Original Article

Glaucoma Profile in a Tertiary Eye Hospital of Bangladesh

Islam MA[1], Azam AAH[2], Siraj MS[3], Alam AE[4], Hasanuzzaman M[5], Rasel SMSB[6]

Abstract

Background: *Glaucoma is a chronic progressive optic neuropathy associated with characteristic optic nerve damage which may lead to certain visual field loss patterns at least some part of which is due to a sub optimal intra ocular pressure. Glaucoma is also known as silent killer of vision.* ***Objective:*** *To evaluate the pattern of glaucoma among the patients who were presented to a tertiary eye hospital, in southern region of Bangladesh.* ***Method:*** *A prospective observational study was done in outpatient department (OPD) of a tertiary eye hospital from January 2019 to December 2019. All patients with glaucoma were included. Data on age at presentation, gender, laterality, intraocular pressure, cup/disk ratio (C:D) with neuroretinal rim (NRR) and diagnosis were collected from OPD. Patients in age of 1 day - 100 years were included in this study. Patients were grouped into three age groups (0-25 years, 26-50 years and >50 years) and grouped in terms of clinical diagnoses.* ***Result:*** *A total of 387 eyes of 292 patients were included. Primary angle closure glaucoma (PACG) was the predominant type (45%) followed by primary open angle glaucoma (POAG) (32%), secondary glaucoma (14%) and normal tension glaucoma (6%). Other types including juvenile glaucoma (2%) and congenital glaucoma (1%) were also present but of lower prevalence.* ***Conclusion:*** *Primary angle closure glaucoma (PACG) was the predominant form of glaucoma followed by POAG suggesting that the pattern in Bangladesh could be quite different from that reported for primary glaucoma in the Western literature.*

Key words: Glaucoma, Blindness, Optic nerve, Visual field

Received: April 29, 2022; **Accepted:** June 15, 2022

Introduction

Glaucoma is not a single disease process, but a large group of disorders characterized by widely diverse clinical and histopathological manifestations. It is one of the blinding diseases for both child and adult. Glaucoma is the leading cause of irreversible blindness worldwide, affecting all age groups, gender and race. In 2010, it has been estimated that 60 million people have open angle and angle closure glaucoma. By 2020, this number will increase by 20 million[1].

Globally, in 2002, more than 161 million people were visually impaired, of whom 124 million had low vision and 37 million were blind. From South-East Asia 27% of people were with visual impairment. Glaucoma is the second leading cause of blindness worldwide[2]. The social and economic impact of this is huge and includes difficulty in seeking employment, mobility, ability to drive, social isolation and depression. The prevalence of glaucoma varies across different populations. POAG accounts for 90% of all glaucoma in blacks and whites and some Asian populations. PACG predominates in south Asian population[1]. Risk of blindness from POAG is 5-10% and undiagnosed or preclinical POAG is the greatest reservoir of preventable blindness in the world where less than 50% of cases have been diagnosed yet[1]. The global burden of glaucoma is predicted to increase in the coming decades, where the prevalence of glaucoma among the population 40+ of age is calculated to increase from 2.65% in the year 2010 to 2.86% by the year 2020[3].

Additionally, the burden of congenital and childhood glaucoma is also quite high worldwide and specifically in the Middle East and developing countries where the prevalence of blindness among children is around 0.051% contributing 3.9% of the total blindness[4]. Unless serious intervention is considered, these figures will drastically increase by the year 2020. It is evident that there is a critical need to tackle important blinding diseases not only for humanitarian reasons but also considering the high

[1] Dr. Mohammad Ariful Islam, Asst. Prof. (Ophthalmology), National Institute of Ophthalmology & Hospital, Dhaka, Bangladesh.
[2] Dr. Amir Abdulla-Hel Azam, Junior Consultant (Ophthalmology), Sheikh Fazilatunnessa Mujib Eye Hospital & Training Institute, Gopalganj, Bangladesh.
[3] Dr. Md. Shahjahan Siraj, Junior Consultant (Ophthalmology), National Institute of Ophthalmology & Hospital, Dhaka, Bangladesh.
[4] Dr. Afroza-E-Alam, Junior Consultant (Surgery), Upazilla Health Complex, Laksham, Cumilla, Bangladesh.
[5] Dr. Md. Hasanuzzaman, Medical Officer (Ophthalmology), National Institute of Ophthalmology & Hospital, Dhaka, Bangladesh.
[6] Dr. S M Shafiul Bari Rasel, Medical Officer (Ophthalmology), Sheikh Fazilatunnessa Mujib Eye Hospital & Training Institute, Gopalganj, Bangladesh.

Address of Correspondence: Dr. Mohammad Ariful Islam, Asst. Prof. (Ophthalmology), National Institute of Ophthalmology & Hospital, Dhaka, Bangladesh. Mobile: +8801717855790, Email: drarifuleye@gmail.com

impact of these conditions on the economy, rate of development and other quality of life issues. Therefore, the estimated average of disability adjusted life years (DALYs) due to glaucoma is 4.72 million DALYS which is quite high[5]. Glaucoma can be primary or secondary. Secondary glaucoma is a form of glaucoma in which the etiology is traceable to an ocular or systemic pathology. Secondary glaucoma refers to any form of glaucoma in which there is an identifiable cause of increased intraocular pressure (IOP) resulting in optic nerve damage with or without vision loss[6]. As with primary glaucoma, secondary glaucoma can be of open angle or angle closure type which can be unilateral or bilateral. Most primary glaucoma are managed by early diagnosis and treatment however secondary glaucoma differ from primary by the fact that, if the primary pathology is treated properly and the possibility of secondary glaucoma is kept in mind, glaucomatous damage can be easily prevented[6]. Early detection of the risk factors and etiology of secondary glaucoma can help to avoid progression of this disease. Ocular trauma, cataract, diabetic, hypertension and infectious uveitis represent special risks for developing secondary glaucoma[7].

Understanding the pattern and the associated characteristics of glaucoma is an essential and crucial step to develop strategic plans and corresponding intervention programs. There is a need to establish an accurate baseline, clarifying the current needs, helping health policy makers to arrange their priorities for effective intervention in terms of training and other important health policy measures at the national health level. The purpose of the current study was to estimate the pattern of different glaucoma types and associated patient characteristics among patients presented to our hospital. As no study to date had been conducted amongst the population of Southern Region of Bangladesh; thus, we undertook this study to see the prevalence of various types of glaucoma in this region and to compare them to the various studies within other part of Bangladesh and worldwide.

Materials and Methods

A prospective observational study was done in outpatient department (OPD) of Sheikh Fazilatunnessa Mujib Eye Hospital & Training Institute (SFMEHTI), Gopalganj, Bangladesh; from January 2019 to December 2019. All glaucoma or glaucoma suspect patients who were presented to this hospital were included. Patients in age of 1 day to 100 years were included in this study. Patients were grouped into three age groups (0-25 years, 26-50 years and >50 years) and grouped in terms of clinical diagnoses. History was taken in regard to chief complaints, any history of pain, redness, watering, decrease in vision, frequent change of glasses, colored haloes, photophobia, any history of previous eye surgery, trauma, any laser treatment of the eye, use of topical steroids, any family history of glaucoma, any history of systemic disease like diabetes mellitus, hypertension and asthma. Ocular examination included visual acuity and the best corrected visual acuity. Visual acuity (VA) was obtained with illuminated Snellen chart. Refraction was done where it was indicated. External eye examination, papillary light reaction and overview of anterior segment were performed with torch light in a screening mode. Slit Lamp Examination was the backbone of the study and the detailed ocular examination for glaucoma was done with a slit Lamp biomicroscope. Careful examination of cornea, anterior chamber, iris, pupil, and lens was done. Pseudo-exfoliation (PEX) deposits on the corneal endothelium, iris and iris margin were examined using 16-20 times magnification before dilating the pupil. The anterior lens surface was also screened for any PEX material. PEX syndrome was diagnosed by the typical white deposits on the iris and/or anterior lens surface, anterior vitreous face, posterior capsule and even on the intraocular lens. Stereoscopic examination of the optic disc and parapapillary area was performed at the slit lamp using a +90-dioptre lens. Vertical cup:disc ratio (vCDR) was measured and recorded in units of 0.5. Asymmetry of discs, notching, bayoneting, disc haemorrhages, peripapillary atrophy and tilted discs were noted and recorded. The width and locations of the thinnest neuroretinal rim was also noted. The posterior pole was examined with red free light to note early changes of retinal nerve fiber layer in the arcade. Gonioscopy was attempted in all participants with a Goldmann three mirror gonioscope and the angles were graded according to RPC classification.[8-10] If the posterior pigmented trabecular meshwork was not visible in the three quarters or more of the angle circumference in the primary position without manipulation in the presence of low illumination, the angle was considered occludable, otherwise it was open (i.e. grade 3 or less). If the patient was not cooperative with gonioscopy, the Van Herrick technique was used to grade peripheral anterior chamber depth. When peripheral chamber was equal to or less than ¼ th of corneal thickness, the angle was considered occludable. All participants with open angles determined on gonioscopy had their eyes dilated using tropicamide 1%. Participants who had dilatation deferred because of occludable/narrow angles had dilated examination performed after laser iridotomy either on the same day or on a subsequent day. Gonioscopy was done by Goldmann three mirror gonioscope in all the cases. This helped in classifying the glaucoma into the various subtypes and to record changes like peripheral anterior synechia, pigmentation of trabeculum strampollis line, angle configuration, any neovascularization, PEX material, angle recession etc. Intra ocular

pressure (IOP) was recorded with either the Goldman or Perkins applanation tonometer or this was used throughout the study. Visual fields were tested with the Humphrey Field Analyzer using the threshold 24-2 or 30-2 test strategy. SITA programme was used in selected patients who had good vision and were cooperative and analyses of data was performed. P value of < 0.05 was considered significant. Visual field tests were judged to be reliable if fixation losses <33%, false positives <40%, and false negatives <33%. Reliable tests showing defects >5 dB in depth in an area 12˚x12˚ were considered probably glaucomatous, while those consistent with definite glaucoma were >10 dB in depth and 18˚x12˚. It was required that the cluster of points in these areas be confined to one horizontal hemi field. The four points along the superior margin of the field were disregarded in grading, as were the nine points surrounding the blind spot. Medical files of all patients were retrieved and evaluated through standardized international guidelines. The specific type of glaucoma was determined based on the clinical presentation, optic nerve-head findings, gonioscopic findings, slit lamp, IOP and visual-field changes. The eye with the worse visual acuity and/or visual-field defect was included in the analyses.

Results

A total of 387 eyes of 292 patients were included. Primary angle closure glaucoma (PACG) was the predominant type (45%) followed by primary open angle glaucoma (POAG) (32%), secondary glaucoma (14%) and normal tension glaucoma (6%) [Figure-1]. Other types including juvenile glaucoma (2%) and congenital glaucoma (1%) were also present but of lower prevalence.

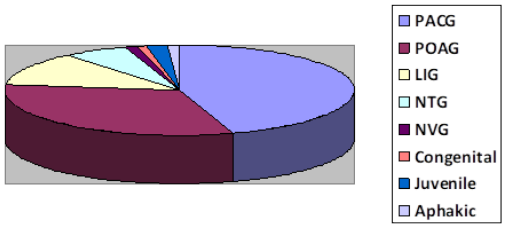

Figure-1: Distribution of different glaucoma type by prevalence. PACG (45%), POAG (32%), LIG (12%), NTG (6%), Juvenile glaucoma (2%), Congenital glaucoma (1%), NVG (1%) and Aphakic & others glaucoma (1%).

A total of 387 eyes of 292 patients fulfilled the inclusion criteria. Out of those, 152 (52%) were males and 140 (48%) were females, with 238 (81.52%) suffering bilateral and 54 (18.48%) unilateral disease. The mean age of our sample was 49.9 ranging from 1 day to 100 years. Patients were grouped into three age groups (0-25 years, 26-50 years and >50 years) and in terms of clinical diagnoses. According to the 10th Revision of the WHO International Statistical Classification of Diseases, Injuries and Causes of Death; 14 (5%) were blind at presentation and 54 (14%) patients were severely visually impaired (SVI). Patients with normal vision was 137 (47%), while 85 (30%) had visual impairment (VI). Among these 292 patients, 7 eyes did not perceive any light [Figure-2].

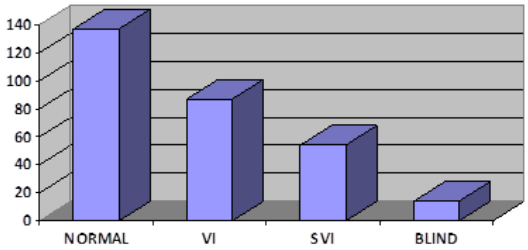

Figure-2: Bar diagram shows visual status at the time of presentation; Normal, visually impaired (VI), severely visually impaired (SVI) and blind. Most of the patients (47%) were with normal vision and 5% were blind.

Out of 387 eyes, intraocular pressure was determined in 380 eyes. IOP >35 mmHg was in 121 (31.27%) eyes. 103 (26.61%) eyes had IOP equal to or less than 20 mmHg, while 156 (40.31 %) eyes had IOP of 21 mm-35 mmHg. Phthisical eyes were 4 (1.04%) and in 3 (0.77%) eyes IOP could not be determined. Highest IOP was recorded 52 mmHg in neovascular glaucoma followed by in phacomorphic glaucoma 46 mmHg. Vertical cup:disc ratio (vCDR) was determined in 373 eyes. 170 (45.6%) eyes had a vCDR >0.8; 69 (18.5%) eyes were with vCDR 0.6-0.8 and 134 (35.9 %) eyes had vCDR <0.6. In 14 eyes, disc morphology could not be assessed. In visual field frequency doubling test (FDT), only in 227 eyes could reliable FDT findings be determined. Normal FDT results found in 28 (12.3%) eyes, whereas 84 (37%) eyes had severe defects. 68 (30%) eyes and 47 (20.7%) eyes had mild and moderate defects respectively. Out of 292 patients, 387 eyes were diagnosed to have glaucoma. Among these, 131 (45%) cases were with PACG and comprised the largest group. The most common subtype of PACG was chronic PACG (107/131; 81.68%). 11 cases (11/131; 8.4%) had a latent angle closure, 7 cases (7/131; 5.34%) had acute attack of angle closure and 6 cases (6/131; 4.58%) had intermittent angle closure. Primary open angle glaucoma (POAG) was diagnosed in 94 cases (94/292; 32%). Secondary glaucoma was diagnosed in 41 (41/292; 14%) cases. Lens induced glaucoma (LIG) was the most common cause in this group 35 cases (35/41; 85.4%) comprises phacolytic, phacomorphic, subluxated and anterior dislocated lens. Neovascular glaucoma was found in 3 cases (3/41; 7.3%). Aphakic glaucoma and others was in 3 cases (3/41; 7.3%). Patients diagnosed as normal tension glaucoma (NTG) was in 18 cases (18/292; 6%).

Only 3 cases (3/292; 1%) had congenital glaucoma and 6 cases (6/292; 2%) were diagnosed to have juvenile open angle glaucoma (JOAG).

Table-I: Intraocular pressure (IOP) observed in studied subject.

IOP (mmHg)	Right Eye		Left Eye	
	N	%	n	%
<20	49	25.65	54	27.55
21-35	76	39.8	80	40.8
>35	62	32.47	59	30.11
Phthisical (<6)	2	1.04	2	1.04
Not measured	2	1.04	1	0.5
Mean IOP	26.29		26.37	

n=Number of eyes

Table-II: Gonioscopic findings in studied subject.

Gonioscopy	Right Eye		Left Eye	
	n	%	n	%
Open	65	34.75	68	35.24
Narrow	105	56.15	104	53.88
Closed	17	9.1	21	10.88

n=Number of eyes

Discussion

The most common types of glaucoma seen in a tertiary government hospital were PACG, POAG, and lens-induced glaucoma[8]. Many patients consulted late in the course of the disease and had NLP, a high percentage of which was seen in PACG and secondary glaucoma [Figure-2]. IOP was also higher in these groups associated with poorer vision, indicating the severity of glaucomatous optic neuropathy (GON)[9]. PACG causes more destruction to the eye in the form of advanced GON, loss of central vision, and uncontrolled IOP due to the closure of the drainage angle, either acutely or chronically, that eventually becomes unresponsive to medical or laser treatment[10]. In contrast, POAG is associated with a more gradual increase in IOP that is generally responsive to medical therapy and causes vision loss much later if left untreated[11]. Lens-induced glaucoma, specifically the phacomorphic type, is associated with a rapid increase in IOP resulting from angle closure due to a pupillary block that occurs as a result of increased contact between the lens and the iris[12]. If the condition is not treated immediately, total loss of vision and permanent closure of the angle can result[13]. Due to the delay in treatment of the enlarged cataractous lens in phacomorphic glaucoma, resultant complications such as glaucoma developed, indicating that the type of patients seeking care at government referral hospitals tend to seek medical treatment late and were likely to have more advanced disease and complications[14]. Among the glaucoma we found that PACG was the most common subtype (45%), which is very similar to the findings of one center-based study from North-India (36.6%)[15]. One study from North-India confirms our finding that chronic PACG is the most common subtype of PACG[9]. Many Western based studies report primary open angle glaucoma (POAG) as far more common than primary angle closure glaucoma (PACG) worldwide[16]. However, population-based studies from Asia and the Far East, specifically from countries with high population size such as China and India report that closed angle is more prevalent than open angle glaucoma[17]. A survey was done 40 years earlier at the University of the Philippines-Philippine General Hospital (UP-PGH) revealed that; PACG and POAG were the most common types of glaucoma; accounting for 35% and 31% of the total cases respectively[11]. In both surveys, PACG was more common than POAG. Caution, however, should be exercised in extrapolating that PACG is the predominant type of glaucoma in the Philippines as patients that come to UP-PGH are those who tend to seek consultation late (>6 weeks in 83.2%) because of economic reasons. Moreover, they tend to seek consultation only when the disease is symptomatic, such as in the presence of acute pain (14.5%) or blurring of vision (67.5%). Both symptoms were the most common complaints on consultation (82%), indicating that the study population was biased toward the more severe nature of the disease. As in other studies[12-14], this study showed that those with PACG were likely to be older, female, and have higher IOP and poorer visual acuity with a larger percentage of NLP. POAG is more common among males and generally respond well to medical therapy (70%), in contrast to PACG where the majority had either surgical (37.5%) or laser treatment (20.5%). In summary, PACG and POAG remain the two most common types of glaucoma seen among patients seeking treatment at the government tertiary eye hospital. Because of the select population that this institution serves, any conclusion regarding the two types of glaucoma in this country cannot be drawn. A population-based study is, therefore, needed to establish the true incidence and prevalence of glaucoma in Bangladesh.

Limitations

Due to the high volume of patients, we may have missed patients with early glaucoma during our screening in the OPD, which may have caused a referral bias in this study. As all ophthalmologists were not equally expert in indirect slit lamp biomicroscopy in cataractous eye and gonioscopy, few early diagnoses of glaucoma may have missed from our study.

Conclusion

The most common glaucoma seen in the out-patient department of a large eye-care center in southern region of Bangladesh is primary angle-closure glaucoma. At the time of presentation 5% of the

glaucoma patients were blind and 14% were severe visually impaired. In more than one fourth of the patients, trabeculectomy was advised as the treatment of choice. We have attempted to define the profile of glaucoma on patients from remote parts of southern region of Bangladesh. Although this is a single center-based study, it could help to understand the severity of glaucoma, the profile of its different subtypes and ways of intervention in this region. It may also provide useful background information for planning population-based glaucoma studies and strategies to fight blindness due to glaucoma in this region. In addition, lens induced glaucoma was the most common form of secondary open and closed angle glaucoma.

Recommendation

These results indicate the need for a national intervention program for early detection and referral of glaucoma cases in order to prevent significant visual loss. There is also a need for a community-based assessment to determine the prevalence of glaucoma as a baseline for future intervention.

Author's Contributions

All the authors were contributed in various parts of the publication from concept and design, acquisition of data, analysis & interpretation of data and drafting of the manuscript.

Declaration of Conflicts

The authors declare that there is no conflict of interest regarding the publication of this article.

Acknowledgement

The present study was supported by the outpatient and emergency department of Sheikh Fazilatunnessa Mujib Eye Hospital & Training Institute (SFMEHTI), Gopalganj, Bangladesh. The authors wish to thank Dr. Syeed Mehbub Ul Kadir for assisting in statistical analysis.

References

1. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol. 2006; 90 (3): 262-7.
2. WHO Fact Sheet No. 282. Visual Impairment and Blindness. Available at: http://www.who.int/mediacentre/factsheets/fs282/en. [Accessed on August 22, 2021]
3. Allison K, Patel D, Alabi O. Epidemiology of Glaucoma: The Past, Present, and Predictions for the Future. Cureus. 2020; 12 (11): e11686.
4. Neumann E, Zauberman H. Glaucoma survey in Liberia. Magnitude and Causes of Visual Impairment. World Health Organization, Geneva. November Fact Sheet N_282. Am J Ophthalmol. 2004; 59: 8-12.
5. Ono K, Hiratsuka Y, Murakami A. Global inequality in eye health: country level analysis from the Global Burden of Disease Study. Am J Public Health. 2010; 100 (9): 1784-8.
6. Ritu G, Ramanjit S, Tanuj D, Viney G. Current profile of secondary glaucomas. Indian J Ophthalmol. 2008; 56 (4): 285-9.
7. Strohl A, Pozzi S, Wattiez R, Roesen B, Miño de Kaspar H, et al. Secondary glaucoma in Paraguay. Etiology and incidence. Ophthalmologe. 1999; 96 (6): 359-63.
8. Gupta S, Sood NN, Dayal Y. Angle closure glaucoma IV. Eastern Arch Ophthalmol. 1975; 3: 238-42.
9. Sihota R, Agarwal HC. Profile of the subtypes of angle closure glaucoma in a tertiary hospital in north India. Indian J Ophthalmol. 1998; 46 (1): 25-9.
10. Thomas R, George T, Braganza A, Muliyil J. The flashlight test and Van Herick's test are poor predictors for occludable angles. Aust NZ J Ophthalmol. 1996; 24 (3): 251-6.
11. Genio CA, Gavino BC. Glaucoma profile at the Philippine General Hospital. Philipp J Ophthalmol. 1983; 15: 1-2.
12. Gazzard G, Foster PJ, Devereux JG, et al. Intraocular pressure and visual-field loss in primary angle-closure and primary open-angle glaucomas. Br J Ophthalmol. 2003; 87 (6): 720-5.
13. Wong TY, Foster PJ, Seah SKL, Chew PTK. Rates of hospital admissions for primary angle-closure glaucoma among Chinese, Malays, and Indians in Singapore. Br J Ophthalmol. 2000; 84 (9): 990-2.
14. Congdon NG, Quigley HA, Hung PT, et al. Screening techniques for angle-closure glaucoma in rural Taiwan. Acta Ophthalmol Scand. 1996; 74 (2): 113-9.
15. Das J, Bhomaj S, Chaudhuri Z, Sharma P, Negi A, Dasgupta A. Profile of glaucoma in a major eye hospital in north India. Indian J Ophthalmol. 2001; 49 (1): 25-30.
16. Tham YC, Li X, Wong TY, Quigley HA, Aung T, Cheng CY. Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology. 2014; 121 (11): 2081-90.
17. Foster PJ, Johnson GJ. Glaucoma in China: how big is the problem? Br J Ophthalmol. 2001; 85 (11): 1277-82.

Citation of this article

Islam MA, Azam AAH, Siraj MS, Alam AE, Hasanuzzaman M, Rasel SMSB. Glaucoma Profile in a Tertiary Eye Hospital of Bangladesh. Eastern Med Coll J. 2022; 7 (2): 16-20.