

Clinical and epidemiological study in patients with glaucoma in tertiary eye center, Bhaktapur

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Abstract

Background Glaucoma is increasing as a significant global health problem being the major cause of irreversible blindness worldwide. Early detection and timely management of glaucoma can decrease the burden of blindness worldwide.

Methods This was a retrospective hospital -based study conducted at Glaucoma unit in CHEERS Hospital, Bhaktapur from August 2015 to July 2019. Patients demographic profile, along with a comprehensive examination, reviewed from the records. Collected data included: age, sex, race/ethnicity, intraocular pressure, cup/disc ratio, different types of glaucoma, visual field. Data analysis done with IBM SPSS version 24 and was presented in mean (\pm SD), frequency and proportions and chi- square test was applied. P value < 0.05 was considered statistically significant.

Results Total of 312 glaucoma cases were reviewed and included in this study. The mean age presentation was 61.89 ± 14.4 years, and maximum number (52.6%) was between ages 60-79 years. The majority of patients were primary open angle glaucoma (173, 55.4%) followed by primary angle closure (92, 29.5%). The association between all types of glaucoma and increasing age was statistically significant ($P < 0.001$). Similarly, the association between all types of glaucoma with positive family history and caste/ ethnicity was statistically significant ($P < 0.001$).

Conclusion This study showed primary open angle glaucoma as the most common glaucoma. There was a positive association seen between all types of glaucoma with increasing age (beyond age of 40 years) and family history of glaucoma. Screening programs in population with risk factors and opportunistic eye examinations should be conducted for early detection of glaucoma.

Trial registration: retrospective registered

Background

Glaucoma is increasing as a significant global health problem being the major cause of irreversible blindness worldwide. It is estimated that 79.6 million people will be affected by glaucoma 2020 and 111.8 million in 2040 [1, 2]. The estimated global prevalence of glaucoma is 3.54% [2]. In Nepal, prevalence of glaucoma ranges from 0.94% to 1.9 % [3, 4]. Early detection and timely management of glaucoma can decrease the burden of blindness worldwide.

Primary open angle glaucoma (POAG) is the most common type of glaucoma accounting for three-quarters (74%) of all glaucoma cases [1]. The prevalence of glaucoma and subtypes vary with sex, age, geographical location, and race [5]. Population-based studies have shown that Asians are more susceptible to primary-angle closure glaucoma (PACG) in comparison to Africans and Europeans. In the United States, subjects of African descent have been shown to be at a greater risk of glaucoma compared to white Caucasians [5, 6]

This study targeted the people of Bhaktapur which falls in Central Nepal with aim to find out clinical characteristics and epidemiology of glaucoma among the patients attending CHEERS Hospital, Bhaktapur. This study will also provide background information regarding the burden of glaucoma and its risk factors which in turn would be beneficial to plan screening program and management protocol.

Methods

This retrospective study was conducted among glaucoma patients attending Glaucoma Unit at B.P. Eye Foundation, Hospital for Children, Eye, ENT and Rehabilitation Services (CHEERS) between August 2015 and July 2019. Ethical approval was obtained from Nepal Health Research Council (NHRC Reg' no. 620/207-9) prior the study. All the patients with age 20 years and above with diagnosis of glaucoma during the study period were included in this study. Data was retrieved for the hospital records. Patients with incomplete records were excluded from the study.

Data was collected in predesigned proforma which included patient's demographic profile, duration of illness, family history of glaucoma, history of prolonged steroid medication as well as a history of any prior ocular trauma or ocular surgery were included. Histories of any systemic illness hypertension, diabetes were noted. All the patients had undergone comprehensive ophthalmic examination. Visual Acuity was obtained with a Snellen chart. Intraocular pressure (IOP) was measured with the Goldman applanation tonometer. Vertical cup-disc ratio was evaluated with the 90D Goldman lens. Gonioscopy was performed using the Zeiss 4-mirror lens. Visual fields were tested with the Humphrey Field Analyzer (Carl Zeiss Meditech, Inc. Dublin, CA). A digital photograph of optic nerve was taken. Central corneal thickness was measured. Disc optical coherence tomography (OCT) was done where necessary (TOPCON 3D ver.8.20).

The specific type of glaucoma was determined based on the clinical presentation, optic nerve-head findings, visual-field changes, intraocular pressure (IOP), and gonioscopic findings. Patients were categorized into subgroups- primary open-angle glaucoma (POAG), primary angle-closure glaucoma (PACG) and secondary glaucoma (SG) as per following diagnostic criteria [3].

1. Primary Open Angle Glaucoma was defined as IOP ≥ 21 mmHg associated with either glaucomatous optic disc abnormalities or glaucomatous visual field abnormalities or with both. The chamber angle had to be open and normal appearing by gonioscopy.
2. Normal tension Angle was defined as IOP ≤ 21 mmHg associated with either glaucomatous optic disc abnormalities or glaucomatous visual field abnormalities or with both. The chamber angle had to be open and normal appearing by gonioscopy.
3. Primary Angle Closure Glaucoma was defined as IOP ≥ 21 mmHg associated with either glaucomatous optic disc abnormalities or glaucomatous visual field abnormalities or with both, associated with one or more of the following criteria

- a. Anterior chamber angle is partially or totally closed, a very narrow angle clearly prone to occlusion
 - b. Synechiae in angle
 - c. Absence of signs of secondary angle closure
4. Secondary Glaucoma: IOP ≥ 21 mmHg associated with either glaucomatous optic disc abnormalities or glaucomatous visual field abnormalities or with both, associated with evidence secondary to other eye disorders, medical or surgical treatment or trauma.

Data was entered in MS Excel 2016 and then transferred to IBM SPSS version 24 for further analysis. The data was presented in mean (\pm SD), frequency, proportion and chi-square test was applied. P value < 0.05 was considered statistically significant.

Results

Among 331 glaucoma patients during the study period, records of 19 patients were incomplete and excluded from analysis. Records of 312 glaucoma patients were reviewed and analyzed in this study. The mean age of patients was 61.89 ± 14.4 years (range 20-96 years) and maximum number (164, 52.6%) was in age group 60-79 years (Table 1). Glaucoma was mostly seen after the age of 40 years and above which was statistically significant (Table 1). There was slight female predominance (163, 52.5%) among the participants, though the association between glaucoma and gender was not statistically significant ($P=0.363$). The mean IOP for all types of glaucoma was 16.78 ± 8.4 mmHg and CCT was 528.6 ± 35.4 μ m.

Thirteen (4.2%) patients had a family history of glaucoma. The association between all types of glaucoma and family history was statistically significant ($P<0.001$). POAG showed highest number of positive family history (6.43%). Majority of patients were POAG (173, 55.4%) followed by PACG (92, 29.5%) and SG (47, 15.1%). NTG was observed in 65 (59.6%) among patients with POAG. POAG was most common among male and PACG among female (Figure 1).

Maximum numbers of glaucoma patients were observed in Janajati (264, 84.6%) followed by Brahmin/Chhetri (36, 11.5%), Thakuri/Sanyasi (6, 1.9%), Madhesi (5, 1.6%) and Muslim (1, 0.3%). The association between all types of glaucoma and caste/ethnicity was statistically significant ($P<0.001$) (Table 1). 85 patients (27.2%) had already been diagnosed previously at other centers, whereas 227 patients (72.8%) were new diagnosis.

Discussion

Increasing age is considered as a risk factor for glaucoma. The mean age presentation was 61.89 ± 14.4 years in our study. This result was in concordance with other studies [4, 8-10]. Proportion of glaucoma was increased with increasing age beyond 40 years, which was also observed in other studies from Nepal

[3, 7], India [11] and Nigeria [12]. A population based study in Nigeria showed prevalence of glaucoma increased from 1.5% (40-49 years), 3.69% (50-59 years), 8.85% (60-69 years) and 16.85% (70-79 years) whereas it decreased to 12.32% in 80-89 years [12]. Majority of glaucoma patients were in age group 40-79 years and the proportion of glaucoma were less in age beyond 80 years in this study which was similar to a study [12].

There was no significant difference in gender. This finding was inconsistent with other studies [4, 8-10]. In some studies male predominance was seen [8, 13], on contrary some studies showed female predominant [11,14]. This difference in gender distribution may be influenced by different criteria, regional and ethnic diversity in various study groups.

The mean IOP was 16.79 ± 8.4 mmHg which was comparable to other studies [9, 15, 16]. Several large population-based studies showed disparities in the prevalence of glaucoma by race and ethnicity [17]. This study showed significant association of glaucoma with Janajati ethnicity. However, as this was a single center, hospital based study at central Nepal and presence of discernible pattern to geographical spread of different ethnic groups in Nepal [18], the definite relationship of ethnicity with a specific ethnicity is difficult to establish with this study.

Proportions of common types of glaucoma were compared with previous studies in Nepal (Table 2). The results of this study were comparable to Bhaktapur Glaucoma Study [4] and Podyal I et al [8], whereas studies by Sah RP et al [3] and Rijal AP et al [7] showed POAG as commonest, and followed by SG and PACG. The proportion of NTG among patients with POAG in the entire Asian population ranged 52%-92% [19]. The percentage of NTG among patients with POAG was 59.6% which was similar to 52% in Aravind Comprehensive Eye Survey [20] and 56% in Nigeria National Blindness and Visual Impairment Survey [12].

POAG accounts for the most common type of glaucoma in most population- based studies in Asia [19]. The Tajimi Study showed that the prevalence of POAG was the highest among the population-based studies from Asia [21]. However, studies from Myanmar [22], Mongolia [23] and Harbin, China [24] showed the prevalence of PACG higher than that of POAG. The prevalence of POAG and PACG remain disputed among different Asian populations. Such differences could be attributed to dissimilar different criteria to define glaucoma, geographic or genetic factors [9].

The goal of screening for glaucoma is to identify patients in the early stage and treat before onset of visual impairment. Implementation of screening programs for glaucoma in persons aged 40 years and above and/or family members of glaucoma patients as shown in this study would help in early identification of glaucoma. Retrospective hospital based study was the limitation of this study. In our study certain race groups showed a very small sample, which might have resulted in limitation of race /ethnic analysis. Future studies with larger population and broader geographic will help to address this issue.

Conclusion

POAG was the most common glaucoma. Proportion of glaucoma increased significantly with increasing age. Similarly family history of glaucoma was significantly associated with glaucoma. Opportunistic eye examinations and formulating screening programs focusing on people aged more than 40 years and those with family history of glaucoma will help to detect glaucoma at early stage and reduce adverse visual outcome.

List Of Abbreviations

POAG: Primary open angle glaucoma

PACG: Primary angle closure glaucoma

IOP: Intraocular pressure

NTG: Normal tension glaucoma

OCT: Optical coherence tomography

MS Excel: Microsoft Excel

IBM SPSS: IBM Statistical Package For The Social Sciences

CHEERS: Hospital for Children, Eye, ENT and Rehabilitation Services

Declarations

Ethical approval: Ethical approval was obtained from Nepal Health Research Council (NHRC Reg' no. 620/207-9) prior the study.

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Authors' contributions: NS developed the study concept and design, collected data, performed statistical analysis, interpretation of results, drafted and finalized the manuscript. SS was involved in the study design, acquisition of data and manuscript writing. DK participated in the study design, interpretation of results and manuscript preparation. AS participated in literature review, data acquisition and revised the

manuscript. BS reviewed literature, collected data and drafted manuscript. SS was involved in data acquisition, manuscript preparation and critical revision of the manuscript. RS was involved in study design, data analysis and interpretation, and revision of the manuscript. All the authors read and approved the final version of the manuscript.

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Tables

Table 1 . Demographic distribution, gender and family history with glaucoma diagnosis

		All types of glaucoma (n=312)	P-value (χ^2 test)
Age Category (years)	20-39	26 (8.39%)	< 0.001
	40-59	91 (29.35%)	
	60-79	164 (52.90%)	
	80-99	29 (9.35%)	
Gender	Male	147 (47.42%)	0.36
	Female	163 (52.58%)	
Ethnicity	Brahmin/ Chhetri	36 (11.61%)	< 0.001
	Janajati	262 (84.52%)	
	Madhesi	5 (1.61%)	
	Muslim	1 (0.32%)	
	Thakuri/ Sanyasi	6 (1.94%)	
Family history of glaucoma	Present	13 (4.2%)	< 0.001
	Absent	299 (95.8%)	

Table 2. Comparison of glaucoma diagnosis with previous Nepalese studies

Name of study	Study type	Sample size	POAG (%)	PACG (%)	SG (%)
Rijal AP (2005) (7)	Hospital based	Glaucoma patients 827	57.3	19.9	20.8
Sah RP, et al (2007) (3)	Population based	1600 screened Glaucoma patients 15	60	13.3	26.7
Podyal I, et al (2011) (8)	Hospital based	Glaucoma patients 447	38.2	32	19.4
Bhaktapur Glaucoma study (2012) (4)	Population based	3991 screened Glaucoma patients 75	68	22.7	9.3
Present study 2020	Hospital based	Glaucoma patients 331	55.4	29.5	15.1

Figures

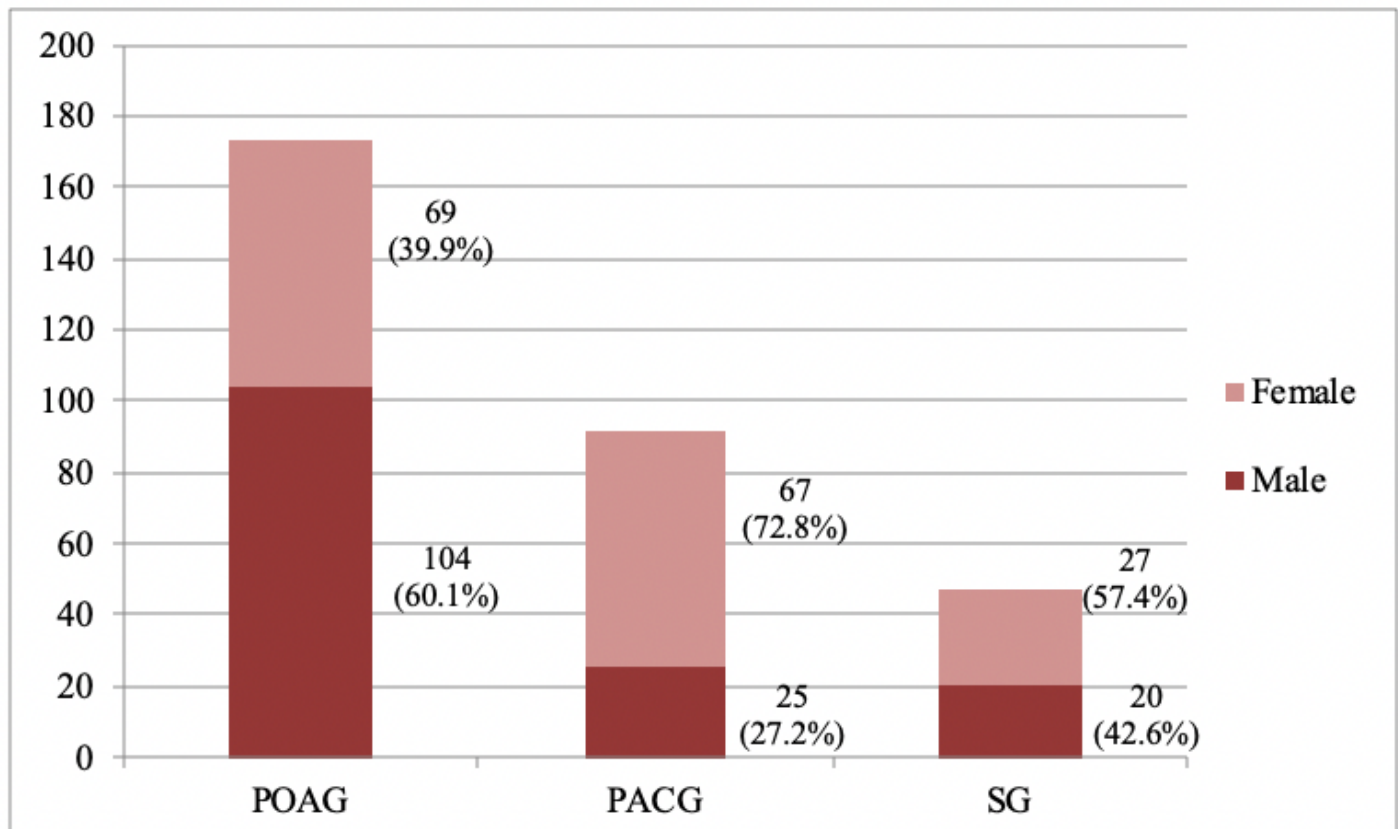


Figure 1

