DOI: 10.7860/JCDR/2020/46197.14309

Original Article

Ophthalmology Section

Prevalence of Posterior Segment Disease in Subjects Screened for Cataract- A Retrospective Study

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ABSTRACT

Introduction: Glaucoma, retinal vein occlusion and diabetic retinopathy are the common posterior segment diseases affecting the eye and need to be specifically looked for in the community by Intra Ocular Pressure (IOP) measurement and a dilated fundus examination. Cataract screening alone in eye camps might not be adequate to prevent and treat these causes of blindness.

Aim: To establish the need for routine screening of posterior segment diseases at primary and secondary eye care level by estimating the prevalence of this diseases in patients presenting with cataract in order to prevent avoidable blindness.

Materials and Methods: This was a retrospective observational study conducted at Tertiary Care Hospital comprising of 1109 subjects who were screened for cataract and underwent cataract surgery, at screening camps from semi urban and rural localities in and around Hyderabad city between October 2018-March 2019. All subjects underwent detailed ophthalmic evaluation including visual acuity assessment, applanation tonometry, slit lamp examination and dilated fundus examination. Prevalence of blindness and moderate to severe visual impairment caused by posterior segment disease among these patients was analysed. Percentage distribution of the data was calculated mathematically.

Results: Of the 1109 subjects, posterior segment diseases causing blindness was seen in 0.63%, severe visual impairment in 0.99% and moderate visual impairment in 3.78%. Glaucomatous optic neuropathy was the most common posterior segment disease followed by retinal vein occlusion and diabetic retinopathy in that order. Diabetes Mellitus (DM) and Hypertension (HTN) were associated with increased risk of glaucoma.

Conclusion: Routine screening for posterior segment disease is recommended with the use of portable fundus cameras in the elderly population along with IOP measurement using hand held portable tonometer in screening camps in order to reduce the burden of avoidable blindness. Monitoring of life style diseases like HTN and DM at the time of cataract screening is needed for primary prevention of most of these diseases of the eye.

Keywords: Blindness, Community, Portable fundus camera, Portable hand held tonometer, Severe vision impairment

INTRODUCTION

Posterior segment eye disease forms an important cause of preventable blindness [1]. Screening for cataract alone in the population, which is vulnerable to diseases affecting the retina and optic nerve might not be sufficient in the community. Information on the epidemiological data is important to understand the magnitude of the problem and is a pre-requisite for planning the diagnostic services, in order to achieve the target of reducing the prevalence of blindness to <0.3%, as per the Vision 2020, National Program for Control of Blindness [2]. Increased life expectancy, lifestyle changes is leading to a rise in the prevalence of DM and its complications like diabetic retinopathy. Increased prevalence of glaucoma is also noted in subjects with DM [3].

Cataract being a common visual disability in ageing population, strategies to screen this subset of population with or without cataract for associated systemic diseases like HTN and DM would help in secondary and tertiary prevention of several posterior segment diseases. One study by Matta S et al., showed that among one third of study population, 8.1% of patients with pre-existing ocular co-morbidity leading to poor visual outcome post-cataract surgery had glaucoma and retinal disease [4]. The prevalence of common ocular conditions in this sub population helps formulate comprehensive protocols and cost-effective strategies to prevent and treat them. The closer to the community these services are provided; the better will be the outcome. Tele ophthalmology can be incorporated as one such strategy for screening aged population in the community. Tele ophthalmology is emerging as an important screening and consulting modality for posterior segment conditions like glaucoma and diabetic retinopathy [5].

The current study is aimed to estimate the prevalence of posterior segment disease in patients presenting with cataract. To reach the aim, the objectives drawn were estimation of prevalence of posterior segment disease causing vision loss or moderate visual impairment in subjects screened for cataract at specified rural and semi urban areas in and around Hyderabad city that will help to formulate effective strategies for their prevention and management among the elderly population in the community.

MATERIALS AND METHODS

This study was a retrospective review of medical records of 1109 subjects who were screened for cataract at screening camps from semi urban and rural localities in and around Hyderabad city for period of six months, between October 2018-March 2019. The review of data was conducted in the month of June 2020. The power of study was 80%.

Institutional Ethical Committee (IEC) approval was obtained (EC No: 120). Patients screened for cataract by vision technicians in the community were examined at the base hospital. History was taken about the duration of visual disability, presence of systemic diseases like DM and HTN as well as the treatment history. Visual acuity was recorded using Snellen tumbling E-optotype at six meters. Subject's vision at the time of presentation to the Outpatient Department on the postoperative day 1 of cataract surgery and at one month was recorded. IOP was recorded by Goldman applanation tonometer. Anterior segment examination was performed using a slit-lamp bio-microscope and the findings were recorded. Fundus examination was performed using slit lamp bio microscopy and indirect ophthalmoscopy. Posterior segment findings in the pre-operative

examination and at one month follow-up were analysed. Blindness and visual impairment caused by posterior segment disease were categorised as per the International Classification of Diseases 11 (2018) [6]. Blindness is defined as distance visual acuity worse than 3/60, Severe visual impairment as better than 3/60 and worse than 6/60, Moderate visual impairment as worse than 6/18 and better than 6/60, in the better-seeing eye.

STATISTICAL ANALYSIS

Descriptive analysis of both quantitative data that included patient's age, the number of patients with posterior segment disease, the number of patients with various grades of visual impairment caused by posterior segment disease and qualitative data that included the gender of the patients in the study and the various causes of posterior segment disease among the study population was done using Microsoft Excel 2019. Percentage distribution of the data was calculated mathematically.

RESULTS

Out of the 1109 subjects screened, 508 (45.8%) were male and 601 (54.2%) were female. Age distribution of the population ranged between 30 and 90 years. About 78% of study population was aged between 51 and 70 years. Age and gender distribution of the study population is shown in [Table/Fig-1]. Out of the 1109 study subjects, 280 patients (25.25%) had associated systemic vascular disease [Table/Fig-2]. Prevalence of posterior segment eye disease in the current study was 9.56%. The posterior segment diseases prevalent in the study population and their association with HTN and DM are shown in [Table/Fig-3]. Blindness caused by posterior segment disease was found in seven patients (0.63%), severe visual impairment was seen in 11 patients (0.99%) and posterior segment disease was a cause for moderate visual impairment in 42 patients (3.78%) among the study population. The three most common posterior segment diseases found in present study subjects were glaucoma related optic neuropathy in about 46 patients (4.15%) followed by diabetic retinopathy in 18 patients (1.62%) and retinal vein occlusions in 14 patients (1.26%). Of the total blindness due to posterior segment disease in present study, retinitis pigmentosa was seen in three patients (42.85%), glaucomatous optic neuropathy in two patients (28.6%), vitreous haemorrhage secondary to diabetic retinopathy in one patient (14.30%) and wet age related macular degeneration in one patient (14.30%). Degree and causes of vision loss by posterior segment disease is given in [Table/Fig-4].

Age (years)	No of patients {n (%)}
30-40	18 (1.6%)
41-50	101 (9.1%)
51-60	363 (32.7%)
61-70	507 (45.7%)
71-80	113 (10.2%)
81-90	07 (0.7%)
Gender	
Male	508 (45.8%)
Female	601 (54.2%)

[Table/Fig-1]: Age and gender distribution (N=1109).

Systemic vascular disease	Number of Patients n (%)
Hypertension	182 (16.4%)
Diabetes mellitus	89 (8%)
Coronary artery disease	5 (0.5%)
Cerebral vascular disease	4 (0.4%)
No known systemic vascular disease	829 (74.7%)

[Table/Fig-2]: Prevalence of systemic vascular disease in the study sample.

Posterior segment findings	Prevalence n (%)
Normal fundus	1003 (90.44%)
Glaucomatous optic neuropathy	n=46 (4.15%)
Association with HTN	14
Association with DM	4
Association with both HTN and DM	2
No systemic risk factor association	26
Diabetic retinopathy	**n=18 (1.62%)**
Mild NPDR only	5
PDR with vitreous haemorrhage	2
PDR with tractional retinal detachment	2
Diabetic macular edema	9
Association with HTN	n=6
Association with DM	n=18
Association with DM and HTN	n=6
Retinal vein occlusions	**n=14 (1.26%)**
Central retinal vein occlusion	1
Branch retinal vein occlusion	13
Association with HTN	n= 5
Association with DM	n=2
Association with both HTN and DM	n=1
Age Related Macular Degeneration (ARMD)	**n=12 (1.08%)**
Dry ARMD	10
Wet ARMD	02
Association with HTN	n=3
Association with DM	n=1
Association with both HTN and DM	n=0
Retinitis pigmentosa	**08 (0.72%)**
Primary optic atrophy	**03 (0.27)**
Rhegmatogenous retinal detachment	**02 (0.18%)**
Macular hole	**02 (0.18%)**
Posterior uveitis	**01 (0.09%)**

[Table/Fig-3]: Prevalence of posterior segment disease and its association with hypertension and diabetes mellitus.
NPDR: Non proliferative diabetic retinopathy; PDR: Proliferative diabetic retinopathy

Cause	Blindness n (%) 7 (100%)	SVI n (%) 11 (100%)	MVI n (%) 42 (100%)	Mild or no central vision impairment n (%) 46 (100%)
Glaucoma	2 (28.6%)	3 (27.3%)	16 (38.1%)	25 (54.3%)
Retinal vein occlusion	-	1 (9%)	7 (16.6%)	6 (13%)
Diabetic retinopathy	1 (14.3%)	3 (27.3%)	5 (11.9%)	9 (19.6%)
Age-related macular degeneration	1 (14.3%)	1 (9%)	6 (14.3%)	4 (8.7%)
Retinitis pigmentosa	3 (42.9%)	2 (18.1%)	1 (2.4%)	2 (4.3%)
Primary optic atrophy		1 (9%)	2 (4.6%)	-
Rhegmatogenous retinal detachment			2 (4.6%)	-
Age related macular hole			2 (4.6%)	-
Posterior uveitis			1 (2.4%)	-

[Table/Fig-4]: Degree and causes of vision loss by posterior segment disease.
SVI: Severe visual impairment; MVI: Moderate visual impairment

DISCUSSION

Posterior segment eye diseases are an emerging cause of visual impairment in the developing world and screening for cataract alone in the community is not adequate to prevent avoidable blindness [7]. The common causes of posterior segment eye diseases are glaucomatous optic neuropathy, retinal vein occlusion, diabetic retinopathy and age related macular degeneration that is often associated with irreversible vision loss. The prevalence of these

diseases in the current study was 9.56%. Posterior segment diseases constituted about 11.5% of causes of visual impairment with presenting visual acuity less 6/18 and second only to cataract accounting for 11.8% of blindness in a study by Zhang X et al., [8]. A significant proportion of these diseases are treated at the tertiary level and there is a need for a comprehensive approach to deal with these diseases at primary and secondary level of care. There are few population based studies like the Andhra Pradesh Eye Disease Study (APEDS) [9] and Rapid Assessment of Cataract Surgical Services (RACSS) [10], where prevalence of posterior segment disease is estimated in particular, leading to its underestimation as a cause of blindness [9-11]. Comparison of prevalence of blindness and severe visual impairment caused by posterior segment disease in present study with APEDS [9] and RACSS [10] has shown in [Table/Fig-5].

Primary cause	APEDS (%) [9]	RACSS (%) [10]	Present study (%)
Posterior segment pathology-Retinal disease, Glaucomatous optic neuropathy and Optic atrophy	1.84	2.3	1.62

[Table/Fig-5]: Comparison of prevalence of blindness and severe visual impairment caused by posterior segment disease in our study with APEDS[1] and RACSS[2] [9,10]. 1. Andhra Pradesh Eye Disease Study (APEDS), 2. Rapid Assessment of Cataract Surgical Services (RACSS)

The magnitude of disease in a given set of population when determined can be tackled by a targeted approach. Blindness due to glaucoma, diabetic retinopathy and retinal vein occlusion are potentially avoidable with early diagnosis and treatment. Estimating the associated systemic and ocular risk factors and instituting timely medical management helps prevent most of the visual morbidity caused by these diseases. In the present study, 89 patients (8.0%) were known diabetics and 182 patients (16.4%) were known hypertensive. In order to compare present study with other landmark studies like APEDS, authors combined the percentage of blindness and severe visual impairment caused by posterior segment disease which was found to be 1.62% [Table/Fig-3]. The Andhra Pradesh Eye Disease Study (APEDS) [9], a cross-sectional epidemiological study found the prevalence of blindness due to posterior segment diseases that included retinal disease, optic atrophy and glaucoma related optic neuropathy put together to be 1.84%. RACSS study conducted in the same district where APEDS concluded a decade later, using a validated RACSSs determined blindness due to above diseases to be 2.3% [10]. Visual impairment with visual acuity worse than 6/60 and better than 6/18 in the better eye caused by posterior segment disease was 4.93% in APEDS and in present study it was 3.78%. The difference in the prevalence rates could be due to larger sample size and inclusion of entire population in APEDS, whereas present study had individuals over 30 years of age screened for cataract and those with no known pre-existing retinal disease.

The current study showed glaucoma related optic neuropathy to be the commonest posterior segment disease seen in 46 (4.15%) subjects. This is comparable to the prevalence of both primary open-angle and primary-closed angle glaucoma in individuals over 40 years in Andhra Pradesh eye disease study in urban versus rural population, which was 5.8% and 2.3%, respectively [12]. Among the patients with glaucomatous optic neuropathy in the current study, 14 (30.43%) were hypertensive and 4 (8.69%) were diabetic and 2 (4.34%) were both hypertensive and diabetic which again proves that DM and HTN are associated with increased risk of glaucoma [3,13]. The rest of the 26 patients had no systemic risk factor association. Routine use of portable hand held tonometers to measure IOP in individuals in the cataract age group helps early diagnosis of this condition. Portable hand held tonometers are comparable to Goldman applanation tonometer in taking accurate measurements of IOP and can be incorporated as a useful tool in telemedicine [14].

The prevalence of DM in present study was 8% which is comparable to the prevalence of known diabetes in National Diabetic Retinopathy RAAB survey which was 8.0% [15]. Diabetic retinopathy was the second most common cause of posterior segment disease only after glaucoma. The prevalence of diabetic retinopathy among individuals with known diabetes in present study was 20.22% compared to 16.9% in the National RAAB survey [15] and 21.7% among diabetic patients in a study conducted by the All India Ophthalmological society [16]. Among 18 patients with diabetic retinopathy causing blindness and visual impairment, nine patients had diabetic macular edema, two patients had tractional retinal detachment and two had vitreous haemorrhage.

Retinal vein occlusion particularly branch retinal vein occlusion, was the third most common acquired posterior segment disease. HTN was present in six patients (42.85%) out of 14 patients with retinal vein occlusion. The data of published studies had shown that 48% of retinal vein occlusions were connected to HTN [17]. De novo HTN was diagnosed in about a third of the patients with retinal vein occlusion in this study. Age related macular degeneration constituted next significant pathology affecting the patient's vision. Three patients out of 12 with age related macular degeneration causing moderate to severe visual impairment and blindness were hypertensive. Blindness and visual impairment due to retinitis pigmentosa in present study was 0.45% and the prevalence of retinitis pigmentosa was 0.72% in comparison to 0.12% in APEDS [9]. Though retinitis pigmentosa constituted an important cause for severe visual impairment, it cannot be categorised as a cause of avoidable blindness. Optic atrophy was found to be commonly prevalent among individuals who drink toddy, but the cause effect relation was not assessed in present study. Given the magnitude of the problem, it is necessary to evaluate these diseases as a part of routine community eye screening. Cost-effective screening tools like routine use of portable fundus cameras and hand held tonometers integrated with tele ophthalmology can be incorporated in screening patients in this sub-population where an ophthalmologist is not available. Use of trained paramedical staff to take images and remote grading of these images done by an ophthalmologist helps in treating these posterior segment eye diseases [18].

The growing burden of posterior segment eye disease needs to be a focus of policy makers in order to achieve the Vision 2020: Right to sight objective [1]. A community based approach for diagnosis and treatment of these diseases that need referral across different specialities and lifelong follow-up goes a long way in achieving this objective.

Limitation(s)

Assessment of glaucoma severity was based on surgeon's discretion of the optic disc appearance and central visual acuity for distance but not by visual field examination which could have caused some disparity in blindness estimation.

CONCLUSION(S)

Routine screening for posterior segment disease at primary and secondary eye care levels with the help of portable fundus cameras for timely recognition and management in the elderly population. Glaucoma screening to be a part of regular eye check-up in ageing population. Monitoring of life style diseases like HTN and DM at the time of cataract screening in the screening camps. Training of ophthalmic assistants to measure IOP using portable tonometers. To train them in counselling the patients that helps to improve their health seeking behaviour for fundus examination as well as to improve disease awareness.

Acknowledgement

The Authors wish to acknowledge the management of Mamata Academy of Medical Sciences for their support in conducting this study and Dr. Sunanda Vusikala HOD, Department of Biochemistry.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Aug 08, 2020
- Manual Googling: Nov 02, 2020
- iThenticate Software: Nov 25, 2020 (7%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **Aug 04, 2020**
Date of Peer Review: **Aug 24, 2020**
Date of Acceptance: **Nov 02, 2020**
Date of Publishing: **Dec 15, 2020**