

Clinical and demographics profile of glaucoma patients in Hebron, Palestine — a retrospective hospital-based study

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ABSTRACT

BACKGROUND: The purpose of the study was to describe the clinical profile of glaucoma types, treatment modalities, visual outcomes, and intraocular pressure (IOP) control for patients in Palestine.

MATERIAL AND METHODS: Data collection was done through the hospital record review, which included basic demographics including file number, age, sex, family history of glaucoma, history of anti-glaucoma and steroid medication, history of ocular trauma or surgery, etiology of secondary glaucoma and history of systemic illness. All the patients had a comprehensive eye examination, including visual acuity, intraocular pressure, vertical cup-disc ratio, and gonioscopy. Data were obtained, tabulated, and organized using Microsoft Excel, and statistical analyses were done using Wizard Version 1.9.49 by Evan Miller.

RESULTS: There were 100 females with a mean age of 53 and 101 males with a mean age of 67. Primary open-angle glaucoma and its variants represented 45.3% of all patients, while secondary glaucoma represented 40.3% and primary angle closure glaucoma represented 10.4%. The prevalence of glaucoma increased with age, and the last visual acuity (VA) showed that 39.2% of eyes had Normal/near normal VA. The highest average IOP of 25 mm Hg was recorded among secondary glaucoma patients. Of all glaucoma eyes studied, 64% were on one or two medications, and the most common surgical procedures performed were peripheral iridectomy 18.2% followed by trabeculectomy 15.5%.

CONCLUSION: Primary open-angle glaucoma (POAG) was the predominant glaucoma. Glaucoma increased significantly with advancing age. Pseudoexfoliation and neovascular glaucoma comprised the majority of secondary glaucoma.

KEY WORDS: clinical characteristics; glaucoma types; age; gender; IOP; Palestine

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INTRODUCTION

Glaucoma is a group of eye disorders characterized by progressive optic nerve damage resulting in a characteristic optic disc appearance, leading to a specific pattern of irreversible visual field defects and blindness. It is often associated with elevated intraocular pressure (IOP), although

it can also occur with normal or low IOP. Early detection through regular eye examinations is crucial since glaucoma is typically asymptomatic in its early stages. The primary goal of glaucoma management is to lower IOP and prevent further damage through medication, laser therapy, and surgery.

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Glaucoma is the third leading cause of blindness worldwide [1]. This study focuses on investigating the clinical profile and patient characteristics of glaucoma in Southern Palestine, targeting the Hebron region. By examining the demographics of glaucoma cases, this study aims to identify patterns and can assist clinicians in managing the disease effectively.

Glaucoma is classified into primary open-angle glaucoma (POAG), primary angle-closure glaucoma (PACG), secondary glaucoma, and congenital glaucoma. Risk factors include elevated IOP, advanced age, race, thin central cornea, family history, myopia, eye trauma, specific structural eye abnormalities, and certain medical conditions such as diabetes, hypertension, and cardiovascular disease.

This study adheres to international guidelines and terminology, ensuring consistency and comparability with other global studies. By characterizing glaucoma cases and examining treatment modalities, visual outcomes, and IOP control, this study aims to contribute to glaucoma management knowledge and improve care provided for patients in Palestine.

While glaucoma prevalence studies have been conducted in other Middle Eastern countries, there is a lack of local studies in Palestine. This research aims to fill this gap.

The findings from this study will not only enhance the understanding of glaucoma in Palestine but also aid in developing effective screening and management strategies, ultimately improving the quality of care for glaucoma patients.

MATERIAL AND METHODS

This is a retrospective, descriptive, and quantitative study over a period of 1 year conducted among glaucoma patients attending St. John Eye Hospital, Hebron. The study included all glaucoma patients who presented to the Glaucoma Unit during the study period. Data collection was done through the hospital record review. We carried out the study following the tenets of the Declaration of Helsinki.

Data collected from patients' medical records were the primary demographic data, including file number, age, sex, family history of glaucoma, history of prolonged steroid medication and, history of any prior ocular trauma or ocular surgery, and history of any systemic illness. All the patients had a comprehensive eye examination. The last documented visual acuity (VA) was obtained using the Snellen Chart. Intraocular pressure (IOP) was

obtained with the Goldman applanation tonometer or the Tonopen. The examiner estimated the vertical cup-disc ratio (CDR) at the slit-lamp using a Volk 90D. A 3-mirror Goldman lens was used for gonioscopy. Standard automated perimetry (SAP) was done with the Octopus perimeter using central 30 degrees, size III white stimulus. Data on anti-glaucoma medication, filtering surgery or drainage device, and the etiology of secondary glaucoma were collected. If both eyes had glaucoma, we included the data from both eyes in the analysis. If one eye was diagnosed with glaucoma, we only included data on the affected eye.

The following definitions for glaucoma types were used: POAG was defined as open and normal appearing angle by gonioscopy with IOP > 21 mm Hg associated with either glaucomatous optic disc (OD) abnormalities or glaucomatous visual field (VF) abnormalities or with both. Normal tension glaucoma (NTG) was defined as an open and normal appearing angle with IOP < 21 mm Hg associated with either glaucomatous OD abnormalities, glaucomatous VF abnormalities, or both. Ocular hypertension (OHT) was defined as an open and normal appearing angle by gonioscopy with IOP > 21 mm Hg associated with normal appearing OD and average VF. Glaucoma suspect was defined as an IOP > 21 mm Hg associated with suspicious angle, suspicious OD, and suspicious VF.

PACG was defined as an occludable eye with peripheral anterior synechiae, iridocorneal contact, and an IOP of 21 mm Hg or more, with glaucomatous optic nerve damage and VF loss. Secondary glaucoma: IOP > 21 mm Hg associated with either glaucomatous OD abnormalities or glaucomatous VF abnormalities or with both, associated with a positive history and ocular findings (e.g., trauma, previous surgery, neovascularization, inflammation, any ocular or systemic abnormalities that could cause IOP elevation). In addition, glaucoma, patients with a history of use of topical steroids (6 months), a history of trauma or ocular surgery, chronic uveitis, evidence of pseudoexfoliation or pigment dispersion, evidence of intumescent cataract were grouped under secondary glaucoma. Congenital glaucoma was defined as idiopathic glaucoma arising in children under 3 years of age, and diagnosis was made in the presence of elevated IOP (measured under general anesthesia) in association with at least one of the following findings: corneal haze with or without Haab's striae, enlarged corneal diameter (> than 12 mm), and an increased

cup-disk ratio of > 0.4 or significant cupping asymmetry between both eyes. Juvenile glaucoma was defined as an idiopathic glaucoma diagnosed in patients between the ages of 3 and 30 years having the criteria of POAG.

Visual acuity (VA) was defined as normal or near-normal visual acuity (NV) with last VA $> 6/18$, Moderate visual impairment (MVI) with last VA $< 6/18$ and $> 6/60$, Severe visual impairment (SVI) with last VA $< 6/60$ and $> 3/60$, Limited functional vision (LFV) with last VA $< 3/60$ and $> 1/60$, near-total blindness (NTB) with last VA $< 1/60$ and $>$ perception of light (PL), and total blindness (TB) with last VA as no perception of light (NPL). Gonioscopy findings were defined as closed angle (no visible structures), very narrow angle (Schwalbe's line visible), narrow angle (trabecular meshwork visible), open angle (scleral spur visible), and wide open angle (ciliary body visible). Cup-disk ratio (CDR) was defined as normal ($0.4 - < 0.5$), early cupping ($0.6 - 0.7$); moderate cupping ($0.7 - 0.8$), severe cupping (> 0.8), total cupping (1.0).

Data were obtained, tabulated, and organized using Microsoft Excel 2016, and statistical analyses were subsequently carried out using Wizard Version 1.9.49 by Evan Miller.

The variables used in the survey were types of glaucoma, age group, gender, therapeutic approach, comorbidities, and IOP.

RESULTS

The retrospective study reviewed 208 patient charts over 1 year. We excluded seven patients who did not have glaucoma and one prosthetic eye, resulting in 201 patients and 401 eyes. Of the eyes studied, only 334 eyes were diagnosed as glaucomatous and were included in the study.

Types of glaucoma in the study population are presented in Table 1. There were 100 females with a mean age of 53 years \pm 17.5 (range 3–105), and 101 males with a mean age of 67 years \pm 16.6 (range 7–92). Males accounted for 50.2% of patients, and females represented 49.8%. Primary open-angle glaucoma and its variants represented 45.3% of all patients, with almost equal representation among females and males, while secondary glaucoma represented 40.3% of all patients studied, with higher representation among males than females. Primary angle closure glaucoma represented 10.4% of patients, with higher female representation.

The most common risk factors detected in our study were patients older than 60 years of age (62.7%), diabetes mellitus (24.9%), and hypertension (19.4%). Notably, we did not detect any case mentioning a positive family history of glaucoma.

Glaucoma types based on age group, last VA, mean IOP, gonioscopy, visual fields, and CDR are presented in Table 2. The study showed that the prevalence of glaucoma increased with age, and the majority of patients studied (106, 52.8%) were in the age groups 60–79 years. Last VA showed that 39.2% of eyes had normal/near normal VA and 29.9% had mild visual impairment, and 17.7% had near-total blindness. The highest average IOP of 25 mm Hg was recorded among secondary glaucoma patients, followed by 21 mm Hg and 19 mm Hg among PACG and POAG patients, respectively.

Of studied eyes, the most common gonioscopic finding was wide open angles — 38.6% and CDR ratios ranged from total cupping 32.6% to normal 26.3%. The most common VF defects seen were normal 8.1% and nasal step 8.1%.

Patient treatment modality based on eyes is presented in Table 3. Of all glaucoma eyes studied, 64% were on one or two medications at their last visit, while the most common glaucoma treatments were a combination drop (timolol and carbonic anhydrase inhibitor) 32.6% followed by prostaglandins 28.4%.

The most common surgical procedures performed were peripheral iridectomy 18.2% followed by trabeculectomy 15.5%.

POAG and variants (NTG and OHT)

A total of 91 patients and 157 eyes were included in the study. Most patients were older than 50 years old, with almost equal representation between males and females. Most of these patients' last VA was normal-moderate visual impairment. CDR ranged from moderate to total cupping, and the majority had wide open angles on gonioscopy. Mean IOP ranged from 15 to 19 mm Hg. The most common VF defects seen in these patients were nasal step and arcuate scotoma. The most common surgical procedures performed for these patients were trabeculectomy and or peripheral iridectomy. Most POAG and OHT patients used one or two eye drops, while NTG patients received none. Compliance with drops was 81% for POAG and 80% for OHT patients. The mean age of patients with POAG and its variants was 56.3 ± 18.9 years.

Table 1. Types of glaucoma in study group								
Glaucoma type	Patients	%	Males	%	Females	%	Eyes	%
Primary open angle glaucoma (POAG)	80	39.8%	40	39.6%	40	40.0%	136	40.7%
Normal tension glaucoma (NTG)	3	1.5%	2	2.0%	1	1.0%	6	1.8%
Ocular hypertension (OHT)	8	4.0%	3	3.0%	5	5.0%	15	4.5%
Glaucoma suspect (GS)	5	2.5%	3	3.0%	2	2.0%	9	2.7%
Primary angle closure glaucoma (PACG)	21	10.4%	8	7.9%	13	13.0%	36	10.8%
Congenital glaucoma (CG)	1	0.5%		0.0%	1	1.0%	1	0.3%
Juvenile glaucoma (JG)	2	1.0%	2	2.0%			3	0.9%
Secondary glaucoma (2ry G)	81	40.3%	43	42.6%	38	30.0%	128	38.3%
Aphakic	3		2		1		4	
Fuchs	2		1		1		2	
Inflammatory	6		4		2		7	
Neovascular	14	7%	8		6		20	
Pseudoexfoliation	36	17.9	18		18		64	
Phacomorphic*							1	
Pigmentary	3		2		1		4	
Traumatic	6		5		1		7	
Post cataract extraction	1		1				1	
Post lensectomy	6		2		4		11	
Steroid-induced	3				3		5	
Secondary ACG	1				1		2	
Total	201	50.2%	101	49.8%	100	49.8%	334	

*Patient had 2 types of glaucoma (POAG and phacomorphic)

Juvenile glaucoma

Our study included two patients diagnosed with juvenile glaucoma. Both patients were males aged 12 and 15 years old. The 12-year-old patient's last VA was Normal/near normal in both eyes, while the 15-year-old patient's last VA was severe visual impairment in the left eye (the right eye was excluded from the study). The IOP ranged from 15-16 mmHg for both patients. CD ratios were normal (0.5) and moderate cupping (0.8) for the 12-year-old patient and the 15-year-old patient, respectively. The 12-year-old patient's visual fields were normal, and no VF was done by the second patient. Timolol was used by the 12-year-old patient in both eyes, and the other patient used latanoprost, and no surgery was performed on either patient.

Glaucoma suspects

A total of 5 patients and 9 eyes with glaucoma suspects were included in the study. All of these patients' last VA was normal/near normal; their CDR was split between regular and moderate cupping on gonioscopy. The mean IOP was 17 mm Hg. Three patients had their visual fields done; two were nor-

mal, and one was unreliable. These patients did not receive any surgical intervention or used any medications.

Primary angle closure glaucoma

A total of 21 patients and 36 eyes with PACG were included in the study. There were 13 females and 8 males. Most patients were older than 60 years of age. Most of these patients' last VA was between normal-moderate visual impairment, their CDR ratio ranged from normal to total cupping, and they had closed angles (G0) on gonioscopy. The mean IOP was 21 mm Hg. The most common VF defects seen were the nasal step and central island. A majority of eyes had peripheral iridectomy and or trabeculectomy done. Most patients used one, two, or three eye drops, and compliance with drops was 78%. The mean age of patients with PACG was 58.5 ± 15 years.

Congenital glaucoma

There was one case of congenital glaucoma in our study: a 22-year-old female with a history of right congenital glaucoma and buphthalmos. Her

Table 2. Glaucoma types based on age group, last visual acuity (VA), mean intraocular pressure (IOP), Gonio, visual field (VF), and cup-disc (CD) ratio

Glaucoma type	POAG	NTG	OHT	GS	PACG	CG	JG	2ry G	Total	%
Age group (201 patients)	80	3	8	5	21	1	2	81	201	
0–4								1	1	0.5%
05–09	2								2	1.0%
10–19	2						2	9	13	6.5%
20–29	4	1		1		1		5	12	6.0%
30–39	3		1	1	1			7	13	6.5%
40–49	6	1		3	4				14	7.0%
50–59	10	1	1		2			7	21	10.4%
60–69	23		3		8			17	51	25.4%
70–79	24		1		4			26	55	27.4%
80+	6		2		2			9	19	9.5%
Last VA (334 eyes)										
Normal/near-normal VA (NV)	56	6	12	9	13		2	33	131	39.2%
Moderate visual impairment (MVI)	41		3		14			42	100	29.9%
Severe visual impairment (SVI)	7				1		1	6	15	4.5%
Limited functional vision (LFV)	1				1			1	3	0.9%
Near-total blindness (NTB)	25				4			30	59	17.7%
Total blindness (TB)	6				3	1		16	26	7.8%
Mean IOP	19	15	17	17	21	60	15	25*		
Gonio (334 Eyes)										
Closed angle	1				28			15	44	13.2%
Very narrow angle					3			2	5	1.5%
Narrow angle	10		1					4	15	4.5%
Open angle	9		2		3			9	23	6.9%
Wide open angle	54	4	10	2	2		1	56	129	38.6%
Undetermined									118	35.3%
VF defect (334 eyes)										
Normal	9		8	2	3		2	3	27	8.1%
Arcuate scotoma	12	2						4	18	5.4%
Nasal step	13	3	1		4			6	27	8.1%
Paracentral scotoma					1				1	0.3%
Central island	9		2		5			5	21	6.3%
Total loss	1				1			1	3	0.9%
Unreliable	11			1	3			4	19	5.7%
Not done									218	65.3%
CD ratio (334 eyes)										
Normal	22	1	12	4	9		2	38	88	26.3%
Early cupping	7				4			7	18	5.4%
Moderate cupping	32	5	2	5	3		1	17	65	19.5%
Severe cupping	1				2			4	7	2.1%
Total cupping	63				17			29	109	32.6%
Undetermined									47	14.1%

POAG — primary open angle glaucoma; NTG — normal tension glaucoma; OHT — ocular hypertension; GS — glaucoma suspect; PACG — primary angle closure glaucoma; CG — congenital glaucoma; JG — juvenile glaucoma; 2ry G — secondary glaucoma; *Mean of 2ry glaucoma includes one phacomorphic glaucoma

Table 3. Treatment modality by eye										
	POAG	NTG	OHT	GS	PACG	CG	JG	2ry G	Total	%
Eyes	136	6	15	9	36	1	3	128	334	
Bottles										
1	49		5		8		3	40	105	31.4%
2	45		2		17			45	109	32.6%
3	13		1		7			7	28	10.2%
4								2	2	0.6%
No Medication	29	6	7	9	4	1		28	84	25.1%
Medication										
Prostaglandins	56		3		13		1	50	123	28.4%
Beta-blockers	28		3		12		2	32	77	17.8%
Alpha-adrenergic agonists	19		1		3			21	44	10.2%
Carbonic anhydrase inhibitors	11		2		6			14	33	7.6%
Combination	64		3		17			57	141	32.6%
Miotics					12			3	15	3.5%
Surgery										
PI	14				20			13	48	18.2%
ALT	2							1	3	1.1%
Trabeculectomy	18				10			14	42	15.5%
Ahmed valve	1							3	4	1.5%
Molteno's tube	1							2	3	1.1%
Cyclodiode laser	2							6	8	3.0%
Iridoplasty					3				3	1.1%
Drop compliance*	110	6	12	9	28	1	3	95	264	
Drop compliance %	81%	100%	80%		78%	100%	100%	74%		

POAG — primary open angle glaucoma; NTG — normal tension glaucoma; OHT — ocular hypertension; GS — glaucoma suspect; PACG — primary angle closure glaucoma; CG — congenital glaucoma; JG — juvenile glaucoma; 2ry G — secondary glaucoma; PI — peripheral iridectomy; ALT — argon laser trabeculoplasty; *Compliance was deducted from records over periods of visits. Prostaglandins: latanoprost or bimatoprost; beta-blockers: timolol; alpha-adrenergic agonists: brimonidine; carbonic anhydrase inhibitors: dorzolamide or acetazolamide; combination: dorzolamide + timolol; miotics: pilocarpine

IOP was 60 mm Hg, and she was blind in that eye. The patient was put on drops but never used them. She was advised that she might need diode-laser treatment and possible tube surgery.

Secondary glaucoma

A total of 81 patients and 128 eyes with secondary glaucoma were included in the study. Most patients were older than 60, with 30% females and 42.6% males. Most of these patients' last VA was between Normal VA and moderate visual impairment; their CDR was average in 38 cases and total cupping (1.0) in 29 cases, and they had wide-open angles (G4) on gonioscopy. The mean IOP was 25 mm Hg. A majority of eyes had peripheral iridectomy and or trabeculectomy done. Most patients used one of two eye drops; compliance with drops was 74%. The most common types of secondary glaucoma were pseudoexfoliation, with 17.9%,

and neovascular, with 7% of all glaucoma types. The mean age of patients with secondary glaucoma was 62.7 ± 19.3 years.

Overall, this study provides a preview into the prevalence and characteristics, clinical profiles, and treatment patterns of glaucoma patients seen at St. John's Eye Hospital, Hebron, Palestine.

DISCUSSION

This was a cross-sectional retrospective descriptive study to determine the characteristics of glaucoma patients at St. John's Eye Hospital, Hebron, over one year.

Glaucoma is not a single disease entity of raised intraocular pressure (IOP) only but a complex disorder that is characterized by diverse clinical and histopathological manifestations, leading to gradual visual loss in the majority of cases, which

is irreversible and permanent. Despite its numerous presentations, glaucoma is still diagnosed by raised IOP, disc changes, field changes, and loss of the retinal nerve fiber layer. Raised IOP is the only treatable factor in glaucoma, which can be lowered by medical means, laser treatment, or surgery.

Glaucoma is the third leading cause of blindness worldwide [1]. Regarding the visual acuity observed in our study, 69.1% of participants showed average or moderate visual impairment at their last presentation. The percentages of cases with near-total blindness and total blindness at the last presentation were 17.7% and 7.8%, respectively, which is not in accordance with world data. There were no significant differences in gender regarding the last visual acuity.

There was no significant difference in gender regarding all types of glaucoma in our study. Male:female ratio was almost 1:1. This finding was inconsistent with other studies where male predominance was seen in some studies, and some studies showed female predominance [2, 3].

POAG patients in our study (including NTG, OHT, and juvenile glaucoma) comprised 45.3% of the patients, and PACG constituted 40.3% of patients. These findings are consistent with many Western studies [4]. However, population-based studies from Asia and the Far East, such as China and India, report that PACG is more prevalent than open-angle glaucoma [5–8]. The study also revealed that about 20.5% of the patients were under 40 years of age, indicating that glaucoma occurs at a younger age in our population compared to other populations. Cheng et al. [9] found that angle closure glaucoma is found more in women. Our study showed the same results with 13% females and 7.9% males.

Prevalence of glaucoma was shown to increase with advancing age in our population: 7% in 40–49 years, 10.4% in 50–59 years, 25.4% in 60–69 years, and 27.4% in 70–79 years. However, the prevalence decreased to 9.5% in 80+ years. This observation was seen in other studies [3, 10]. Increasing age is considered a significant risk factor for glaucoma [11]. The mean age recorded in our study was 61.2 ± 18.2 years. This result is in concordance with other studies [12, 13]. The mean age for females was 53 ± 17.5 years, and for males, 67 ± 16.6 years.

Most patients in this study (64%) were using one or two glaucoma medications at their most recent clinical visit. A large proportion of patients still required medications even after surgery. Pros-

taglandins and combination drops were the most commonly used medications, while miotics were used the least. Peripheral iridectomy was the most frequently performed surgery, followed by trabeculotomy. Approximately 33% of eyes in the study underwent at least one glaucoma surgery, excluding NTG, OHT, and juvenile glaucoma.

Qiao et al. [14] Beijing study and Aponte et al. [15] Olmstead County study found that traumatic and surgical causes of childhood glaucoma were the most common. Our study does not confirm the role that trauma plays in childhood glaucoma.

Our study showed that pseudoexfoliation glaucoma formed the third largest group of glaucoma patients, with 17.9% of all patients studied. Various studies show the prevalence of pseudoexfoliation glaucoma as 5.2% [16], 13% [17], and 50% [18].

We observed a mean IOP of 25 mm Hg in the secondary glaucoma group, 19 mm Hg in the POAG group, and 21 mm Hg in the PACG group. Similar observations were made by Meena et al. [19].

Visual field defects varied significantly based on the type of glaucoma, but nasal step and arcuate scotoma were the most common.

Finally, it is worth mentioning that around 2.7% of the patients were labeled as glaucoma suspects.

Several limitations need to be acknowledged in this study, including missing data and the study's retrospective nature. Moreover, the presence of different physicians who measured intraocular pressures and assessed the vertical CDR resulted in significant interobserver variability. Another potential limitation was the possibility of differences in the diagnosis of glaucoma between fellow eyes, leading to altered prevalence rates among various subgroups. Additionally, this study's limitations include its hospital-based design and small sample size, which may restrict the generalization of the findings. Nonetheless, we consider these findings as a baseline for future more extensive population-based studies aimed at establishing the true incidence and prevalence of glaucoma in Palestine.

CONCLUSION

POAG (including normal tension and OHT) was the predominant glaucoma. The proportion of glaucoma increased significantly with advancing age. Pseudoexfoliation and neovascular glaucoma accounted for the majority of secondary glaucoma. On their last visit, most patients had normal

to near-normal visual impairment. Most patients used one or two drops, while the most common glaucoma treatments were a combination drop followed by prostaglandins. The most frequent surgical procedures were peripheral iridectomy and trabeculectomy.

Data availability statement

All data is available.

Ethics statement

The author was following the tenets of the Declaration of Helsinki.

Conflict of interest

Author declare no conflict of interest.

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