






## Original Article

# Profile of secondary glaucoma in a tertiary eye hospital of eastern Nepal

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## Abstract

**Introduction:** This study was conducted to determine the clinical profile and causes of various types of secondary glaucoma.

**Materials and methods :** This was a hospital-based cross-sectional study conducted in a tertiary eye hospital of eastern Nepal from 1<sup>st</sup> June to 30<sup>th</sup> November, 2017. Patients who met the criteria for secondary glaucoma underwent detailed ophthalmic examination.

**Results :** Out of 7079 patients diagnosed with glaucoma or glaucoma suspects, 528 (7.4%) had secondary glaucoma. The mean age at presentation was  $52 \pm 17$  years with male to female ratio of 1.5:1. The most common cause was lens induced 173 (32.8%) followed by neovascular 107 (20.3%), steroid induced 86 (16.3%), traumatic 76 (14.4%), post-vitreotomy 17 (3.2%), uveitic 11 (2.1%), pseudophakic 10 (1.9%), aphakic 8 (1.5%), post-keratoplasty 5 (0.9%) and miscellaneous included 35 (6.6%). Post-traumatic 31 (29.5%) was more prevalent below 41 years while lens induced glaucoma 86 (49%) above 60 years of age. At presentation, the average IOP was  $40 \pm 11$  mmHg. 36 (6.8%) had no light perception in the presenting eye and a large number of participants 307 (58.1%) presented with visual acuity of  $<3/60$  to perception of light. Glaucomatous optic atrophy was found in 22 (9.0%) cases.

**Conclusion :** The causes of secondary glaucoma are diverse, lens induced glaucoma being most common. Most patients present late with poor vision, high IOP and even glaucomatous optic atrophy. So, early identification and treatment of the causes is important so that we can prevent the burden of blindness due to secondary glaucoma.

**Key words:** Secondary glaucoma, Lens induced, Blindness.

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## Introduction

Glaucoma is the second leading cause of irreversible blindness worldwide (Quigley, 1996). In Bhaktapur Glaucoma study (Thapa et al, 2011), the total prevalence of glaucoma was 1.9%, of which 9.33% had secondary glaucoma. The prevalence of secondary glaucoma accounted for 0.250%, a study conducted in Sunsari district of eastern Nepal (Sah et al, 2007). Studies have shown lens induced glaucoma to be the commonest variant among the secondary glaucoma cases (Sah et al, 2007; Sarkar et al, 2010, Paudyal et al, 2011).

Secondary glaucoma occurs as a consequence of underlying ocular or systemic disorders, which includes lens pathology, trauma, neovascularization, steroid use, inflammation, previous surgery and any other abnormal ocular and systemic pathologies (Gadia et al, 2008). Early identification and treatment of underlying pathology is important so that we can prevent vision loss due to secondary glaucoma. There is limited data available regarding various causes and clinical patterns of secondary glaucoma in the clinical context of Nepal. This hospital-based study may reflect the scenario of secondary glaucoma in our society and create awareness regarding the causes and initiate early treatment so that we can prevent the development of glaucoma secondarily.

This study was conducted with the aim to find the common causes, demographic profile and pattern of various types of secondary glaucoma in a tertiary eye hospital of eastern Nepal.

## Materials and methods

All patients presenting to the glaucoma department of Biratnagar eye hospital from 1<sup>st</sup> June to 30<sup>th</sup> November, 2017 and who gave informed written consent were included in the study. The Institutional Review Committee of Biratnagar eye hospital approved the study.

A detailed clinical history and ocular examination was done. The data were recorded in terms of age, sex, laterality of eye, causes of secondary glaucoma, visual acuity, slit lamp examination, intraocular pressure (IOP), fundus evaluation and gonioscopy findings. Patients were categorized into four age groups. i.e. 0-20 years, 21-40 years, 41-60 years and >60 years. Visual field evaluation was done in patients who had good visual acuity. Anterior segment findings like corneal edema, opacity, anterior and posterior synechiae, iris neovascularization, lens pathology was noted. In funduscopy, vitreous, retinal, macular abnormal findings and optic disc changes were recorded.

Diagnosis of secondary glaucoma was made when there was a positive history and ocular pathologies such as trauma, previous surgery, neovascularization, inflammation, or any other abnormal ocular or systemic findings in presence of raised IOP with or without glaucomatous optic disc abnormalities. In unilateral cases, patients were included as secondary glaucoma only when the other eye had no features or family history of primary glaucoma (Gadia et al, 2008).

Glaucoma was managed initially with anti-glaucoma medications followed by treatment of underlying ocular and systemic conditions.

The data collected was analyzed in a statistical package for social sciences software (SPSS version 20.0, IBM, Armonk, NY, USA). We performed descriptive statistics like frequency, percentage, mean and standard deviation to describe the characteristics of collected data.

## Results

Out of 7079 patients diagnosed as glaucoma or glaucoma suspects, 528 (7.4%) had secondary glaucoma. There was greater prevalence of males 316 (60%) compared to females 212 (40%) with M:F ratio of 1.5:1. The mean age

of presentation was  $52 \pm 17$  years. The majority of cases 215 (40.7%) was between 41-60 years. The most common cause was lens induced 173 (32.8%) followed by neovascular 107 (20.3%), steroid induced 86 (16.3%), post-traumatic 76 (14.4%), post-vitrectomy 17 (3.2%), uveitic 11 (2.1%), pseudophakic 10 (1.9%), aphakic 8 (1.5%), post keratoplasty 5 (0.9%) and miscellaneous 35 (6.6%) (Figure 1). Post-traumatic 31 (29.5%) was more prevalent below 41 years while lens induced glaucoma 86 (49%) above 60 years of age. Intraocular pressure at presentation ranged from 21 to 71 mmHg with average IOP of  $40 \pm 11$  mmHg. There was no light perception in the presenting eye in 36 (6.8%) and higher number of patients 307 (58.1%) presented with visual acuity of  $<3/60$  to perception of light. Optic nerve was evaluated in 243 (46%), of which 22 (9%) participants had optic atrophy, vertical cup/disc ratio of 0.9:1 in 46 (19%), 0.8:1 in 38 (15.6%), 0.7:1 in 27 (11.1%), 0.6:1 in 11 (4.5%) and  $\leq 0.5:1$  in 99 (40.7%). In rest of the participants, fundus couldn't be visualized due to lens opacity, posterior synechiae, hazy aqueous/vitreous, corneal edema and corneal opacity.

In lens induced glaucoma, females 107 (61.8%) were affected more than males 66 (38.1%) with F:M ratio of 1.6:1. The mean age of the patient was  $60.46 \pm 13$  years. They presented with poor visual acuity  $<3/60$  in 167 (96.6%), IOP  $>31$  mmHg in 101 (94.3%) cases, ocular pain and headache. Causes of lens induced glaucoma shown in Table 3.

At presentation, neovascular glaucoma had male to female ratio of 1.7:1 with mean age  $55.5 \pm 14.7$  years. It was secondary to underlying pathology like proliferative diabetic retinopathy 39 (36.4%), central retinal vein occlusion 38 (35.5%), vitreous hemorrhage

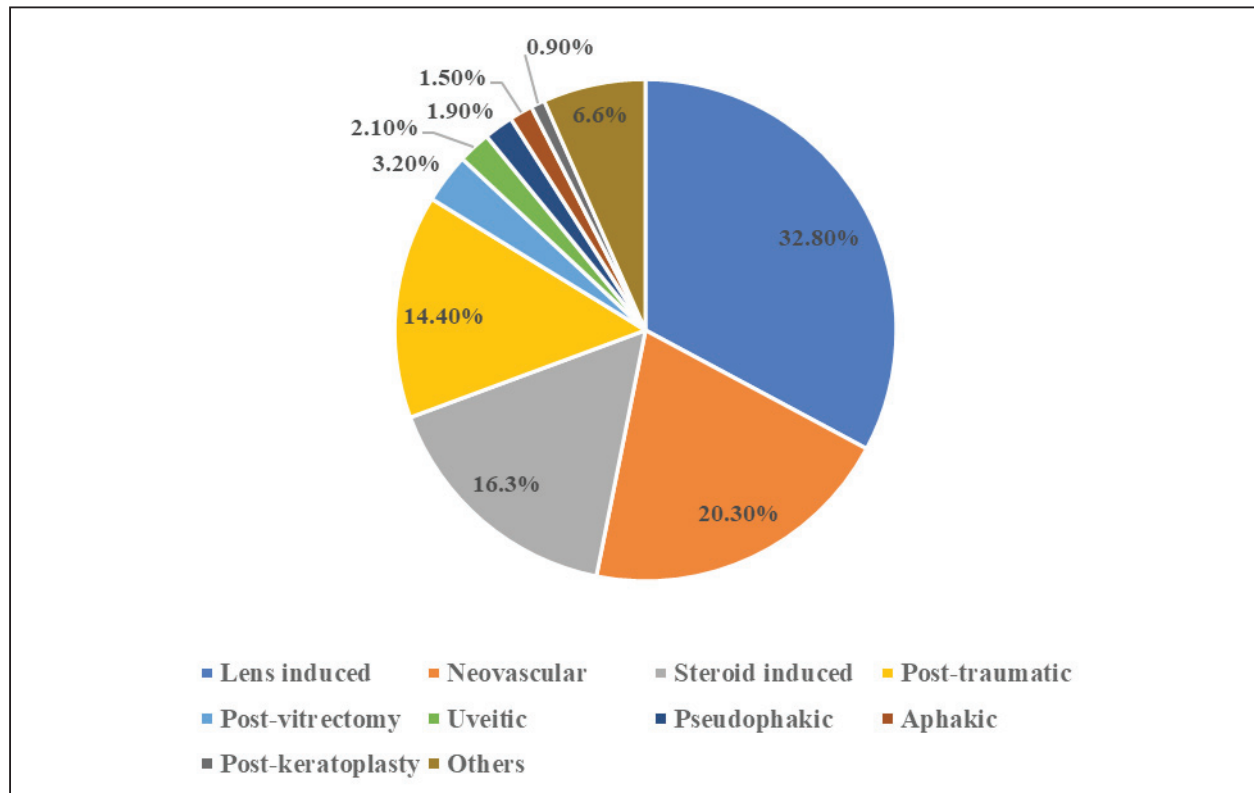
10 (9.3%), retinal detachment 8 (7.5%) and branch retinal vein occlusion 6 (5.6%). They presented with vision of  $<3/60$  in 73 (68.2%) and glaucomatous optic atrophy in 10 (9.3%) cases.

Steroid induced glaucoma constituted 86 (16.3%) cases of all secondary glaucoma. Male to female ratio was 2.3:1. Patients used steroids for ocular allergies, postoperative ocular cases and for systemic illness.

In post-traumatic glaucoma, a higher number of males 62 (81.6%) were affected with M:F ratio of 4.4:1. The average age of presentation was  $38.25 \pm 15.8$  years. Blunt trauma was the commonest mode of injury found in 66 (86.8%) cases, work related and accidental injury in 8 (10.5%) cases and firecracker injury 2 (2.6%) cases. Hyphema, iridodialysis, uveal inflammation, subluxation and dislocation of lens, cataract, vitreous hemorrhage and retinal detachment were common presentations after trauma. Gonioscopy showed an angle recession in 28 (36.8%). Visual acuity of  $<3/60$  was seen in 40 (52.6%) and glaucomatous optic atrophy in 8 (10.5%).

Glaucoma secondary to vitreoretinal surgery was mainly due to retained silicone oil for more than 3 months 9 (53%). Pseudophakic and aphakic glaucoma were common in older age groups. 4 (40%) and 6 (75%) cases had visual acuity of  $<3/60$  in pseudophakic and aphakic glaucoma respectively. 2 (25%) cases of aphakic glaucoma presented with glaucomatous optic atrophy.

Miscellaneous causes of secondary glaucoma 35 (6.6%) included pigment dispersion glaucoma, pseudoexfoliation syndrome, iridocorneal endothelial syndrome and post retinitis pigmentosa.



**Figure 1:** Distribution of various types of secondary glaucoma

**Table 1:** Age group in accordance with types of secondary glaucoma

Types	Age group N (%)				Total N (%)
	0-20	21-40	41-60	>60	
Lens induced	1 (0.6)	12 (6.9)	74 (42.8)	86 (49.7)	173 (32.8)
Neovascular	2 (1.9)	13 (12.1)	53 (49.5)	39 (36.4)	107 (20.3)
Steroid induced	11 (12.8)	22 (25.6)	23 (26.7)	30 (34.9)	86 (16.3)
Post-traumatic	15 (19.7)	31 (40.8)	26 (34.2)	4 (5.3)	76 (14.4)
Post-vitrectomy	1 (5.9)	6 (35.3)	6 (35.3)	4 (23.5)	17 (3.2)
Uveitic	1 (9.1)	5 (45.5)	4 (36.4)	1 (9.1)	11 (2.1)
Pseudophakic	0	2 (20)	4 (40)	4 (40)	10 (1.9)
Aphakic	0	3 (37.5)	4 (50)	1 (12.5)	8 (1.5)
Post-keratoplasty	0	1 (20)	4 (80)	0	5 (0.9)
Others	1 (2.9)	10 (28.6)	17 (48.6)	7 (20)	35 (6.6)
Total N (%)	32 (6.1)	105 (19.9)	215 (40.7)	176 (33.3)	528 (100)

**Table 2: Gender distribution, Visual acuity and IOP levels of different secondary glaucoma**

Types	Male N (%)	Female N (%)	Visual acuity <3/60 N (%)	Baseline IOP >30mmHg N (%)
Lens induced	66 (38.2)	107 (61.8)	167 (96.5)	157 (90.7)
Neovascular	68 (63.6)	39 (36.4)	73 (68.2)	101 (94.3)
Steroid induced	60 (69.8)	26 (30.2)	17 (19.8)	63 (73.2)
Post-traumatic	62 (81.6)	14 (18.4)	40 (52.6)	55 (72)
Post-vitrectomy	12 (70.6)	5 (29.4)	8 (47.0)	9 (53)
Uveitic	8 (72.7)	3 (27.3)	8 (72.7)	7 (63.6)
Pseudophakic	5 (50)	5 (50)	4 (40)	8 (80)
Aphakic	3 (37.5)	5 (62.5)	6 (75)	5 (62.5)
Post-keratoplasty	5 (100)	0	4 (80)	3 (60)
Others	27 (77.1)	8(22.9)	16 (45.7)	12 (34.2)

**Table 3: Causes of lens induced glaucoma**

Causes	Frequency (N=172)	Percentage
Phacomorphic	110	64
Phacolytic	51	29.7
Subluxated	6	3.4
Microspherophakia	4	2.3
Lentiglobus	1	0.6

### Discussion

This study gives information on various causes of secondary glaucoma presented in a tertiary eye hospital of eastern Nepal. Lens induced glaucoma still remains the main cause of blindness in our cohort similar to previous literatures (Shah RP et al, 2007; Sarkar et al, 2010; Paudyal et al, 2011). Phacomorphic type was more prevalent than phacolytic (Sitoula et al, 2016). The higher rate of lens induced glaucoma in developing countries may be due to lack of eye care facilities in all parts due to uneven geographical distribution and financial problems (Sitoula et al, 2016). Therefore, easily accessible and affordable cataract surgery should be provided to reduce this burden of blindness.

Neovascular glaucoma was second common cause similar to other study (Paudyal et al. 2011). Whereas, it was the commonest

cause in a recent study (Sherpa et al, 2017). Proliferative diabetic retinopathy and central retinal vein occlusion were mainly responsible for neovascular glaucoma (Gadia et al, 2008). Most of these patients presented late with poor visual acuity and even glaucomatous optic atrophy. The increased number of neovascular glaucoma may be due to change in lifestyle and also there is lack of awareness about the need for routine ocular examination in patients with systemic vascular disease, thus presenting late.

In our study, steroid induced glaucoma was higher compared to other studies 3.39% (Sherpa et al, 2017) and 1.6% (Paudyal et al. 2011). This may be due to over-the-counter use of steroids in any form and lack of awareness about its possible ocular side effects.

Traumatic glaucoma was common in males below 41 years. Males at this age group are more into outdoor physical activity, so higher

chance of trauma (Gadia et al, 2008), (Nanwami et al, 2015). These patients presented with optic atrophy in 8 (10.5%) eyes. Use of safety measures at work and do a baseline ocular examination after any ocular injury should be encouraged at community level so that early treatment can be initiated to prevent blindness.

Post-vitrectomy glaucoma was the fifth cause of secondary glaucoma in comparison to (Gadia et al, 2008), who found it to be the commonest cause. The vitrectomized eyes filled with silicon oil are at risk of developing glaucoma, especially when it is kept for more than three months. So, these patients need frequent IOP measurements and those with silicon oil should be removed once the tamponade effect is obtained.

Our study showed a decreased number of aphakic and pseudophakic glaucoma, while aphakic glaucoma (37.7%) was the most common cause in (Agarwal et al, 1982) study. This decline is probably due to improvement in micro-surgical technique and proper management of surgical complications.

### Conclusion

Lens induced glaucoma is still the commonest cause of secondary glaucoma in our region. Other common causes include neovascular, steroid use, traumatic and post-vitrectomy. Therefore, identification of the primary pathology with appropriate management strategies should be our goal so that together we can reduce the burden of blindness due to secondary glaucoma.

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