follow-up***: Visual fields provide an excellent tool to monitor resolution and/or recurrence of disease processes affecting the visual pathways.
3. ***Activities of daily living***: Since visual field defects adversely affect the patient's ability to perform day-to-day activities such as personal hygiene, reading, and driving, these defects should be actively sought when planning rehabilitation strategies.

There are limited studies related to the assessment of the visual filed defects among this population. Our study assessed the patients who required visual field defects among the population coming to our OPD at Solan.

Materials and method

After obtaining the written informed consent, all subjects were made to undergo a comprehensive ophthalmic examination. The study population included the patients visiting the OPD of the Ophthalmology department, Solan. The study sample was chosen as per the inclusion and exclusion criteria. The study population included the subjects with visual field defects which required detailed examination.

The ophthalmic examination consisted of recording the best-corrected visual acuity using the modified ETDRS chart, applanation tonometry, gonioscopy, grading of lens opacities using LOCS II for those with a minimum pupillary dilation of 6 mm, stereoscopic evaluation of the optic nerve head and macula using + 90 diopter lens at the slit lamp, a detailed retinal examination with a binocular indirect ophthalmoscope using a +20 diopter lens optic disc fundus photography.

The visual field defects were recorded by zeiss humphrey visual field analyser which is considered to be the Gold standard for diagnosis of the visual filed defects. The Humphrey visual field test measures the entire area of peripheral vision that can be seen while the eye is focused on a central point.

The results of the analyser identify the type of vision defect. Therefore, it provides information regarding the location of any disease processes or lesion(s) throughout the visual pathway. This guides and contributes to the diagnosis of the condition affecting the patient's vision. These results are stored and used for monitoring the progression of vision loss and the patient's condition.

Data were entered on self-coded forms by the investigators and the examiners which were then entered into a computer by the data entry operator. The data was entered into Microsoft excel sheet and analyses were done using the SPSS software (SPSS for Windows, Rel 27.0. 2020. Chicago: SPSS Inc).

Results

Table 1: Total number of patients with Visual Field Defects

Age groups	Number	%
< 20 years	1	0.95%
20-29 years	9	8.57%
30-39 years	12	11.43%
40-49 years	22	20.95%
50-59 years	25	23.81%
60-69 years	20	19.05%
70-79 years	16	15.24%

Majority of the study population in present study belonged to 50-59 years (23.81%), 40-49 years (20.95%), 60-69 years (19.05%), 70-79 years (15.24%), 30-39 years (11.43%), 20-29 years (8.57%) and < 20 years (0.95%)

Table 2: Distribution of visual filed defects among study population

Condition	Number	%
Normal	14	13.3%
Glaucoma	58	55.2%
Neurological causes	12	11.4%
Cataract	10	9.5%
ARMD	5	4.8%
BRVO, CRVO	4	3.8%
Optic neuritis	2	1.9%

The major cause for the visual field defects was Glaucoma (55.2%) followed by Neurological causes (11.4%), Cataract (9.5%), ARMD (4.8%), BRVO, CRVO (3.8%) and Optic neuritis (1.9%).

Table 3: Distribution of the Neurological causes among subjects with visual filed defects

Condition	Number	%
Bilateral temporal hemionopia	5	41.7%
Bilateral nasal hemionopia	4	33.3%
Right lower quadrantonopia	2	16.7%
Left lower quadrantonopia	0	0.0%
Right upper quadrantonopia	0	0.0%
Left upper quadrantonopia	1	8.3%

Most of the subjects had Bilateral temporal hemionopia (41.7%) followed by Bilateral nasal hemionopia (33.3%), Right lower quadrantonopia (16.7%) and Left upper quadrantonopia (8.3%).

Table 4: Distribution of visual filed defects in other conditions according to Age

	Glaucoma	Cataract	ARMD	BRVO, CRVO	Optic neuritis
< 20 years					1
20-29 years	0	0	0	1	1
30-39 years	2	1			
40-49 years	16	3	0		
50-59 years	18	2	1	1	
60-69 years	12	2	2	1	
70-79 years	10	2	2	1	

Glaucoma and Cataract was significantly more among 50-59 years, 60-69 years and 70-79 years age groups.

Discussion

Few population-based studies have been performed so far focusing on the prevalence of visual field defects, and even fewer investigations addressed the new occurrence of VFL in a repeatedly examined population [9-12].

The overall incidence rate of VFL in the Rotterdam Study was 7.4 per 1000 person-years, increasing to 21.1 per 1000 person-years in those aged 80 years and older. The incidence of VFL in our study was higher than that of the Rotterdam Study. The difference may be attributed to the different perimetric techniques and accordingly different definitions of a VFL. In the Rotterdam Study, a VFL was defined as the presence of a perimetric defect in at least one eye on Goldmann perimetry in a participant from the cohort at risk or the presence of a defect of at least 6 contiguous points on the last reliable supra-threshold perimetry performed at follow-up in those subjects for whom Goldmann perimetry was indicated but not performed.

Frequency doubling threshold perimetry (program 20–1) was applied in our study and a VFL was defined as a reduced sensitivity at any location [13].

Age

In our study, most of the subjects belonged to 50-59 years age group followed by 40-49 years and 60-69 years age groups. Previous studies have shown that age is a risk factor for blindness [14-20]. *Vijaya et al.* [21] found that the odds ratio for blindness increased from 1.4 for 50–60 years age group to 67.3 for subjects aged 80 and above. If appropriate measures are not taken to control the reversible causes for blindness, blindness rates will continue to increase. [16, 19] *Vijaya et al.* [21] did not see any such difference in gender either among rural population [14] or in the current urban population.

Conditions causing the visual field defect

In our study, the most common visual field defect was glaucoma. Similar to our study, Sharma *et al*. [7] (Shimla, H.P) reported that the most common visual field defect was Glaucoma followed by the neurological causes, cataract and other defects such as ARMD (Age-related macular degeneration), Branch Retinal Vein Occlusion (BRVO), Central retinal vein occlusion (CRVO) and Optic neuritis.

Glaucoma was ranked as the second leading cause of blindness and fourth leading cause of moderate to severe impairment (MSVI), and therefore the most common cause of irreversible blindness, and the second most common cause of irreversible MSVI. Glaucoma in eyes with dense cataract might not be detected, and therefore glaucoma-related irreversible blindness was probably undercounted. With respect to the prevention of glaucoma-related vision impairment, tonometry has not proven to be a useful screening technique and visual acuity assessment is not useful because vision impairment is a late symptom of glaucomatous optic neuropathy [22]. Once detected, therapy for glaucoma can arrest or slow its deterioration in the majority of cases [23], hence the importance of improving systems of surveillance, highlighting risk among family members of cases, and effectiveness of care once treatment is initiated.

Herse and Gothwal [24] reported that the most common causes of low vision were cataract (21.4%), glaucoma (14.0%), diabetic retinopathy (12.9%), and retinitis pigmentosa (10.7%). The 4 most common causes of blindness were glaucoma (16.3%), diabetes (13.2%), corneal opacities (11.6%), and retinitis pigmentosa (11.6%).

The causes of blindness vary across the world. There are a number of studies suggesting that the leading cause of blindness in the White population is age-related macular degeneration [25-27]. Cataract seems to be the leading cause of blindness in the developing countries [14-20, 28]. In India, cataract has been documented to be the cause of bilateral blindness in 50–80% of blind people [1-3]. In this study visual field defects seems to be more in glaucoma patients.

Rotterdam Study revealed that glaucoma was overall the leading cause for incident VFD in the urban Dutch population of Rotterdam in all age categories [29]. In the Rotterdam Study, the overall incidence of glaucomatous VFD was 2.0 per 1000 person-years. In the same Rotterdam Study, stroke was the second most common cause of incident VFL in persons younger than 75 years, followed by age-related macular degeneration and retinal vascular occlusive disease [13].

Vijaya *et al*. [14] reported that 2nd leading cause for blindness was glaucoma. Glaucoma results in irreversible blindness which can potentially be prevented if diagnosed early. The high rates of blindness due to glaucoma in India can be explained partially by the large proportion of undiagnosed disease in the population. In population-based studies across the country, more than 90% of glaucoma patients were diagnosed during the study examination [14]. The causes for poor detection rates were overdependence on intraocular pressure measurements to diagnose glaucoma and the lack of a comprehensive eye examination by eye care professionals [21].

Cataract was the 3rd major cause for the visual filed defect among 9.5% subjects which was dis-similar to the study by Vijaya et al (57.6%). The major causes for incident VFL in the study by *Wang et al.* [30] were cataract, glaucoma and diabetic retinopathy, while age-related macular degeneration and retinal vein occlusion were less frequently responsible for an incident VFL. It reflects the list of disorders which were found to be the major causes for prevalence and incidence of visual impairment and blindness in population-based studies in China [31-34]. The latter studies focusing on visual acuity as well as our study addressing the incidence of VFL showed, that age-related macular degeneration is of lesser importance for presence and development of visual loss in old Chinese in the Greater Beijing region and in Asians in general as compared with Westerners [34-36].

Sirhota et al. [37] reported that Single arcuate scotomas were seen in 31%, followed by double arcuate scotomas (27%). There were 73 isolated nasal steps, of which 67% were superior and 33% were inferior.

In 2020, cataract remained the first or second leading cause of blindness and MSVI in all world regions. Cataract can at present only be treated operatively, by a trained surgeon within a system that has capacity to deliver surgeries and manage any postoperative complications. Alleviation efforts have taken the form of mass campaigns, especially in remote areas, and increasing the capacity for and accessibility of surgical services. Because prevalence increases with age, and is higher in women than in men, it remains an important focus for vision loss alleviation and for addressing gender equity. Outreach screening has been shown to enhance equity of access among underserved groups such as women and the elderly [38].

Given that the vast majority of vision impairment and blindness caused by cataract, undercorrected refractive error, diabetic retinopathy, and glaucoma can be avoided with early detection and timely intervention, a large potential in reducing morbidity for these causes remains.

Conclusion

Visual field tests should be performed in all patients having lesions that either involve or are in close proximity to the visual pathways. Standard Automated Perimetry (SAP) has been shown to be adequate in testing visual fields in the neuro-ophthalmic population at initial presentation as well as for monitoring progressive or recurrent conditions. Perimetry is useful in patients with advanced neurologic and/or visual deficits but is limited by the lack of trained technicians. Visual field defects have a significant impact on the quality of life and should be considered mandatory in the rehabilitation process especially if the patient can perform perimetry.

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