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*Original Article*

# Referral parameters for diagnosis of glaucoma in general eye clinic at Tilganga Institute of Ophthalmology

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## Abstract

**Objective:** To find out the most common referral parameter among the glaucoma suspects patients from general eye clinic and to establish glaucoma diagnosis.

**Methods:** This study is a retrospective cohort hospital based study. Two hundred patients from January to February 2017 sent to glaucoma clinic as glaucoma suspects were re-evaluated meticulously by glaucoma specialist and were diagnosed as glaucoma, non glaucoma, suspects and ocular hypertension.

**Results:** Out **of** the 200 patients referred to glaucoma clinic as glaucoma suspects only 19% were diagnosed to have glaucoma. The mean age at which glaucoma diagnosed was 55.29(14.4) compared to 41.6(15.1) in normal group. One hundred and sixty five patients were referred on the basis of suspicious optic nerve head, among them 14.5% (24/165) had glaucoma. This study showed that, open angle glaucoma (OAG) 28.9% was the most common type of total glaucoma diagnosed. The mean vertical cup disc ratio in the OAG group was $0.69 \pm 0.1$ (0.4 -0.9) compared to $0.56 \pm 0.11$((0.2-0.8) (p=0.00) normal. The mean intra ocular pressure (IOP) in OAG group was $19.73 \pm 4.95$(11-32) mmHg compared to $16.74 \pm 3.36$(10-30) mmHg (p=0.00) in normal group. The mean central corneal thickness (CCT) in OAG group was $533.05 \pm 31.24 \mu m$ (467 -606) compared to normal was $534.9 \pm 33.6 \mu m$ (432-696) (p=0.670).

**Conclusions:** Suspicious optic nerve head is the most common referral parameter between the general ophthalmologist and residents, but this study shows only few of them were diagnosed with glaucoma. This gives us a clue that the ophthalmologists and residents are to be trained better to help them identify the signs of glaucoma on the optic nerve head beside its size, which will reduce unnecessary burden to the resources of patients and hospital.

**Key words:** Open angle glaucoma, primary open angle glaucoma, central corneal thickness, intra ocular pressure

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## Introduction

Glaucoma is the disease of optic nerve head, which causes progressive, painless, irreversible blindness. It is the second common cause of irreversible blindness in the world as mentioned by Quigely et al, 2006 and is the fifth common cause of blindness in Nepal as

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shown in survey by Brilliant et al, 1988. Since open angle glaucoma is symptomless, those affected seek hospital in advanced stage, due to poor awareness of the disease.

Due to the geographical challenges in developing country like Nepal, there is increasing burden on the hospital eye services so we need major modifications for detection and care of glaucoma diseases. There are few numbers of glaucoma specialists in Nepal and general ophthalmologists and residents make most of the referrals for glaucoma. These days ophthalmologist are very cautious about glaucoma and we are aware that if not detected early, it can cause irreversible damage to patients' sight. So, if any patient has clinical findings suggestive of glaucoma are hence referred to glaucoma clinic for detailed evaluation by a glaucoma specialist. This way the disease is at times over diagnosed and patients with no glaucoma have to spend their time and resources without any benefit. Therefore, we conducted this study to look at the common referral parameters for suspicion of glaucoma by the general ophthalmologists and residents. We want to make the baseline referral parameters for a patient with glaucoma suspect. This in turn, can help us in training the general ophthalmologist and residents and enhance their skills in diagnosing disease.

**Method**

Data of all the patients referred from general clinic to Glaucoma clinic in the months of January 2017 and February 2017 were collected from record department of Tilganga Institute of Ophthalmology. Proforma was used to collect the data of each participant examined in glaucoma clinic of Tilganga Institute of Ophthalmology by glaucoma specialist. Patients were examined in general clinic with detailed anterior segment examination under slit lamp bio microscope, intra ocular pressure (IOP) by Goldman applanation tonometer and dilated fundus examination was recorded

and referred to Glaucoma department with diagnosis of glaucoma suspect.

In Glaucoma clinic those patients were re-examined in detail by Glaucoma specialist, using slit lamp bio microscope Haag Streit BP 900 (Switzerland). Grading of peripheral anterior chamber depth was done by using Van Harrick's grading system. Intra ocular pressure was measured with Goldman applanation tonometer. Gonioscopy was done by indirect gonioscopy using Volk four mirror gonio lenses. Dilated fundus examination was done with Volk 90 diaptore lens. Cup disc ratio (CDR) and neuro retinal rim details were recorded.

Pachymetry, Sonogage (Cleveland, OH 44128 USA) was used to measure central corneal thickness (CCT). Ancillary tests like disc photo (DP), Humphrey visual field (HVF), ocular coherence tomography (OCT) was ordered as per clinician's decision.

Information collected from the recorded performa included, person referring, patient age, intraocular pressure (IOP), optic disc details and central corneal thickness (CCT) at the first visit in the glaucoma department of TIO. The data on subjective assessment of whether the optic disc findings were distinctly glaucomatous (that is focal or concentric neuro retinal rim loss and/or greater than 0.2 difference in cup disc ratio between two eyes with symmetrical disc diameters), distinctly non-glaucomatous (healthy neuro retinal rim with cup disc ratio less than 0.7) or of uncertain status was documented. The recorded subjective assessment of the visual field was done if available as: characteristically glaucomatous (if it had paracentral, arcuate, ring, nasal step, or end stage defect), non-glaucomatous (including characteristic of other pathology, particularly central neurological disease) or uncertain (unreliable). Further the presence of any other ocular pathologies mentioned were noted.

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A provisional diagnosis was made on the basis of information available by the initial assessment in the department of glaucoma taking reference from Bhaktapur glaucoma study (Thapa SS et al, 2013)

1.  **Open angle glaucoma:** Presence of open anterior chamber angles IOP > 21 mmHg with characteristic optic disc and/or visual field changes, participants were diagnosed to have primary open angle glaucoma, if one or both eyes met any of the criteria mentioned below

    a)  VCDR of 0.7 or greater or asymmetry between two eyes of 0.2 or more, and a visual field defect consistent with glaucoma.

    b)  VCDR of 0.9 or greater in either eye or asymmetry between two eyes of 0.3 or more, when reliable field test result could not be obtained.

2.  **Glaucoma suspect**: A provisional diagnosis of glaucoma suspect was made when the subject had one or more of the following: IOP ≥ 21 mmHg in either eye; VCDR ≥ 0.7 in either eye or CDR asymmetry ≥ 0.2; and focal thinning, notching or splinter hemorrhage.

3.  **Primary angle closure suspects (PACS):** An eye in which posterior trabecular meshwork is not seen in at least 180 degrees on non indentation gonioscopy; PAC, an eye with PACS and peripheral anterior synechiae and/or elevated IOP without glaucomatous damage of optic disc.

4.  **Primary angle closure glaucoma (PACG):** PACS with evidence of glaucoma.

5.  **Ocular hypertension (OHT):** IOP≥21 mmHg without visual field or optic disc abnormalities in the absence of an occludable chamber angle and no signs of secondary glaucoma.

6.  **Chronic angle closure glaucoma (CACG):** Eyes with raised IOP, peripheral anterior synechiae on gonioscopy and optic disc changes in absence of signs of acute angle closure. (AAO Glaucoma Edition 2013)

7.  **Shallow AC:** Eyes, which had peripheral anterior chamber depth of VH (Van Harrick) grade II or less

This study was approved by the Institutional Review Committee of the Tilganga Institute of Ophthalmology (TIO) and conducted in accordance with the Declaration of Helsinki and its subsequent revisions.

Data analysis was done in SPSS version 20. For categorical data, chi square /Fisher Exact test was used. For continuous nature of the data, Independent T test / Mann Whitney U test was used wherever applicable. The difference was considered as significant at 5% level of significance ($p<0.05$).

## Results

### Demography

Our study included 399 eyes of 200 patients (one patient had leucomatous corneal scar in one eye), who were referred as glaucoma suspects to the glaucoma clinic over the period of two months. The mean age in our study was 44.28 ± 15.8 among them 52% were male and 48% were females. The mean vertical cup disc ratio in this study was 0.58 ±0.12 (0.2-0.9). The mean intraocular pressure (IOP) in our study group was 17.42± 4.61 mmHg (10- 58). The mean central corneal thickness (CCT) in this study was 534.84 ±33.12μm (432-696).

### Glaucoma diagnosis and basis of referral

In 19% (38/200 subjects) of the patient referred to the glaucoma clinic were diagnosed with glaucoma and 81% were normal. The mean age of glaucoma diagnosis was 55.3± 14.45 compared to the normal patient which was 44.69 ± 15.12. There was increase in prevalence of glaucoma with increase in age compared to reference age group <40 an odds ratio (OR)

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of 4.7 (CI 1.86-11.91, P=0.00) was observed in age group ≥40 years.The most common parameter for referral to glaucoma clinic from the general ophthalmologists and residents as a glaucoma suspect was suspicious optic nerve head. Out of total 85.5 % (165 /200) patients referred as glaucoma suspect on the basis of suspicious optic nerve head, 14.5% (24/165) were diagnosed with glaucoma. Out of total 15 (15 /200) patients referred as glaucoma suspect on the basis of shallow anterior chamber, 40% (6/15) were diagnosed with glaucoma. Out of total 20 (20 /200) patients referred as glaucoma suspect on the basis of raised IOP 40% (8/20) were diagnosed with glaucoma (Table 2).

**Open angle glaucoma**

The most common subtype of glaucoma diagnosed in our study was open angle glaucoma 28.9% of the total glaucoma diagnosis. The mean vertical cup disc ratio in the open angle glaucoma was 0.69±0.1 (0.4 -0.9). The mean IOP in this group was 19.73 was ±4.95 (11-32) mmHg. Study showed that the mean central corneal thickness (CCT) in this group was 533.05 ± 31.24µm (467 -606).

In our study out of 200 participants referred to glaucoma clinic as glaucoma suspects only 38 were diagnosed with glaucoma diseases. Of the total participants 9% were diagnosed with open angle glaucoma, 5.5% with primary open angle glaucoma (Figure 1).

Among the patients who were diagnosed with glaucoma (n=38), 47.4% had open angle glaucoma and 28.9% had primary open angle glaucoma.

This study showed 74% of the referrals were made by ophthalmologists.

In this study 57.9% of subjects were from outside Kathmandu valley.

**Table 1: Descriptive statistics VCDR= vertical cup disc ratio, IOP= intra ocular pressure, CCT= central corneal thickness, BE= both eyes.**

|         | VCDR BE | IOP BE mmHg | CCT BE µm |
|---------|---------|-------------|-----------|
| N       | 399     | 399         | 395       |
| Mean    | 0.58    | 17.42       | 534.84    |
| SD      | 0.12    | 4.61        | 33.12     |
| Minimum | 0.20    | 10          | 432       |
| Maximum | 0.90    | 58          | 696       |

**Table 2: Presence of Glaucoma in different referral parameters, IOP = intra ocular pressure, AC = anterior chamber, ONH = optic nerve head**

|          |          | Basis of Referral | | | | | | | |
|----------|----------|-----------|--------|-----------|--------|----------------|--------|-------|--------|
|          |          | Raised IOP | | Shallow AC | | Suspicious ONH | | Total | |
|          |          | Count | % | Count | % | Count | % | Count | % |
| Glaucoma | Presence | 8 | 40.0% | 6 | 40.0% | 24 | 14.5% | 38 | 19.0% |
|          | Absence  | 12 | 60.0% | 9 | 60.0% | 141 | 85.5% | 162 | 81.0% |
|          | Total    | 20 | 100.0% | 15 | 100.0% | 165 | 100.0% | 200 | 100.0% |

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**Table 3: Different subtypes of glaucoma**

| | | Percent prevalence (200) | | No of morbidities (38) | |
|---|---|---|---|---|---|
| | | Count | % | Count | % |
| Diagnosis | CACG | 1 | 0.5% | 1 | 2.6% |
| | OAG | 18 | 9.0% | 18 | 47.4% |
| | OHT | 1 | 0.5% | 1 | 2.6% |
| | PACG | 2 | 1.0% | 2 | 5.3% |
| | PACS | 4 | 2.0% | 4 | 10.5% |
| | Pigment Dispersion Glaucoma | 1 | 0.5% | 1 | 2.6% |
| | POAG | 11 | 5.5% | 11 | 28.9% |
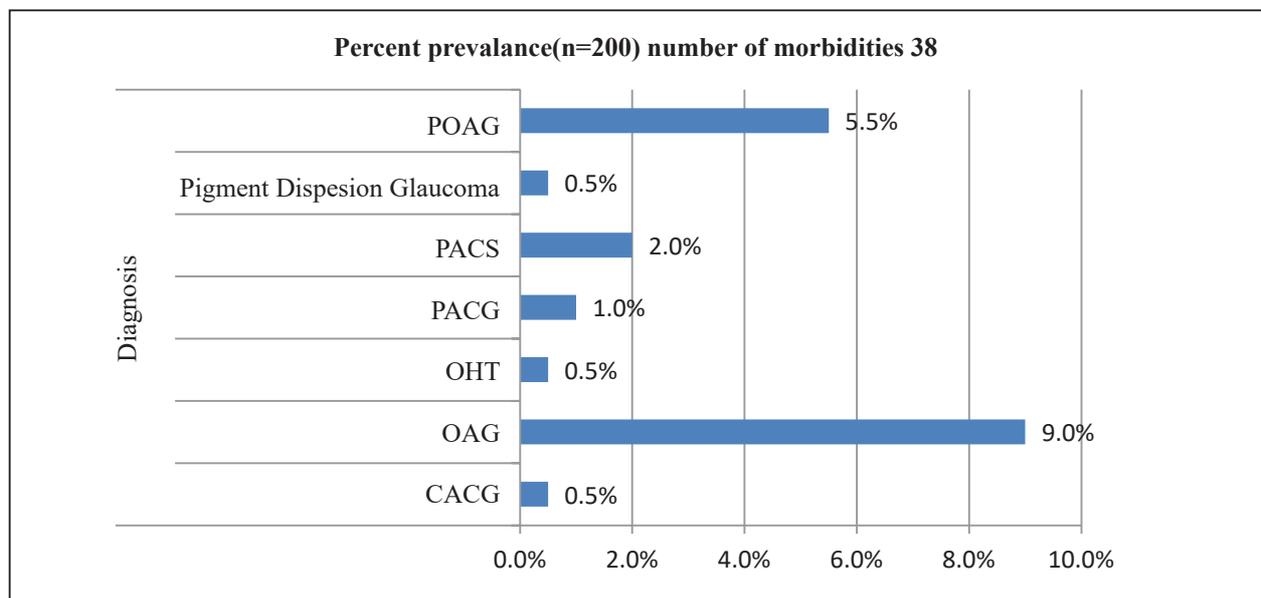


**Figure 1:** Subtypes of glaucoma. POAG = primary open angle glaucoma, PACS = primary angle closure suspects, PACG = primary angle closure glaucoma, OHT = ocular hypertension, OAG = open angle glaucoma, CACG = chronic angle closure glaucoma
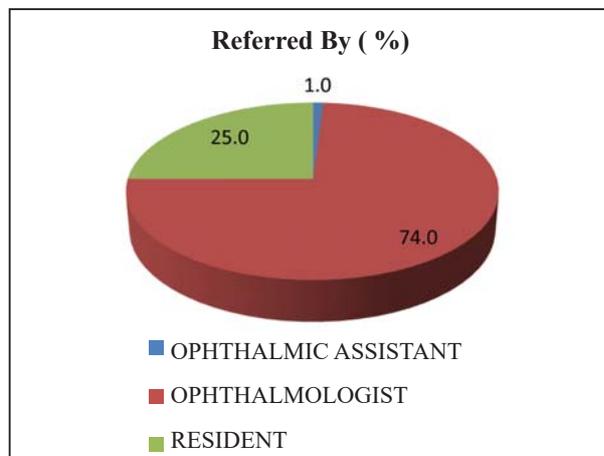


**Figure 2:** Percentage of source of referrals
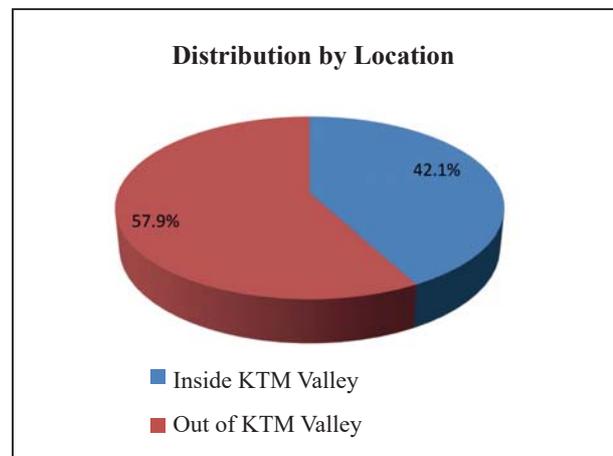


**Figure 3:** Distribution of participants by location

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**Discussion**

Glaucoma if not detected early, it can cause irreversible damage to patients' sight (Quigley HA et al 2006). Most of the referrals to glaucoma specialist for glaucoma are initiated by general ophthalmologists and residents. Glaucoma diagnosis involves an assessment of structural changes in the optic nerve head, functional visual loss by visual field testing, and measurement of intraocular pressure (IOP). The choice of test is important to differentiate between missed cases and false positives. This study is first of its type as we analyzed common referral parameters in glaucoma suspects by general ophthalmologists and residents to the glaucoma clinic at a tertiary eye care centre.

In our study 19% were diagnosed to have glaucoma out of the total number of glaucoma suspects. Results are similar to the study done in 1999 (Julia Theodossiades et al) and 2008 (R. W. D. Bell et al). Our study is different from other studies in literature as the referrals were initiated by ophthalmologists.

In this study we found that there was an increase in the prevalence of glaucoma with the increasing age. The mean age at which glaucoma was diagnosed was 55.29 years. The results of our study are comparable to the results of Bhaktapur glaucoma study (Thapa SS et al 2013).

An assessment of reasons (positive findings) for referral in our study demonstrates that the majority of referrals are on the basis of suspicious optic nerve, out of which 14.5% were diagnosed with glaucoma on the basis of suspicious optic nerve head which concludes that suspicious optic nerve head is an important screening tool in glaucoma diagnosis.

In this study the mean vertical cup disc ratio in the glaucoma diagnosis group was 0.69 compared to 0.56 which is similar to the results of Bhaktapur glaucoma study which states that the VCDR above 0.6 should be looked into with suspicion (Thapa SS et al 2013).

The mean IOP in open angle group in our study was 19.73 mmHg (4.61), which is higher than the median IOP found in (Bhaktapur Glaucoma Study, 2013) which was 13mmHg and Chennai glaucoma study (Ronnie George et al, 2010) 16.35 mmHg.

In our study the most common type of glaucoma was open angle glaucoma i.e. 28.9% out of total glaucoma diagnosis. Open-angle glaucoma is the most common form (Quigley HA et al 2006).

Glaucoma is the leading cause of irreversible blindness worldwide and open-angle glaucoma is the most common form and late detection is the major risk factors for developing blindness (Quigley HA et al 2006). Careful clinical evaluation of optic nerve head could help in early diagnosis of glaucoma and its correlation with intra ocular pressure and other functional tests could decrease the false positive diagnosis of glaucoma as proper recognition may spare the patients from unnecessary testing and would decrease the load at the glaucoma clinics.

**Conclusion**

In our study, suspicious optic nerve head was of the most common parameters for diagnosis of glaucoma, which gives us a clue that the general ophthalmologists and residents are to be trained better to identify the signs of glaucoma on the optic nerve head. A test of low specificity can overburden the health service with people who do not have glaucoma and cause unnecessary burden to patients' resources and on the other hand a test of low sensitivity would miss treatable diseases, which might be unacceptable to society. Hence we need to provide more training of ophthalmologist and residents in regards to the diagnosis of glaucoma.

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