ORIGINAL

Prevalence, Types and Risk factors of Glaucoma Among Patients Attending Department of Ophthalmology in a Tertiary Care Hospital: A Descriptive Cross-sectional Study

Prevalencia, tipos y factores de riesgo del glaucoma entre los pacientes que acuden al servicio de oftalmología de un hospital terciario: Un estudio descriptivo transversal

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Abstract

Background: Glaucoma is one of the leading causes of visual impairment, and blindness worldwide. Early detection of glaucoma can prevent sight threatening complications. The study was designed to find out the prevalence, and types of glaucoma among patients attending the Department of Ophthalmology in a tertiary hospital of Nepal.

Methods: A hospital-based cross-sectional study was conducted in the Department of Ophthalmology after receiving ethical approval from the institutional review board The study was conducted from 10 September 2022 to 10 March 2023. Convenience sampling was done to reach the sample size. Relevant data was entered in a proforma specified for the study. Data analysis was done using Statistical Package for the Social Sciences version 26, point estimate at 95% Confidence Interval (CI) was calculated along with frequency and proportion for binary data.

Results: Among 1140 participants, 25 (2.19%) (1.49-3.22 at 95% Confidence Interval) study subjects had glaucoma at least in one eye. Primary open angle glaucoma was much more common 10 (0.87%), followed by primary narrow angle glaucoma 9 (0.78%), and secondary glaucoma 6 (0.53%) in the study population. Primary narrow angle glaucoma was much more common in female gender. Within the diagnosed glaucoma cases 9 (36%) subjects had a positive family history.

Conclusion: The prevalence of glaucoma was higher than the recent national estimates in the current study. Primary open angle glaucoma remains the commonest type of glaucoma. First degree relative of a diagnosed case of glaucoma should be subjected for glaucoma screening.

Keywords: first degree relative, glaucoma, intraocular pressure, malignant glaucoma, optical coherence tomography.

Resumen

Antecedentes: El glaucoma es una de las principales causas de discapacidad visual y ceguera en todo el mundo. La detección precoz del glaucoma puede evitar complicaciones que pongan en peligro la visión. El estudio se diseñó para averiguar la prevalencia y los tipos de glaucoma entre los pacientes que acuden al Departamento de Oftalmología de un hospital terciario de Nepal.

Métodos: Se realizó un estudio transversal hospitalario en el Departamento de Oftalmología tras recibir la aprobación ética de la junta de revisión institucional El estudio se llevó a cabo del 10 de septiembre de 2022 al 10 de marzo de 2023. Se realizó un muestreo de conveniencia para alcanzar el tamaño de la muestra. Los datos pertinentes se introdujeron en un formulario específico para el estudio. Los datos se analizaron con el paquete estadístico SPSS 26. y se calculó la estimación puntual con un intervalo de confianza (IC) del 95%, así como la frecuencia y la proporción de los datos binarios.

Resultados: Entre los 1140 participantes, 25 (2,19%) (1,49-3,22 en el Intervalo de Confianza del 95%) sujetos de estudio tenían glaucoma al menos en un ojo. El glaucoma primario de ángulo abierto era mucho más frecuente 10 (0,87%), seguido del glaucoma primario de ángulo estrecho 9 (0,78%) y el glaucoma secundario 6 (0,53%) en la población del estudio. El glaucoma primario de ángulo estrecho era mucho más frecuente en el sexo femenino. Dentro de los casos de glaucoma diagnosticados, 9 (36%) de los sujetos tenían antecedentes familiares positivos.

Conclusiones: La prevalencia del glaucoma fue superior a las estimaciones nacionales recientes en el estudio actual. El glaucoma primario de ángulo abierto sigue siendo el tipo de glaucoma más frecuente. Los familiares de primer grado de un caso diagnosticado de glaucoma deberían someterse a un cribado de glaucoma.

Palabras clave: familiar de primer grado, glaucoma, presión intraocular, glaucoma maligno, tomografía de coherencia óptica.

Introduction

Glaucoma is one of the leading causes of irreversible blindness worldwide, and is associ¬ated with a reduced quality of life[1]. Various notable risk factors of glaucoma have been identified which include age, gender, genetics, family history, smoking, race, systemic hypotension and hypertension, vasospasm, use of systemic or topical steroids, obstructive sleep apnea and most significantly raised intraocular pressure (IOP)[2-4].

An estimated global prevalence of glaucoma is 3.54%, with the highest prevalence in Africa. The number of people with glaucoma worldwide (aged 40-80 years) is expected to rise from 64.3 million in 2013 to 111.8 million in 2040, more frequent in populations residing in Asia and Africa[5].

There are studies on glaucoma from various parts of Nepal; however; the data is limited and varies. This study aimed to determine the prevalence and types of glaucoma among patients attending the Department of Ophthalmology in a tertiary care hospital of central Nepal.

Methods

This hospital based descriptive, cross-sectional study was conducted in the outpatient Department (OPD) of Ophthalmology of Chitwan Medical College (CMC) Teaching Hospital, from 10 September 2022 to 25 February 2023. Ethical approval was obtained from the Institutional Review Committee (**Ref: CMC-IRC/079/080-053**). An informed consent was obtained from the study subjects. A convenient sampling was done to enroll the participants during the study.

The sample size was calculated using the formula as given in the following table.

n = (Z² × p × q) / e²	
= (1.96² × 0.019 × 0.981) / 0.025²	
= 115	
Where,	
n = required sample size,	
Z = 1.96 at 95% Confidence Interval (CI),	
p = prevalence of glaucoma reported by a similar study from Nepal, 1.90%[4]	
q = 1-p	
e = margin of error, 2.5%	
Required sample size	**115**

$$n = (Z^2 \times p \times q) / e^2$$
$$= (1.96^2 \times 0.019 \times 0.981) / 0.025^2$$
$$= 115$$

As convenience sampling was done, the sample size was doubled to 230. Considering the non-respondent rate of 10%, the total sample size becomes 253. However, our study included 1140 study participants during the study period. All study subjects who are more than 30 years of age, glaucoma suspect study participants were enrolled in the study. Patients over 85 years of age, study subjects not providing informed consent, patients with systemic chronic debilitating illnesses were excluded from the study.

All the study participants underwent a thorough ocular examination including visual acuity testing, refraction when needed, slit lamp biomicroscopy including detailed anterior segment examination and posterior segment examination. A detailed retina evaluation, including the optic disc examination was carried out in study participants with clear media. If a mydriasis was needed to complete the examination, Tropicamide 0,8 or 1 % and Phenylephrine 2,5 % were used

Patients needing further examinations and tests were subjected for intraocular pressure measurement using Schiotz tonometry, and pulsair tonometer, Goldman applanation tonometer was used to confirm the intraocular pressure besides visual field examination, fundus photography, gonioscopy, and Optical coherence tomography (OCT) when and where required. In addition, phasing and water drinking tests were performed in cases to help confirm the diagnosis of normal tension glaucoma (NTG). This test was performed following a quick baseline IOP measurement a litre of sterile water was given to the patient early morning and IOP was measured every 15 minutes till the IOP starts declining. The highest IOP recorded was taken as the IOP for that study subjects. A glaucoma specialist, and a retina specialist examined the suspected study subjects to confirm the diagnosis of glaucoma and further management. Data was collected using a form designed for the study. Statistical analysis was done in SPSS version 26. Interobserver agreement of Kappa was taken as a reliability tool, and to validate the findings, a Kappa value more than 0.8 was considered complete agreement between the examiners. The statistical methods used were frequencies, percentages, mean, and standard deviation. Any p value less than 0.05 was considered significant when applicable.

Results

Among 1140 participants, of the 2280 eyes examined, 25 (2.19%) (1.49-3.22 at 95% Confidence Interval) study subjects had glaucoma at least in one eye. Primary open angle glaucoma was the commonest 10 (0.87%), followed by primary narrow angle glaucoma in nine (0.78%), and secondary glaucoma in six (0.53%) study participants of all the study subjects (**Table I**).

Nine (36%) study subjects in the study population were overweight or obese, 10 (40%) subjects consumed alcohol, 11 (44%) used tobacco, only four (16%) study subjects were aware about glaucoma, whereas nine (36%) study subjects gave a positive family history of glaucoma. Only four (16%) study subjects experienced Raynaud's phenomenon, 21 (84%) study subjects were either diabetic or a hypertensive as summarized in **table II**.

Table I: Prevalence and types of glaucoma in the study subjects (n=25).

Types of glaucoma in the study population		n	%
Primary open angle glaucoma	Primary open angle glaucoma	04	16.00
	Normal tension glaucoma	01	4.00
	End stage open angle glaucoma	02	8.00
	Chronic open angle glaucoma	03	12.00
Primary narrow angle glaucomas	Primary angle closure glaucoma	06	24.00
	Acute congestive glaucoma	03	12.00
Secondary glaucomas	Steroid induced glaucoma	02	8.00
	Neovascular glaucoma	02	8.00
	Malignant glaucoma	01	4.00)
	Other types of glaucoma	01	4.00)
Total		**25**	**100**

Table II: Patient related clinical characteristics (n=25).

Variables	n	%
Body mass index (BMI) of the study subjects with glaucoma		
Overweight study subjects	08	32.00
Obese study subject	01	4.00
Alcohol consumption status of the study subjects		
Social	06	24.00
Regular	03	12.00
Alcohol addiction	01	4.00
Tobacco use by the study subjects		
Study subjects who use tobacco	11	44.00
Awareness on glaucoma		
Aware about glaucoma	04	16.00
Unaware about glaucoma	21	84.00
Family history of glaucoma		
First degree relative with glaucoma	09	36.00
First degree relatives not yet diagnosed as glaucoma patients	16	64.00
Chronic problems in the study subjects		
Diabetes mellitus	07	28.00
Hypertension	14	56.00
Myopia	04	16.00
Pseudophakia	13	52.00
Raynaud's phenomenon	04	16.00
Total	**25**	**100**

Table III: Clinical and investigative findings in the study subjects (n=25).

Variables	n	%
Impaired visual acuity at presentation	12	48.00
Presence of corneal edema	06	24.00
Rubeosis iridis (iris neovascularization)	03	12.00
Vertically oval fixed pupil	05	20.00
Relative afferent pupillary defect/afferent pupillary defect	06	24.00
Raised intraocular pressure	20	80.00
Optic disc changes/findings in the study subjects with glaucoma (n=25)		
Optic disc notch (Inferotemporal)	01	4.00
Glaucomatous optic disc cupping	06	24.00
Hyperemic optic disc	08	32.00
Crowded small optic disc	01	4.00
Splinter hemorrhage	01	4.00
Peripapillary changes	01	4.00
Glaucomatous optic disc atrophy	05	20.00
Optic disc could not be visualized	02	8.00
Total	**25**	**100**
Gonioscopy findings in the study subjects (n=25)		
Open angle	16	64.00
Occludable or closed angle	09	36.00
Visual fields finding in the study subjects (n=25)		
Borderline visual field defects	07	28.00
Glaucomatous visual field defects	07	28.00
Could not be assessed	06	24.00
Normal visual field findings	05	20.00
OCT findings suggestive of glaucoma in the study subjects	12	48.00
Total	**25**	**100**

Table IV: Demographic profile of the study subjects (n=25).

Age group of the study subjects	n	%
Study subjects less than fifty years of age	04	16.00
Study subjects more than fifty years of age	21	84.00
Gender distribution of the study subjects		
Male	12	48.00
Female	13	52.00
Geographical representation by the study subjects		
Urban Nepal	20	80.00
Rural areas	05	20.00
Occupation of the study subjects		
Agriculture	05	20.00
Retired	10	40.00
Other occupation	10	40.00
Educational background of the study subjects		
Literate	18	72.00
Illiterate	07	28.00
Total	**25**	**100**

Impaired visual acuity 12 (48%) was a significant presenting complaint in the study subjects, corneal edema was present in six (24%), neovascularization in the iris in three (12%), pupillary defect in 11 (44%), hyperemic optic disc in eight (32%), and 16 (64%) study subjects had open angle while doing a gonioscopy procedure (**Table III**).

Mean age of presentation of the study subjects was 61.64±12.78 years. Twenty-one (84%) of the study subjects with glaucoma were above 50 years of age group. Females just outnumbered the males 13 (52%), and 12 (48%) respectively, however Females outnumbered the males by more than three times in primary angle closure glaucoma group seven (28%), and two (8%) respectively. Majority of the study subjects 20 (80%) represented urban geographic area. Occupation wise retired, and other occupation was common 10 (40%) each among the study subjects with glaucoma. Majority of the study subjects 18 (72%) were literate (**Table IV**).

Discussion

Among 1140 study participants in 2280 eyes examined the overall prevalence of glaucoma was 2.19% in the present study. The prevalence of primary open-angle glaucoma was higher (0.87%) than that of primary narrow-angle glaucoma (0.78%) or secondary glaucoma (0.53%) in the current study.

In different studies from Nepal and elsewhere, the overall prevalence of glaucoma were 1.90%, 0.93%, and 1.92%[3,4,6] in our study the overall prevalence of glaucoma was higher. The global prevalence of glaucoma is estimated at 3.54%[5] which is much higher than our study estimates.

The drop in the prevalence of glaucoma in Nepal is due to the efforts of the eye care sector of Nepal to reduce the preventable and treatable causes of blindness for the last four decades. The higher prevalence of glaucoma in the current study when compared to recent national estimates[4,6] could be attributed to this study being done in a tertiary care hospital where mostly the needy patients visit, improved hospital-seeking behavior of the patients, skilled human resources, infrastructure to detect glaucoma early, and a proper referral channel to establish a diagnosis and management. Primary open-angle glaucoma is the most common kind of glaucoma in the current study, followed by primary angle closure, and secondary glaucoma in concordance with other studies from Nepal, and elsewhere[3,4,7].

Various known patient-related risk factors were explored and observed in the present study. The 84% of study subjects with chronic systemic problems, like diabetes or hypertension, 84% of glaucoma patients over the age of 50 years of age, 16% of study subjects with a history of Raynaud's phenomenon, 40% study subjects consuming alcohol and only 44% study subjects consuming tobacco is also in accordance with findings across the globe[8-12].

In the present study obesity were explored as a risk factor, the as a potential risk to developing glaucoma, in our findings 36% of the study subjects were overweight or obese. This high rate, as in other studies,[13] allows us to warn of the potential increased risk of open-angle glaucoma in young adults in the future.

In the current study, only four (16%) study subjects were aware of glaucoma, which was slightly higher than in a study from Nepal[14]. This could be attributed to the type of study population, and their level of education. Nine (36%) study subjects' first-degree relatives had been diagnosed with glaucoma in the family this finding of the study did not correlate with a study finding from Nepal. Nevertheless, this finding emphasized the importance of screening for glaucoma in first-degree relatives of a glaucoma patient.

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The causes of visual acuity in the study subjects were, 12 (48%), corneal edema in six (24%), neovascularization in the iris in three (12%), pupillary defect in 11 (44%), raised intraocular pressure in 20 (80%), hyperemic optic disc in eight (32%) which are in accordance with other studies[4-8].

In the current study the mean age of diagnosis for glaucoma was above 50 years of age 61.64±12 this finding was comparable to many studies from Nepal and elsewhere further reemphasizing that the prevalence of glaucoma rises with increasing age, especially after the age of 50 years[4-6,11-14]. In the present study, females outnumbered the males by more than three times in primary angle closure glaucoma group seven (28%), and two (8%) in agreement with a study from Nepal and elsewhere establishing that narrow angle glaucomas are more common in females[4].

In the current study majority of the study subjects 20 (80%) represented urban geographic area this could be contributed to the fact the study hospital itself lies in an urban location. In the current study majority of the study subjects 18 (72%) were literate but only four (16%) of them were aware about glaucoma this was an interesting finding in the study which also highlighted the need of health education regarding glaucoma and eye care in all levels eye health care in Nepal.

Conclusions

The prevalence of primary open-angle glaucoma is higher (0.87%) than that of primary narrow-angle glaucoma (0.78%) or secondary glaucoma (0.53%), and primary open angle glaucoma is the most common kind of glaucoma. The drop in the prevalence of glaucoma in Nepal is due to the efforts of the eye care sector of Nepal to reduce the preventable and treatable causes of blindness for the last four decades. The known patient related risk factors like age, gender, systemic chronic illnesses, alcohol consumption, and tobacco use, Raynaud's phenomenon remain the same. Obesity can be a confounding risk to develop primary open-angle glaucoma in young adults, and can be explored further. Awareness regarding glaucoma (16%) remains still very low despite increasing literacy levels (72%). Visual impairment, and blindness in glaucoma subjects is attributed to various causes.

Conflict of interest
None.

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