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THE PROFILE OF SECONDARY GLAUCOMA AT KING HUSSEIN MEDICAL CENTER

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ABSTRACT

Aim: To describe the clinical profile, etiologies, management strategies, and outcomes of secondary glaucoma in patients treated at King Hussein Medical Center, a tertiary referral hospital in Jordan. **Methods:** This retrospective observational study included 500 patients (750 eyes) diagnosed with secondary glaucoma between January 2019 and January 2025. Data were extracted from medical records, including demographics, systemic comorbidities, glaucoma etiology, baseline and follow-up intraocular pressure (IOP), best-corrected visual acuity (BCVA), gonioscopic and optic nerve findings, and treatment modalities. Outcomes were evaluated at 6 months post-treatment. Statistical analysis was performed using SPSS version 26.0. **Results:** The mean patient age was 56.4 years, with a male predominance (58%) and equal distribution of unilateral and bilateral cases. Neovascular glaucoma (27.1%) was the most common subtype, followed by uveitic (20.0%) and traumatic glaucoma (18.0%). Surgical intervention was the primary treatment modality in 50.6% of cases and showed the highest success in achieving target IOP (<21 mmHg) in 90% of eyes. BCVA improved or stabilized in 72% of eyes overall, with phacomorphic and steroid-induced glaucoma showing the best visual outcomes. Eyes with neovascular and traumatic glaucoma had the poorest visual prognosis. **Conclusion:** Secondary glaucoma in Jordan is most commonly attributed to neovascular causes, largely reflecting the high prevalence of diabetes and other vascular comorbidities. Surgical intervention offers the most effective IOP control in advanced cases. Timely diagnosis, etiologic identification, and individualized treatment are critical for preserving visual function in affected patients. These findings provide foundational epidemiological data that can inform clinical practice and healthcare planning in the region

KEYWORDS: Secondary glaucoma, Intraocular pressure, Visual outcomes.

INTRODUCTION

Secondary glaucoma refers to a group of optic neuropathies usually results from elevated intraocular pressure (IOP) due to identifiable ocular or systemic conditions, such as trauma, neovascularization, uveitis, post-operative complications, or steroid use.[1,2] Unlike primary glaucoma, which may occur without an underlying etiology, secondary glaucoma is often more aggressive and with poorer visual outcomes.[3,4] This is attributed to delayed diagnosis and complex pathophysiology of the disease.[5] Therefore, Early detection and effective treatment are therefore essential for improvement of prognosis of the disease.[6]

Globally, glaucoma is considered the second leading cause of blindness. Despite the fact that secondary glaucoma is often under-reported, it is estimated that secondary glaucoma accounts for 10–20% of all glaucoma cases. and it seems to be more prevalent in developing countries.[7] In Jordan and regional countries, glaucoma is the third leading cause of bilateral blindness, though specific data on secondary glaucoma subtypes remain limited.[8,9]

The most important part of the management of secondary glaucoma is to identify the underlying cause while controlling IOP.[10] Medical therapy may be effective alone but in only early stages of glaucoma. Surgical interventions, including trabeculectomy, glaucoma drainage devices, or cyclodestructive procedures, are usually required in more advanced cases. The choice of treatment should be individualized depends on the etiology, severity, and the presence of active inflammation or neovascularization.[11]

This study aims to describe the clinical profile, etiologies, and outcomes of secondary glaucoma at King Hussein Medical Center, one of Jordan's leading tertiary care institutions.

Method

This retrospective observational study was conducted at the glaucoma clinic in King Hussein Medical Center (KHMC), a tertiary referral hospital in Amman, Jordan. The study reviewed medical records of patients diagnosed with secondary glaucoma between January 2019 and January 2025. All Patients who were diagnosed with secondary glaucoma and had complete clinical records, including baseline and follow-up visual acuity (VA), IOP measurements, gonioscopy, optic nerve imaging, and management details were enrolled in the study. Patients with primary glaucoma or those with incomplete medical records or missing follow-up data were excluded from the study. Demographic and clinical data were extracted from electronic and paper-based medical records, including: Age, sex, comorbidities, Etiology of secondary glaucoma, baseline and final best-corrected visual acuity (BCVA), measured using Snellen chart, IOP at diagnosis and follow-up (measured by Goldmann applanation tonometry), gonioscopy findings, optic nerve head assessment using OCT and HVF, and management strategies including Medical therapy, laser, or surgical interventions. The management Outcomes were assessed regarding of IOP and BCVA at 6 months after treatment.

Data were analyzed using SPSS version 26.0. Descriptive statistics (mean ± standard deviation, frequencies, percentages) summarized demographic and clinical characteristics. Comparative analyses (chi-square test, t-test, ANOVA) assessed differences in visual outcomes and IOP control across etiologies.

The study was approved by the Ethical approval committee of Jordanian Royal Medical Services (approval number: 11/2018) on 18/12/2018. Patient confidentiality was maintained by anonymizing data, and informed consent was waived due to the retrospective nature of the study.

RESULTS

The study included 500 patients (750 eyes) diagnosed with secondary glaucoma. The average age of patients was 56.4 years, with a male predominance (58%). Half of the patients presented with bilateral involvement. Hypertension and diabetes mellitus were the most common systemic comorbidities. At presentation, the mean IOP was significantly elevated (31.2 mmHg), which decreased to 19.6 mmHg at 6-month follow-up. The mean best-corrected visual acuity (BCVA) improved from 20/60 at baseline to 20/50 at follow-up. The demographic features of the patients are summarized in table 1.

Table 1: Demographic and Baseline Characteristics of Study Population.

Characteristic	Value
Total patients (eyes)	500 (750)
Age (mean ± SD)	56.4 ± 15.2 years
Sex	Male: 290 (58%) Female: 210 (42%)
Laterality	Unilateral: 250 (50%) Bilateral: 250 (50%)
Systemic comorbidities	Hypertension: 280 (56%) Diabetes: 220 (44%) Both: 150 (30%)
Mean baseline IOP	31.2 ± 9.8 mmHg
Mean final IOP (6 months)	19.6 ± 6.3 mmHg
Mean baseline BCVA (Snellen)	0.3 (20/60)
Mean final BCVA (Snellen)	0.4 (20/50)

Neovascular glaucoma was the most common etiology, accounting for about one-quarter of cases (27.1%). Uveitic and traumatic glaucoma followed, accounting for 20% and 18%, respectively. Steroid-induced, post-surgical, and phacomorphic/phacolytic causes were less frequent but still clinically significant contributors. The results are summarized in table 2.

Table 2: Etiologies of Secondary Glaucoma (n = 750 eyes)

Etiology	Number of Eyes (%)
Neovascular glaucoma	203 (27.1%)
Uveitic glaucoma	150 (20.0%)
Traumatic glaucoma	135 (18.0%)
Steroid-induced glaucoma	90 (12.0%)
Post-surgical glaucoma	75 (10.0%)
Phacomorphic/phacolytic	60 (8.0%)
Other (e.g., pigmentary)	37 (4.9%)

Surgical interventions were the most commonly employed management strategy, used in over half of the cases (50.6%), followed by medical therapy alone (34.7%) and combined medical-laser treatment (14.7%). The treatment choice was typically influenced by the etiology, disease severity, and IOP response. The results are summarized in table 3

Table 3: Management Strategies.

Treatment Modality	Number of Eyes (%)
Medical only	260 (34.7%)
Medical + Laser	110 (14.7%)
Surgical (± Medical/Laser)	380 (50.6%)

The mean IOP across all treatment groups showed significant improvement at 6 months. Surgical treatment resulted in the best IOP control, with 90% of eyes achieving target IOP (<21 mmHg), compared to 74% in the laser group and 63% in the medical-only group. The results are summarized in table 4.

Table 4: IOP Control by Treatment Modality.

Treatment	Mean IOP at 6 months (mmHg)	% Eyes with IOP < 21 mmHg
Medical only	22.5 ± 5.1	63%
Medical + Laser	20.3 ± 4.8	74%
Surgical	17.8 ± 4.2	90%

5. Visual Acuity Outcomes

Overall, 72% of eyes experienced either stabilization or improvement in BCVA after treatment. Visual outcomes varied significantly by etiology. The best visual prognosis was observed in eyes with phacomorphic and steroid-induced glaucoma, while neovascular and traumatic glaucoma had the highest rates of vision deterioration.

Table 5: Final Visual Outcomes by Etiology.

Etiology	Improved/Stabilized VA (%)	Worsened VA (%)
Neovascular glaucoma	55%	45%
Uveitic glaucoma	68%	32%
Traumatic glaucoma	60%	40%
Steroid-induced glaucoma	85%	15%
Post-surgical	78%	22%
Phacomorphic/phacolytic	90%	10%

DISCUSSION

This retrospective observational study provides a detailed clinical and epidemiological profile of secondary glaucoma at a major tertiary referral center in Jordan. Our findings show that neovascular glaucoma (NVG) was the most prevalent subtype, accounting for 27.1% of cases, followed by uveitic (20%) and traumatic glaucoma (18%). This distribution is broadly consistent with global data but shows some distinctive local patterns.

The high prevalence of NVG in our cohort may be explained by the increased prevalence and burden of diabetes mellitus (DM) in Jordan, which was present in 44% of our patients. Jordan has one of the highest rates of diabetes in the Middle East, with national estimates indicating a prevalence of approximately 23.7% among adults.[12] Diabetes is a well-known risk factor for proliferative diabetic retinopathy and subsequent neovascularization of the angle, leading to NVG.[13] In contrast, studies from regions with lower diabetes prevalence, such as Northern Europe or East Asia, report a lower incidence of NVG among secondary glaucoma.[14,15]

When compared to regional data, our findings are consistent with a retrospective study from Saudi Arabia, where NVG and uveitic glaucoma were also among the most common subtypes.[16] However, in contrast to some reports from sub-Saharan Africa and South Asia where traumatic glaucoma and phacomorphic glaucoma dominate due to higher trauma rates and delayed cataract surgery, our center—being a tertiary referral hospital—sees more complex, chronic cases like NVG and steroid-induced glaucoma.

Visual outcomes in our study varied significantly by etiology**;** Eyes with phacomorphic and steroid-induced glaucoma showed the most favorable BCVA outcomes, with 90% and 85% of cases showing improvement or stabilization, respectively. These types are often rapidly recognized and treated, particularly phacomorphic glaucoma which tends to respond well to timely cataract extraction.[17] In contrast, NVG and traumatic glaucoma had the worst visual prognosis, with up to 45% and 40% of eyes, respectively, experiencing a decline in vision. The poor outcomes in NVG likely reflect both the aggressive nature of the disease and the underlying ischemic retinal pathology, which is often irreversible by the time of presentation.

Similarly, traumatic glaucoma was associated with poorer visual outcomes, which can be attributed to concomitant ocular injuries such as hyphema, angle recession, or optic nerve trauma. These findings are supported by other regional and international studies, where trauma-related glaucoma are linked to a wide range of long-term complications.[18]

With regard to IOP control, surgical intervention was the most effective modality, achieving target IOP (<21 mmHg) in 90% of treated eyes, compared to 63% in the medical-only group. This reinforces the current consensus that surgery is often the mainstay modality of treatment in advanced or refractory cases of secondary glaucoma, especially in conditions such as NVG or post-traumatic glaucoma where angle anatomy is severely compromised.[19] Our data are aligned with a recent meta-analysis showing surgical interventions, including trabeculectomy and glaucoma drainage devices, as providing superior long-term IOP control in secondary glaucoma compared to medical or laser treatments alone.[20]

Factors contributing to poor visual and IOP outcomes in our study included: Advanced disease at presentation,

Delayed referral or treatment initiation, particularly in cases referred from peripheral centers, Systemic comorbidities such as uncontrolled diabetes and hypertension, and narrow or closed angle on gonioscopy**.**

This study has several limitations that should be acknowledged. First, due to its retrospective design, it relies on the accuracy and completeness of medical records, Second, the study was conducted at a single tertiary referral center, which may limit the generalizability of the. In addition, the referral for some etiologies of secondary glaucoma, such as pigmentary or angle-recession glaucoma, are limited for severe or advanced cases. Lastly, we did not assess the impact of treatment adherence, which may greatly affect patient outcomes.

To our knowledge, this is one of the first comprehensive studies to characterize the epidemiology, clinical features, and outcomes of secondary glaucoma in Jordan. It highlights neovascular glaucoma as the most common subtype, emphasizing the significant impact of systemic comorbidities—particularly diabetes mellitus.

CONCLUSION

Secondary glaucoma is a complex and vision-threatening condition with diverse etiologies and variable outcomes. In this Jordanian cohort, neovascular glaucoma was the predominant cause, reflecting the high prevalence of systemic vascular diseases such as diabetes. Surgical intervention was the most effective approach in achieving intraocular pressure control, particularly in advanced or refractory cases. Visual outcomes were strongly associated with underlying etiology, disease severity, and timeliness of intervention. Systemic and ocular disease management, early referral, and treatment may greatly improve the prognosis and outcomes of secondary glaucoma.

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