A CROSS-SECTIONAL STUDY OF CAUSES OF SECONDARY GLAUCOMAS AT A TERTIARY EYE CARE CENTRE

ABSTRACT

Introduction: Secondary glaucomas(SG) are defined by the presence of elevated IOP with/without optic neuropathy changes, associated with some primary ocular/systemic disease resulting in severe visual impairment.

Objective: To determine the causes of secondary glaucomas in a tertiary eye care centre.

Materials and Methods: It was a cross-sectional study carried out in medical college hospital over a period of 2 years on 52 patients of either gender, aged < 70 years who presented with IOP >21mmHg, excluding primary open angle/angle closure and congenital glaucoma cases underwent detailed ophthalmic examination (glaucoma evaluation) and the collected data was analysed using SPSS version 20.0.

Results: In our study the majority of cases (51.9%) were in the age group of 60 – 70 years, with a slight female preponderance i.e male to female ratio of 2:3. Pseudoexfoliation glaucoma was the most common cause of SG seen in 15 (28%) cases followed by 7(13%) cases of SG in post cataract surgery and 7 (13%) cases of SG in post vitreo retinal surgery. The least common causes were ICE syndrome, SG due to elevated episcleral venous pressure.

Conclusion: Our study concluded as the most common cause of SG was Pseudoexfoliation glaucoma. SG is a significant public health disease, commonly seen in elderly population having a potential to cause severe visual impairment & blindness. Hence early detection & prompt treatment plays a vital role.

Keywords: *Secondary glaucoma, causes,Pseudoexfoliation glaucoma, IOP.*

1.INTRODUCTION

Secondary glaucomas (SG) and even historically the primary angle closure glaucomas are defined first and foremost by the presence of an elevated intra ocular pressure(IOP), not in reference to optic neuropathy that follows sustained elevated IOP's. The increased IOP in secondary glaucomas is associated with some identifiable primary ocular or systemic disease resulting in severe visual impairment. The mean prevalence of secondary glaucoma is 18% of the mean prevalence of primary open angle glaucoma in the world [1].

The prevalence of SG varies in different parts of the world depending upon the prevalence of the causative primary disease. Various studies have reported the prevalence of SG to be around 0.2 to 0.5% in India [2], 0.6% in Japan, 8% in Nigeria and as high as 13% in Saudi Arabia [3]. Glaucoma affects more than 70 million people across the globe [3]. Quigley estimated that 6 million people in the world have SG with the mean prevalence of this condition being 0.44% or 18% of the mean prevalence of primary open angle glaucoma in the world [4]. The population based Aravind comprehensive eye survey from South India reported a 0.7% incidence of secondary glaucomas, where the total prevalence of glaucoma was 2.6% i.e a third of all glaucoma cases [6].

Different Indian studies have shown various causes of SG, among them the most common cause for SG in (?) most fewer studies was Lens induced glaucoma [1,5,7,9,10,11]. Most primary glaucomas are managed by early diagnosis and treatment, but secondary glaucomas differ from primary by the fact, if primary pathology is treated properly and the possibility of secondary glaucoma is kept in mind, glaucomatous damage can be easily prevented [8].

Aim of this cross-sectional study is to determine the common causes of secondary glaucomas in a tertiary eye care centre, which helps in early detection of disease and it's further management to limit the visual impairment.

2. MATERIALS AND METHODS

It was a cross-sectional study carried out among 52 patients with secondary glaucoma who presented to the department of Ophthalmology, at Bapuji eye hospital and Chigateri General hospital attached to JJM medical college, Davanagere, Karnataka,India over a period of 2 years from August 2022 to July 2024. The institutional ethical committee (IEC) approval was obtained before commencement of the study. Priorwritten informed consent was taken from every patient in the study. Patients with primary open angle, primary angle closure, congenital glaucoma were excluded. Inclusion criteria of this study was patients of either gender aged < 70 years presented with unilateral or bilateral raised IOP >21mmHg with or without glaucomatous optic neuropathy with any of the following signs like ocular trauma / inflammation, steroid usage (topical / systemic), lens induced changes, pseudo exfoliation syndrome, post vitreo retinal surgery, previous ocular surgeries, neovascularization of the eyes.

All the patients underwent a detailed ophthalmic examination which included visual acuity with Snellen's chart, IOP with Goldmann Applanation tonometer, anterior segment examination by slit lamp biomicroscopy, fundus evaluation by Volk +90D convex lens in slit lamp or indirect ophthalmoscope, gonioscopy using 4 mirror gonio lens and additional investigations like B- scan / visual field examination was done in required cases. Data analysis was done using IBM SPSS Statistics for Windows, Version 20.0 Armonk, NY:IBM Corp. The categorical values were shown as frequency in numbers and percentage. Statistical charts were represented in the form of bar and pie chart.

3. RESULTS

In a study undertaken by us over a period of 2 years, 52 patients were affected with secondary glaucoma (SG). Gender distribution demonstrated slight female preponderance that is 31 (59.61%) female patients when compared to 21 (40%) male patients[**Figure 1**]. Among the affected cases 27 (52%) cases involved the right eyes, 19 (36.5%) involved the left eyes and 6 (11.5%) cases of SG affected both the eyes [**Figure 2**]. Age was distributed into 4 groupsand majority of them i.e 27(51%) cases were seen in the age group of 60 – 70 years[**Table 1**]. The presenting IOP ranged between 22-

80 mmHg with the average presenting IOP being 37.17 ± 12.03 mmHg.1 case of Lens induced glaucoma case had recorded highest IOP value of 80mmHg.

After clinical examination,different causes of SG were found in our study were tabulated [**Figure3**] in which the most common cause of secondary glaucoma was pseudoexfoliation glaucoma seen~~present~~ in 15 (28%) cases. This was followed by 7 (13%) cases of SG due to post vitreo retinal surgery, 7 (13%) cases of SG after cataract surgery, 4 (8%) cases of lens induced glaucoma [out of which 3 caseswerephacomorphic type and 1 case wasphacotopic type], 4 (8%) cases of steroid induced glaucoma, 4 (8%) of cases of uveitic glaucoma, 3 (6%) cases of angle recession glaucoma, 3(6%) cases of neovascular glaucoma [out of which 2 cases were due to ischemic CRVO (central retinal vein occlusion) and 1 case was due to proliferative diabetic retinopathy], 2 (4%) cases glaucoma in pseudophakia and 1(2%) case each of ICE syndrome, traumatic ghost cell glaucoma and Secondary open angle glaucoma due to elevated episcleral venous pressure. Thus, Pseudoe ~~E~~xfoliationg~~C~~laucoma was most prevalent type of SG in our tertiary eye care center.

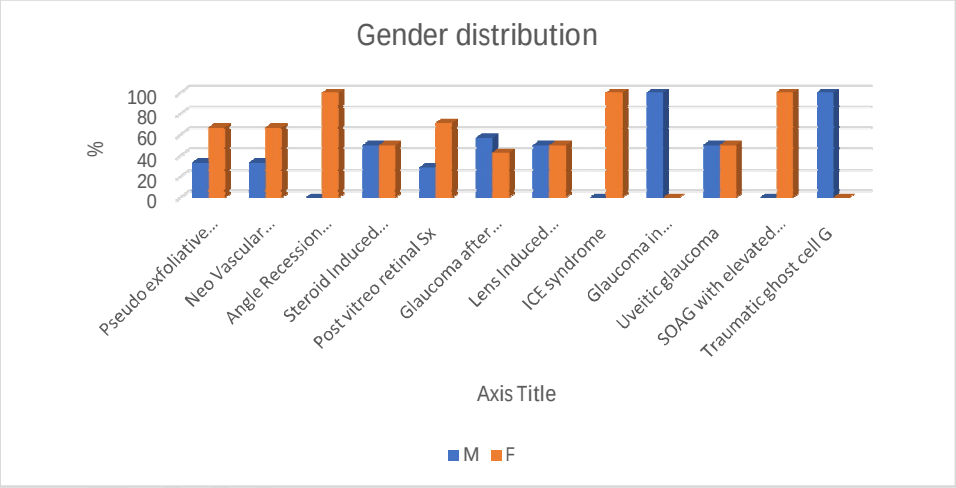

Figure 1: Gender and Causes cross tabulation

	Age in years at the time of presentation (number of cases + %)				Total
Diagnosis	0-20	21-40	41-60	60-70	

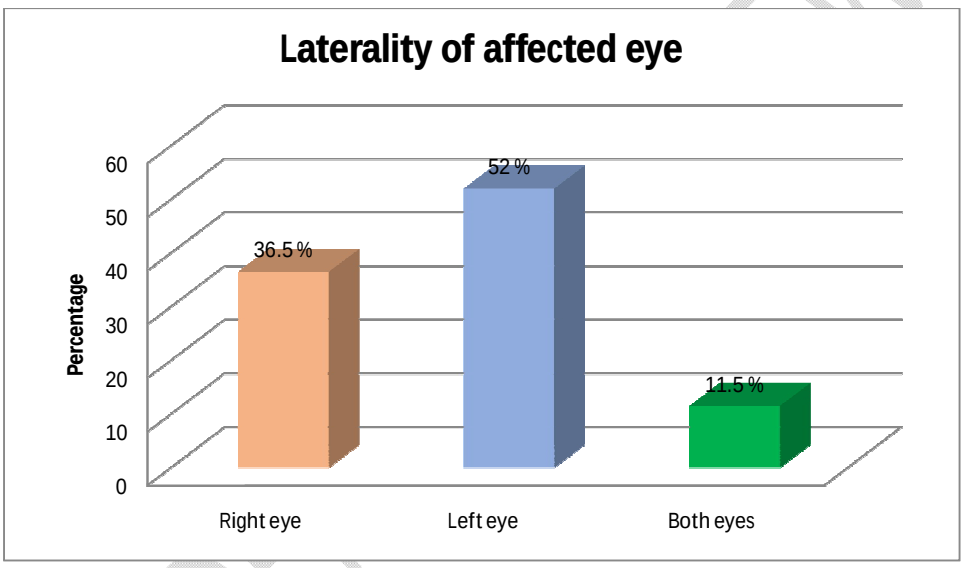

Figure 2 : Laterality of the affected eyes

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Pseudo exfoliative glaucoma	0	0	3(20%)	12(80%)	15 (100%)
Neo Vascular Glaucoma	0	1(33.3%)	1(33.3%)	1(33.3%)	3(100%)
Angle Recession Glaucoma	1(33.3%)	2 (66.7%)	0	0	3(100%)
Steroid Induced Glaucoma	2(50%)	1(25%)	1(25%)	0	4(100%)
Post vitreo retinal surgery	0	1(14.3%)	1(14.3%)	5 (71.4%)	7(100%)
Glaucoma after cataract surgery	0	1(14.3%)	2(28.6%)	4(51.7%)	7(100%)
Lens Induced Glaucoma	0	0	2(50%)	2(50%)	4(100%)
ICE syndrome	0	0	1(100%)	0	1(100%)
Glaucoma in pseudophakia	0	0	1(50%)	1(50%)	2(100%)
Uveitic glaucoma	0	2(50%)	0	2(50%)	4(100%)
SOAG with elevated episcleral venous pressure	0	1(100%)	0	0	1(100%)
Traumatic ghost cell glaucoma	0	1(100%)	0	0	1(100%)
Total no of patients	3 (5%)	10 (19%)	12 (23%)	27 (51%)	52 (100%)
P-value 0.017, Chi square value - 52.446					

Table 1: Causes of secondary glaucoma in different age groups

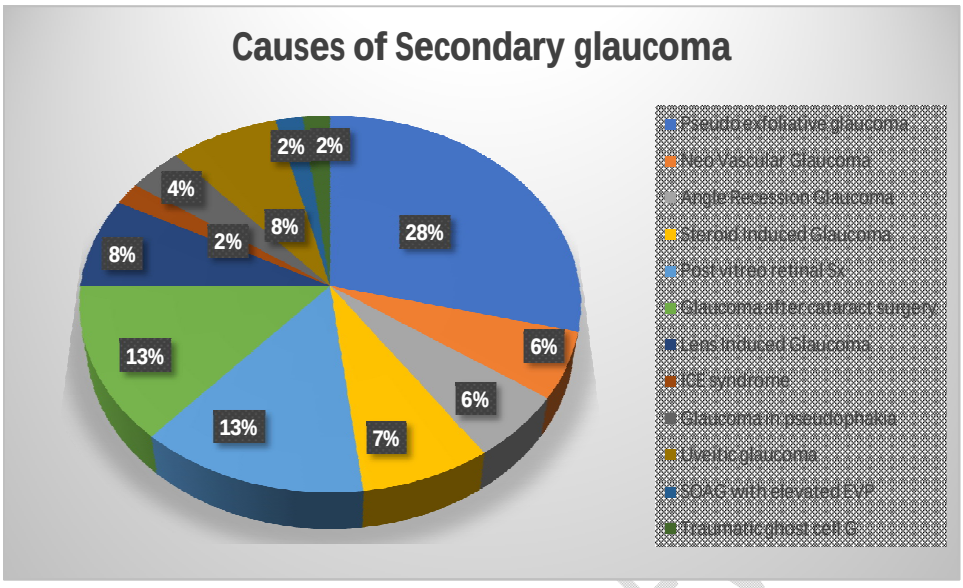

Figure 3: Causes of secondary glaucoma

4. DISCUSSION

This was a cross sectional study of 52 cases of secondary glaucoma(SG) presenting at a tertiary eye care centre carried out from August 2022 to July 2024. We have studied the causes of all the secondary glaucomas over a period of 2 years. In our study most of the patients were in the age group of 41 – 70 years,In a study done by Ramanarao S et al [1] 39 cases of Secondary glaucoma were aged above 41 years, in a study conducted by Shua Aet al [3] most common age group for secondary glaucoma presentation was 51 – 60 years.Also in a study conducted by Nanwani D et al[6] 30% patients were in age group of 41 -60years,thus the results of our studies correlated with other studies as well.

The frequency of SG was found more common in females (59.6%) than males (40%) in our study, although there was a slight female preponderance it did not reach statistical significance. A study done by Chakma P et al[7] showed female predominance with 52.8% of female patients and 47.2% of male patients. Other studies showed male predominance and also in India, men are more likely to reach higher center, as reported in a tertiary glaucoma center in the year 2005 by Gardia R et al[6].

In our study, significantly 15 (28%) patients were diagnosed to have Pseudo exfoliation glaucoma, followed by 7 (13 %) cases of glaucoma after cataract surgery, 7 (13%) cases of glaucoma post vitreo retinal surgery, 4 (8%) cases of Lens induced glaucoma, 4 (8%) cases of steroid induced glaucoma. 4 (8%) cases of uveitic glaucoma. 3 (6%) cases of angle recession glaucoma. 3(6%) cases of neovascular glaucoma out of which 2 were due to ischemic CRVO and 1 case due to proliferative

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diabetic retinopathy. 2 (4%) cases of glaucoma in pseudophakia. 1(2%) each case of ICE syndrome, traumatic ghost cell glaucoma and SOAG due to elevated episcleral venous pressure.

Most ~~C~~common cause of SG in our study was Pseudo exfoliation glaucoma seen in 15(28%) cases. In a study conducted by Shua A et al [3](?) most common cause for SG was pseudo exfoliation seen in 20 (50%)~~cases .~~ cases. A~~In a~~ study conducted by RamanaraoSet al[1] showed 7(14%) cases of pseudo exfoliation glaucoma. As pseudo exfoliation is a age related fibrillopathy disease, incidence of this disease increases as the age increases, since it is commonly missed in the initial stages during clinical examination and ~~it~~ is rapidly progressive in nature, patients may directly present with high IOP of >50mmHg. ~~Although there~~Although there is no definitive treatment to cure the exfoliation or to prevent its progression, the prevalence of this disease was~~itis~~ more in our study.

Second common cause of SG in our study wa~~s~~s glaucoma due to post vitreo retinal surgery, most of them were seen in the age group of 60 – 70 years, most common indication for vitreo retinal surgery was tractional retinal detachment in advanced diabetic eye disease, followed by IOL drop as a complication in cataract surgery. As silicone oil is most commonly used internal tamponade owing to its buoyant force and high surface tension, which results in increase in~~ing~~ IOP due to chronic inflammation, and blockage of TM by silicone oil bubbles. In a study conducted by Dubey, Setal[12]also had common cause of secondary glaucoma following vitreo retinal surgery (9.31%). In a study done by Gadia R et al[8]~~had~~ 48 (21.9%) cases had SG ~~of~~ post vitrectomy, silicone oil seemed to be the risk factor. Honavar et al[8]~~ study~~ showed in their study on glaucoma after vitrectomy in Indian patients ~~has shown~~tythat silicone induced glaucoma is seenin 70% cases of all glaucoma. Hence silicone filled eyes need to get their IOP checked frequently and oil to be removed as soon as tamponade effect is no longer required. Inferior peripheral iridectomy to be done as it prevents the incidence of pupillary block and anterior displacement of silicone oil[6].

Glaucoma after cataract surgerywas seen in 7(14%) cases in our study, in which 6 cases were pseudophakic and 1 aphakic case showed raised IOP observed on post operative day 1, commonly due to retained visco elastic substance in eye and was treated with topical and systemic AGM (anti glaucoma medications) and IOP had come to normal within 3-4 days. Studies have shown that 33 – 100% of patients showed transient rise in IOP after cataract surgery due to~~obstuction~~obstruction of TM (Trabecular meshwork) by blood, pigments, lens particle, viscoelastic substance, inflammatory cells, also inflammation itself releases prostaglandins causing formation of secondary aqueous formation and IOP returns to normal within few hours to days. In a study done by Dubey, S. et al[12] 13% of SG cases were of post cataract surgery. Hence proper precautions to be taken intraoperatively that is, all the visco elastic substance to be removed from eyes.

Out of 4 (8%) cases of lens induced glaucoma 3 were of phacomorphic type and 1 case was of phacotopic type, presented in the age group of 41-60 years. As cataract is common cause of blindness globally, as this condition progresses it causes narrowing of irido corneal angle due to its morphology also causing obstruction of TM due to lens particle resulting in raised IOP. A~~In a~~ study conducted by Ramanarao S et al[1]showed 158(43%) cases of lens induced glaucoma (all were

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phacomorphictype). In a study done by Chakma P et al [7] (44.3%) cases were of lens induced glaucoma. In a study done by Gurung J et al[9]61.8%cases was lens induced glaucoma. As these studies showed lens induced glaucoma as their most common cause which is in contrast to our study, shows improvement in the health care system like ~~out reach~~outreach eye camps and early treatment of senile cataracts, thus preventing its progression to mature and hypermature cataract and subsequently to lens induced glaucoma.

We found 4 (8%) cases of steroid induced glaucoma. Due to non-judicious, over the counter use of topical or systemic steroids for various diseases, steroid induced glaucoma can occur in steroid responders. As steroids cause~~s~~ accumulation of glycosaminoglycans, phagocytes in TM causc~~eing~~ its obstruction, this~~it~~ leads to raised IOP within 3-6 weeks of its usage. The study by Gurung J et al [9] showed 86(16.3%) cases of steroid induced glaucoma,~~as~~ their 3rd most common cause of SG. In Komaraith et al [10] study, 29.5% cases of steroid induced glaucoma were detected and 7.5% cases were reported in Shua Azam et al[3] study. Hence patients need to be explained about the adverse effects of long term use of steroids and patients who require steroid therapy should undergo regular monitoring of IOP to detect steroid induced glaucoma early.

Our study also reported 4(8%) cases of Uveitic glaucoma, whichwere commonly of acute anterior uveitis type. R~~a~~ise in IOP occurs as a result of inflammation, TM gets clogged up by inflammatory cells in acute cases and trabeculitis in chronic cases and over a period of time causes peripheral anterior synechaie and leading to angle closure. 20.8% cases of uveitic glaucoma were reported in Chakma P et al[7] study, 20.5% cases were reported in Komaraith et al[10] study. The prevalence of uveitis glaucoma in our study was lower than these studies but correlates with the 8 % cases found in the study by Gurung et al[9].

Out of 3 (6%) cases of Neovascular glaucoma~~,~~ in our study 2 cases were secondary to ischaemic CRVO and 1 case due to Proliferative diabetic retinopathy. Angiogenesis over iris and irido corneal angle due to ischaemia results in obstruction of TM and synechial angle closure causing raised IOP. Gurung et al[9] study reported 68(63.6%) cases of neovascular glaucoma - where most of patients presented late with poor visual acuity, more number of cases due to change in lifestyle and lack of awareness about routine eye test in patients with systemic vascular disease. This was f~~F~~ollowed by 15.4% cases reported in Komaraith et al [10]study, 7 (14%) cases reported in RamanaraoS et al [1] study stating 33 – 64% of untreated proliferative diabetic retinopathy cases and 58-86% of patients of ischaemic CRVO develops neovascular glaucoma. Followed by this 10% cases were reported in Nanwani D[6] et al study.

Angle recession glaucoma was seen in 3 (6%) cases in our study among male patients aged between 15 – 37 years as a result of ocular blunt trauma. Trauma results in rupture of ciliary body, reducing the tone of ciliary muscle, narrowing of Schlemm's canal, obstructing aqueous outflow causing raised IOP. Glaucoma can develop immediately or months to~~or~~ years lately. Gadia R et al [8] study reported 41(28%) cases of traumatic glaucoma, more in males below 30 years of age. Nanwani D et al[6] study had 9.6% cases traumatic glaucoma and reported that damage to iris, lens, vitreous

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hemorrhage, on baseline examination has shown to have greater risk of developing glaucoma after ocular trauma. Gurung et al[9] study reported 62 (81.6%) cases of traumatic glaucoma more in males below the age of 40 years. Chakma P et al[7]study showed 19.9% cases of traumatic glaucoma. Use of safety measures at work, early referral of eye injury patients to an Ophthalmologist who can do a baseline ocular examination after any ocular injury (so that the early treatment can be initiated). This can prevent the ocular morbidity and blindness due to trauma associated SG.

Two~~2~~ cases of pseudophakic glaucoma, and one~~1~~ case of ICE syndrome was diagnosed in our study which is similar to that of Ramanarao S et al[1] study and Gurung et al[9] study.

5. STRENGTH OF THE STUDY

The various causes of secondary glaucomas were studied in detail, which helps in early diagnosis and quality treatment to prevent the visual impairment.

It is a cross sectional study, hence the patients were more cooperative to get involved in the study.

6. LIMITATIONS OF THE STUDY

As it is a cross-sectional study of only the causes of secondary glaucoma with a small sample size, which may not be helpful in understanding the clinical course and prognosis of secondary glaucomas.

7. CONCLUSION

Incidence of secondary glaucoma varies widely in different levels of eye care centers.Secondary glaucoma (SG) is a significant public health disease and can present at any age depending on the precipitating cause. SG tends to occur more commonly in elderly population, is mostly unilateral and presents with a high IOP. Pseudo exfoliation glaucoma was the most common type of SG in our study as it is an age related fibrillopathy and often missed in the initial examination. Hence early diagnosis and prompt treatment can help reduce the ocular morbidity and blindness due to SG. A ~~long~~~~term~~long term prospective study can help throw light on the course, complications and visual prognosis in patients with SG.Additionally, preventive strategies like improvement of eye care awareness, encouraging eye examinations by ophthalmologists, good control of systemic diseases like diabetes and hypertension, precautions against ocular injuriesand providing access to high quality cataract surgeries can help in reducing the occurrence of SG.

8. CONSENT

Written informed consent was taken from the patient and done according to declaration of Helsinki.

9. ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

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