



**ORIGINAL RESEARCH PAPER**

**Ophthalmology**

**TO STUDY THE CAUSES OF SECONDARY GLAUCOMA IN PATIENTS VISITING TERTIARY EYE CARE CENTRE**

**KEY WORDS:**

**Shailjaa Nilesh Shah**

Ms Ophthalmology, N.h.l. Municipal Medical College

**Sonakshi Manohar Gajwani**

3rd Year Resident, Ms Ophthalmology, N.h.l. Municipal Medical College

**Reema Raval**

Ms And Dnb Ophthalmology, Professor And Head Of Glaucoma And Strabismus Department, Shri C.h. Nagri Eye Hospital, Smt. N.h.l. Medical College, Ahmedabad.

**Sakshi Manohar Gajwani**

3rd Year Resident, Ms Ophthalmology, N.h.l. Municipal Medical College

**Kintu Shah\***

Ms Ophthalmology, Associate Professor H.g. Shri C.h.nagri Eye Hospital, Smt. N.h.l. Medical College, Ahmedabad \*Corresponding Author

**ABSTRACT**

**Introduction:** Secondary glaucoma is a group of disorders in which there is a rise in Intraocular pressure due to an existing ocular or systemic disorder. The causes of secondary glaucoma are multiple, and most patients may not present in the early stage of the disease. Presentation in an advanced stage may be with poor vision, redness, pain, high IOP and even glaucomatous optic atrophy. Early identification and treatment of these causes is important to prevent the burden of blindness due to secondary glaucoma. **Methods:** A total number of 102 patients diagnosed with secondary glaucoma and above 12 years of age, visiting Ophthalmology out-patient department have been taken for the study after obtaining written consent. Detailed history and comprehensive eye examination was done. **Results:** In this study, 24.50% cases had silicon oil induced glaucoma, 9.80% cases had steroid induced glaucoma, 31.37% had pseudoexfoliation glaucoma, 1.96% had phacomorphic glaucoma, 2.94% had glaucoma secondary to uveitis, 2.94% had angle recession glaucoma, 0.98% the cause was malignant glaucoma, 13.72% had neovascular glaucoma, 3.92% cases had ICE syndrome, 3.92% cases were post cataract surgery and 3.92% were post keratoplasty surgery. **Conclusion:** Our study found Pseudo exfoliation glaucoma to be the most common cause of secondary glaucoma, followed by silicon oil induced glaucoma. An early comprehensive examination and treatment of patients having raised IOP with pre-existing ocular comorbidities can help reduce the burden of blindness.

**INTRODUCTION**

Glaucoma is one of the leading causes of irreversible blindness worldwide. It is defined as a group of ocular disorders, with multi-factorial aetiology, having characteristic progressive optic neuropathy. It comprises of either focal or generalized thinning of the neuro-retinal rim with excavation and enlargement of the optic cup. This represents the neurodegeneration of retinal ganglion cell axons. The visual acuity may be spared initially, while progression can lead to complete loss of vision(1).

**Secondary glaucoma:** is a group of disorders in which there is a rise in IOP with an existing ocular or systemic disorder. They can be divided according to the mechanism of the rise in IOP:

**Secondary Open-angle glaucoma (SOAG):** It refers to a type of glaucoma with an open-angle, with elevated IOP and a clinically evident cause of rise in IOP.

**Secondary Angle-closure glaucoma (SACG):** It is a type of glaucoma with irido-trabecular contact not from any form of anatomical predisposition but another pathological mechanism that leads to a rise in IOP.(1)

The causes of secondary glaucoma are multiple, and most patients may not present in the early stages of the disease. An advanced stage presentation may be with poor vision, redness, pain, high IOP and even glaucomatous optic atrophy. Early identification and treatment of these causes is important to prevent the burden of blindness due to secondary glaucoma(2),(3).

**Aims and objectives**

To study the varying spectrum of secondary glaucoma in patients visiting tertiary eye care centre

**Methodology**

This study is a Cross-sectional study conducted in tertiary eye care centre in Western India between December 2020–2022, after receiving the approval from the Institutional Review Board.

A total number of 102 patients diagnosed with secondary glaucoma and above 12 years of age, visiting Ophthalmology out-patient department have been taken for the study after obtaining written consent. All diagnosed cases of primary open angle glaucoma or primary angle closure glaucoma were excluded from the study.

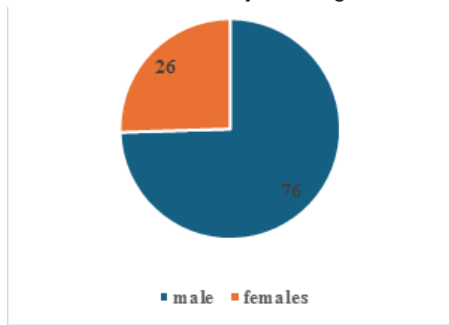
Detailed history and comprehensive eye examination was done of all patients which included: visual acuity, slit lamp examination, intraocular pressure (by applanation tonometry), pachymetry, gonioscopy, cup-disc ratio evaluation, perimetry.

**RESULTS**

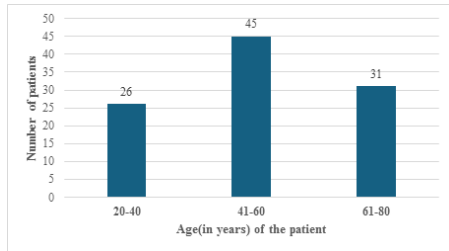
In this study it has been observed that out of 102 patients, 76 patients (74.50%) were males whereas 26 patients (25.49%) were females.

A total of 26 patients (25.49%) were between the age group of 20-40 years, 45 patients (44.11%) between 41-60 years and 31 patients (30.39%) between 61-80 years. Maximum patients

were found to be between 41-60 years of age.



**Graph 1:** Gender distribution among patients of secondary glaucoma



**Graph 2:** Age distribution among patients of secondary glaucoma

This study showed that 41 (40.19%) patients had IOP <30 mm of mercury and 61 (59.80%) patients had IOP ≥30 mm of mercury.

**Table 1: Representing IOP distribution among patients of secondary glaucoma**

Intraocular pressure (mm of mercury)	Frequency	Percent (%)
<30	41	40.19
≥30	61	59.80

The number of patients having systemic illness was found to be 38 patients (37.25%) and 64 patients (62.74%) had no history of systemic illness. Hypertension was found in 27 patients (26.47%), 13 patients had diabetes mellitus (12.74%), 1 patient (0.98%) had asthma, chronic kidney disease was present in 1 patient (0.98%), arthritis was found in 1 patient (0.98%) and hypothyroidism was present in 1 patient (0.98%).

**Table 2: Systemic co-morbidities among patients of secondary glaucoma**

Systemic illness	Frequency	Percent (%)
Hypertension	27	26.47
Diabetes mellitus	13	12.74
Asthma	1	0.98
CKD	1	0.98
Arthritis	1	0.98
Hypothyroidism	1	0.98
None	64	62.74

A total of 27 patients (26.47%) has a history of trauma, whereas the remaining 75 patients (73.52%) had no history of trauma.

**Table 3: Representing the presence and absence of a history of trauma among patients of secondary glaucoma**

History of trauma	Frequency	Percent (%)
Present	27	26.47
Absent	75	73.52

Number of patients having history of ocular surgery were 59 patients (57.84%) and those without any previous ocular surgery were 43 patients (42.15%).

**Table 4: Representing the presence or absence of history**

**of ocular surgery in patients of secondary glaucoma**

History of ocular surgery	Frequency	Percent (%)
Present	59	57.84
Absent	43	42.15

The following table shows the distribution of type of secondary glaucoma among the study patients.

**Table 5: Distribution of type of secondary glaucoma among study patients**

Type of secondary glaucoma	Frequency	Percent (%)
Silicon oil induced glaucoma	25	24.50
Steroid induced glaucoma	10	9.80
Pseudoexfoliation glaucoma	32	31.37
Phacomorphic glaucoma	2	1.96
Uveitis induced glaucoma	3	2.94
Angle recession glaucoma	3	2.94
Malignant glaucoma	1	0.98
Neovascular glaucoma	14	13.72
ICE syndrome	4	3.92
Glaucoma after cataract surgery	4	3.92
Post keratoplasty glaucoma	4	3.92

Out of the patients having neovascular glaucoma, 8 patients (57.14%) had diabetic retinopathy and 3 patients (21.42%) were due to retinal occlusive disease.

**Table 6: Pre-existing ocular pathology in patients having neovascular glaucoma**

Cause of neovascular glaucoma	Frequency	Percent (%)
Diabetic retinopathy	8	57.14
Retinal occlusive disease	3	21.42

**DISCUSSION**

This study is aimed at finding the varying spectrum of ocular conditions resulting in secondary glaucoma. Not many studies have been carried out regarding the profile of secondary glaucoma in Western India. The aim of our study is to find the causes of secondary glaucoma in 102 patients visiting a tertiary eye care centre in Western India.

**Gender distribution**

Our study shows a male predominance, where 74.50% of the study participants were males and 25.49% were females.

In a study by Partha Chakma et al (4), carried in January 2021, out of 106 patients, 50 patients were males and 56 were females, whereas our study showed more number of male patients compared to females.

**Age distribution**

Our study showed that 25.49% patients were in the age group of 20-40 years, 44.11% patients were between the age of 41-60 years and 30.39% patients were between 61-80 years of age. Maximum patients were between 41-60 years of age.

According to an article in the Indian journal of ophthalmology published in 2008, based on the study carried out by Ritu Gadia, MD et al(5), 579 patients out of 2997 had secondary glaucoma. 25% patients were between 0-20 years, 27% between 21-40 years, 30% between 41-60 years and 18% were above the 60 years of age.

**Trauma**

In our study from 102 patients, 27 patients (26.47%) had history of trauma. Of this, 23 patients were males (85.18%) and 4 patients (14.81%) were females.

A study by Ritu gadia, MD et al (5) showed post traumatic glaucoma to be the second most common among cases of secondary glaucoma. Most common age group was 0-20. Almost 90% of those with history of trauma were males.

**Type of secondary glaucoma**

Our study showed that 24.50% (25 patients) cases had silicon oil induced glaucoma, 9.80% (10 patients) cases had steroid induced glaucoma, 31.37% (32 patients) had pseudoexfoliation glaucoma, 1.96% (2 patients) had phacomorphic glaucoma, 2.94% (3 patients) had glaucoma secondary to uveitis, 2.94% (3 patients) had angle recession glaucoma, in 1 patient (0.98%) the cause was malignant glaucoma, 13.72% (14 patients) had neovascular glaucoma, 3.92% (4 patients) cases had ICE syndrome, 3.92% (4 patients) cases were post cataract surgery and 3.92% (4 patients) were post keratoplasty surgery.

A study by Jamuna Gurung et al(2), carried out in 2021 showed that out of the 7079 patients included in the study, 528 had secondary glaucoma. Lens induced glaucoma was found to be the commonest which was present in 173(32.8%) patients, whereas our study showed 1.96% patients to be lens induced. Our study showed 13% patients of neovascular glaucoma, whereas this study showed 20.3% patients had neovascular glaucoma. This study showed that 86(16.3%) patients had steroid induced glaucoma, 76(14.4%) had post traumatic glaucoma, 17(3.2%) patients developed glaucoma post vitrectomy, 11(2.1%) patients had uveitis associated glaucoma, 10 patients (1.9%) had pseudophakic and 8 patients (1.5%) had aphakic glaucoma and post-keratoplasty 5 patients (0.9%) developed secondary glaucoma.

Contrasting our study, a study by Suresh Ramanarao et al (6) carried out in 2020, showed that out of 50 patients with raised IOP, 24(48%) had lens induced glaucoma, 10 of this were phacomorphic glaucoma, 11 were having phacolytic glaucoma and 2 had lens particle glaucoma, making lens induced glaucoma the most common cause. However, similar to our study, this study showed that neovascular glaucoma and pseudoexfoliative glaucoma were each present in 14% cases, making them the second most common cause of secondary glaucoma.

Similar to our study, a study by Suneeta Dubey et al(7) in 2019 showed that out of 419 cases of secondary glaucoma, neovascular glaucoma was found in 17.42% patients. Post-traumatic glaucoma was found in 14.80% patients, post-keratoplasty 13.60% cases developed glaucoma, post-cataract surgery glaucoma was found in 13.13% cases and lens-induced glaucoma was seen in 12.41% patients. Secondary glaucoma was found to be an important cause of visual morbidity.

Similar to our study, a study by Ritu Gadia, MD et al (5) ,in 2008, showed silicon oil infusion as one of the important causes of secondary glaucoma. Out 579 patients of secondary glaucoma 14% patients had history of vitrectomy, 13% were post traumatic, 12% patients had a corneo-iridic scar, 11% were aphakic, 9% had neovascular glaucoma.

Our study showed that the commonest cause of secondary glaucoma was found to be pseudoexfoliation glaucoma (31.37%). Similar to this, a study by Andrea Strohl et al (61), carried out in 1999, included 73 eyes having secondary glaucoma, showed that 20 patients (27%) had pseudoexfoliation glaucoma. A similarity to our study in the cases of neovascular glaucoma (22%) and lens-related glaucoma (5%) was also seen. However our study showed 9.8% cases of steroid induced glaucoma while study by Andrea Strohl et al (61) showed only 3%.

Our study showed that out of the 14 patients having neovascular glaucoma, 8 patients (57.14%) had diabetic retinopathy and 3 patients (21.42%) had retinal occlusive diseases.

In a study by Suresh Ramanarao et al (6), out of 50 patients with raised IOP, 7 (14%) cases were of neovascular glaucoma. Of this, 6 patients were found to have proliferative diabetic

retinopathy and 1 patient had ischemic central retinal vein occlusion.

Uzma Fasih et al(9) showed that out of the patients with neovascular glaucoma, 2.8% (3 patients) had diabetic and 1.8% (2 patients) had central retinal vein occlusion (CRVO).

**Study limitation**

- Small sample size
- Long follow up not taken

**CONCLUSION**

Secondary glaucoma is an important cause of visual morbidity. Our study found Pseudo exfoliation glaucoma to be the most common cause of secondary glaucoma, followed by silicon oil induced glaucoma. An early comprehensive examination and treatment of patients having raised IOP with pre-existing ocular co-morbidities can help reduce the burden of blindness.

**REFERENCES**

1. Casson RJ, Chidlow G, Wood JP, Crowston JG, Goldberg I. Definition of glaucoma: clinical and experimental concepts: Definition of glaucoma. Clin Experiment Ophthalmol. 2012 May;40(4):341–9.
2. Gurung J, Sitoula RP, Singh AK. Profile of Secondary Glaucoma in a Tertiary Eye Hospital of Eastern Nepal. Nepal J Ophthalmol Biannu Peer-Rev Acad J Nepal Ophthalmic Soc NEPJOPH. 2021 Jan;13(25):98–103.
3. DeeptiNanwani, Sri Ganesh. Profile of secondary glaucoma cases in a tertiary eye care centre. IOSR J Dent Med Sci IOSR-JDMS. 2015 Dec;14(12):53–8.
4. Chakma P, Pal DK, Chakma AK. A Clinical Study of Secondary Glaucoma with Special Reference to Its Proportion, Causes and Its Risk Factors in a Tertiary Care Hospital - A Cross Sectional Study. J Evid Based Med Healthc. 2021 Jan 4;8(01):23–7.
5. Dada T, Gupta V. Current profile of secondary glaucomas. Indian J Ophthalmol. 2008 Aug;56(4):285–9.
6. Ramanarao S, Jain D. A clinical study of secondary glaucoma. Indian J Clin Exp Ophthalmol. 2020 May 28;6(1):5–8.
7. Dubey S, Jain K, Mukherjee S, Sharma N, Pegu J, Gandhi M, et al. Current profile of secondary glaucoma in a Northern India tertiary eye care hospital. Ophthalmic Epidemiol. 2019 Jun;26(3):200–7.
8. Strohl A, Pozzi S, Wattiez R, Roesen B, de Kaspar HM, Klauß V. Causes of secondary glaucoma in Paraguay: Ursachen und ihre Häufigkeitsverteilung. Ophthalmol. 1999 Jun;96(6):359–63.
9. Secondary Glaucoma - Causes and Management. Pak J Ophthalmol 2008, Vol. 24 No. 2.