

Challenges in managing glaucoma-related morbidity due to lockdown in a developing country

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ABSTRACT

Objective: The aim of this study was to assess the ocular morbidity due to delayed presentation in glaucoma patients because of COVID lockdown. **Methodology:** This was a retrospective study of 15 cases presented to us between October 2020 and February 2021. Cause of glaucoma in our study group was either primary angle closure, pseudoexfoliation, lens-induced glaucoma, or neovascular glaucoma. The cause of delayed presentation was identified and patients were treated with antiglaucoma medications, Nd-Yag laser, and surgery as per the standard treatment protocol. **Results:** With both medical and surgical intervention, some useful vision was restored in five cases while in rest it was not salvageable. The vision in the affected eye ranged from 6/60 in Snellen's chart to perception of light and projection of rays positive. Better results were achieved in angle, closure, and lens-induced glaucoma cases as compared to neovascular glaucoma cases. **Conclusion:** The time of presentation in such cases is as important as the etiopathogenesis. We are left with limited treatment options if the presentation is late. The lockdown ended but it unraveled quite a few instances of disease presentation which were totally preventable under normal circumstances. Introspection on finding out newer and proactive methods to reach people suffering from such irreversible but preventable diseases is the need of the day especially when preventable but irreversible diseases like glaucoma are considered.

Keywords: Angle closure glaucoma, diabetic retinopathy, glaucoma treatment, neovascular glaucoma, protocol in COVID

Introduction

Glaucoma is called the 'sneak thief of sight' and rightly so. The diagnosis and management of glaucoma whether primary or secondary depends largely on the stage at which the patient presents. Neovascular and angle-closure glaucomas become refractory if not intervened at the right time.^[1] This lockdown has affected treatment of glaucoma as well as diabetes which in turn leads to a rise in number of secondary glaucoma patients. The COVID19 lockdown has been the main cause of delayed presentation in all branches of medicine in recent times and we discuss few cases of ophthalmology that were managed in the

current scenario.^[2,3] Under the looming threat of COVID 19 infection, patients could not avail specialist treatment available at tertiary care centers. In such a scenario general physicians are first point of contact and primary health workers available at the nearest center can also be consulted by the patients. Studies have shown that 'earlier the intervention, better is the visual prognosis'.^[4] We try to put forth the problems and limitations we are facing as a developing country. A healthy association between the primary health care providers and specialists at tertiary care centers may provide a plausible solution. Hence, we try to explore possible solutions using the resources at our disposal and assess what changes can be brought in glaucoma management at the backdrop of COVID lockdown.

Methodology

The study was conducted in a tertiary care center in eastern India between October 2020 to February 2021. Institutional

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Received: 11-07-2021

Revised: 04-12-2021

Accepted: 07-12-2021

Published: 18-03-2022

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_1371_21

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How to cite this article: Sen S, Das M, Das MK, Dash S. Challenges in managing glaucoma-related morbidity due to lockdown in a developing country. J Family Med Prim Care 2022;11:1410-5.

ethical clearance was obtained (KITT/KIMS/IEC/688/2021) and the study complied by the principles of the Declaration of Helsinki. Informed consent was obtained from all participants. Fifteen cases of late-stage glaucoma that presented to us were included in the study. These cases presented to our outdoor and emergency between the small window period between the first and second wave of the pandemic. Inclusion criteria included patients presenting to the outdoor or emergency in late or advanced stages, known cases of glaucoma who were not compliant with their follow-up regimen. Newly diagnosed glaucoma suspects, patients in early stages of the disease or cases with good compliance to follow up and medication use were excluded. Data regarding their medical history, knowledge of glaucoma and reason for delay was collected from the records. All patients were treated with the suitable anti-glaucoma medications, underwent Nd-Yag (Neodinium Yttrium Aluminum Garnet) laser peripheral iridotomy (LPI) and/or surgical intervention where required.

Results

The mean age of the study group was 56.4 years with seven males and 8 females. The baseline data of the study group is described in Table 1. Out of the 15 cases of glaucoma, eight had developed neovascular glaucoma (NVG), three had angle-closure glaucoma (ACG), three had lens-induced glaucoma (LIG) and one case had pseudoexfoliation glaucoma (PXFG). Four cases of NVG and two cases of NVG had associated diabetes mellitus and hypertension respectively while one case of LIG had hypertension.

Three of patients in our study group were known cases of glaucoma and were under treatment while the rest developed the manifestations during the lockdown period. Two of these three known cases of glaucoma had angle-closure disease and one had pseudoexfoliation glaucoma. All three were under anti-glaucoma medications. They had chief complaints of

defective vision and headache on presentation. All the other study patients had complaints of severe pain, redness, watering along with defective vision at presentation. Visual acuity (VA) ranged from 6/60 in Snellen's chart to perception of light and projection of rays (PL PR) in the affected eye. Intraocular pressure (IOP) range was from 32 mm Hg to 56 mmHg in the affected eye in the study group in different types of glaucoma. Ocular features included severe conjunctival congestion and corneal edema in all cases. NVG cases neovascularization iris in all cases and neovascularization angle in two cases. [Figure 1] Significant cataractous changes were seen in PXF glaucoma patient other than LIG cases that had hypermature cataracts. Glaucomatous changes in the optic disc were found in all angle closure cases and five cases of NVG where fundus was visualized post decrease in IOP.

Initial treatment of the patients was aimed at relieving the pain. This included administration of systemic, oral and topical medications like injection mannitol intravenously, oral acetazolamide tablet, oral diclofenac tablets and topical anti-glaucoma medications.

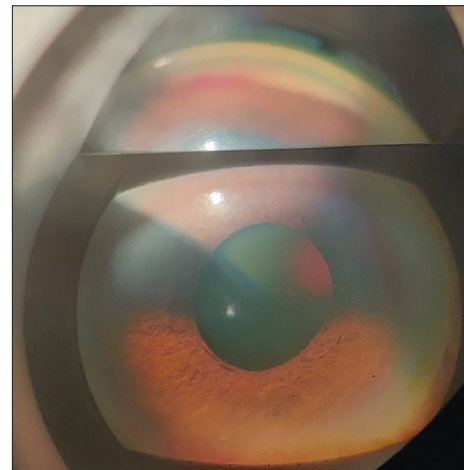


Figure 1: Neovascularization in angle in NVG

Table 1: Demographic characteristics at presentation

Age (in years)	Sex	VA at presentation (Snellen's chart)	IOP at presentation (in mm Hg)	Diagnosis	Comorbidity
57	M	CF1 meters	48	NVG	DM
68	M	CF close to face	52	NVG	DM
56	F	CF 2 meters	48	NVG	DM
70	M	Hand movements	34	NVG	Htn
45	F	Hand movements	32	ACG	Nil
58	F	CF 2 meters	42	NVG	Nil
54	M	6/60	44	ACG	Nil
64	F	CF 3 meters	52	NVG	DM
42	M	Hand movements	48	NVG	Nil
56	F	6/60	46	NVG	Htn
78	M	CF 2 meters	44	PXFG	Nil
42	F	6/60	36	ACG	Nil
56	M	PL PR inaccurate	48	LIG	Nil
52	F	PL PR inaccurate	56	LIG	Nil
48	F	PL PR inaccurate	54	LIG	Htn

M=Male, F=Female, CF=Counting fingers, HM=Hand movements, PLPR=Perception of light and projection of rays, VA=Visual acuity, IOP=Intraocular pressure, NVG=Neovascular glaucoma, ACG=Angle closure glaucoma, PXFG=Pseudoexfoliation glaucoma, LIG=Lens induced glaucoma, DM=Diabetes mellitus, Htn=Hypertension

In addition to the above, topical steroid eye drops were started pre-surgery in the LIG cases to control inflammation. Two of the angle-closure patients underwent laser peripheral iridotomy after initial control of IOP. Intravitreal and intracameral injection of bevacizumab was given in all cases of NVG. Cataract extraction surgery was done for all cases of lens-induced glaucoma, cataract surgery with trabeculectomy for case of pseudoexfoliation glaucoma and trabeculectomy for the for one case with neovascular glaucoma. Four cases with very poor to almost nil visual prognosis underwent diode cyclophotocoagulation.

Post-treatment follow-up showed an improvement in VA in five patients which included two LIG, one PXFG and one ACG and one NVG patient. Intra and postoperative complications included capsular bag dialysis in LIG, inflammatory hypopyon in NVG case respectively. [Figure 2a-d] The hypopyon resolved two weeks post-surgery with systemic, oral and topical steroids along with oral antibiotics and topical cycloplegics. The treatment details are enlisted in Table 2.

Discussion

Glaucoma is the second most common cause of blindness in the world following cataract. As per previous studies almost estimated prevalence of glaucoma in India is about 11.2 million persons above the age of 40 years out of which 6.48 million have open angle and 2.54 million have angle-closure disease.^[5] Diabetes is also a major concern from public health point of view with its prevalence on a rise in India.^[6] Previous studies have shown the prevalence of neovascular glaucoma to be dependent on the prevalence of diabetes to some extent and the hospital prevalence of neovascular glaucoma has been found to be around 0.3% in some studies.^[7,8] Glaucoma features are said to be more severe in cases in cases of proliferative diabetic retinopathy.

In the current scenario, with routine eye care suffering because of surge in COVID cases, the number of people getting affected by

glaucoma whether primary or secondary to diabetic retinopathy or any other causes are expected to increase. Considering our own study, one common factor that could be linked to all cases is the delayed presentation which ultimately led to a compromise in the final vision. All these patients suffered during the lockdown when probably the disease process could have been controlled better and instead presented post lockdown at a stage where the damage control was difficult. Low socioeconomic status, lack of awareness, delay in primary detection, access to health services are some of the main causes of delayed presentation in such cases.^[9,10] All of our cases presented late due to fear of COVID-19 infection and lack of timely access or proper diagnosis and treatment due to lockdown. Many cases have been presenting at a late stage since the lockdown and the above-mentioned cases are the tip of the iceberg representing a small section of a probable greater visual crisis in the coming days. Though these patients did not have access to specialist services, they could have visited the nearest primary health care facilities and at least primary treatment could have been rendered at the correct time thus limiting the visual damage. The primary health care workers as well as general physicians can be sensitized to the problems arising because of undiagnosed and untreated glaucoma. They should be made aware of the risk factors associated with the disease. Symptoms like diminution of vision, presence of colored haloes and ocular pain can be due to glaucoma. Even a simple history taking that reveals a positive family history of glaucoma is relevant in such cases. Simple cases like rapid changes in spectacle power or simply regular change in presbyopic correction should raise suspicion of a more damaging underlying disease process. Timely intervention or referral goes a long way on salvaging vision in these patients.

Over the last 1 year, there has been a paradigm shift in the treatment protocol of several diseases including glaucoma. Countries like China and Singapore have already developed Internet-based applications for screening patients at home.^[11] Using teleophthalmology to incorporate clinical diagnostic skills for diagnosing angle-closure diseases have been suggested.^[12] Similar tools have also been proposed for diabetic retinopathy screening as well.^[13]

Every new change comes with its challenges. Similarly, reaching at a diagnosis of glaucoma or treating it virtually does not seem too appealing at the outset. Surveys have put forward both patient concerns regarding reaching a proper diagnosis and conclusion on a virtual platform as well as the doctors concern regarding proper training of the field staff.^[14] In India several guidelines for safe patient examination and treatment in the hospital setting have been proposed.^[15] Collaboration between the primary care providers and specialist through telemedicine is a must for the patients who attend health care facilities to screen and decide the level of care.^[16] Telemedicine can be integrated into the healthcare delivery system to improve access to glaucoma screening, detection and follow-up. Proper training regarding the screening procedures and the required consent can be given both at primary and tertiary level as and when they collaborate and work together.^[17]

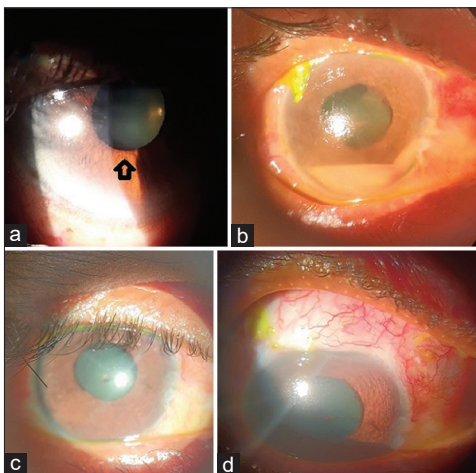


Figure 2: (a) Anterior segment showing Neovascularization iris. (b) Postoperative sterile hypopyon. (c) Well-formed and Quiet Anterior chamber with resolved hypopyon. (d) Well-formed bleb post-operatively

Table 2: Cause of delay and effect of management in glaucoma cases

Type of glaucoma	Cause of delay	Management	VA post T/t (Snellen's chart)	IOP post T/t (in mm Hg)
NVG	Lockdown	Medical, I/C and I/V bevacizumab	CF 2 meters	22
NVG	Lockdown	Medical, I/C and I/V bevacizumab, Diode CPC	HM	21
NVG	Lockdown	Medical, surgical, I/C and I/V bevacizumab	CF 2 meters	20
NVG	Lockdown	Medical, I/C and I/V bevacizumab	HM	24
ACG	Lockdown, financial problem, lack of awareness	Medical, I/C and I/V bevacizumab, Diode CPC	HM	16
NVG	Lockdown	Medical, Diode CPC	CF 2 meters	22
ACG	Lockdown	Medical, LPI	6/60	18
NVG	Lockdown	Medical, Diode CPC	CF 3 meters	20
NVG	Lockdown	Medical, I/C and I/V bevacizumab	HM	18
NVG	Lockdown, financial problem	Medical, surgical, I/C and I/V bevacizumab	6/12	14
PXFG	Lockdown, financial problem	Medical, Surgical	6/9	14
ACG	Lockdown	Medical, LPI	6/12	16
LIG	Lockdown	Medical, surgical	CF3 meters	16
LIG	Lockdown	Medical, surgical	6/12	12
LIG	Lockdown	Medical, surgical	6/18	18

CF=Counting fingers, HM=Hand movements, VA=Visual acuity, IOP=Intraocular pressure, NVG=Neovascular glaucoma, ACG=Angle closure glaucoma, PXFG=Pseudoexfoliation glaucoma, LIG=Lens induced glaucoma, LPI=Laser peripheral iridotomy, I/c=Intracameral, I/V=Intravitreal, CPC-Cyclophotocoagulation

Both the screening for diabetic retinopathy and other risk factors along with glaucoma screening have to go hand in hand. Based on these findings, the treatment protocol for each patient can be tailor made. A flexible algorithm is being proposed to classify patients based on the severity of their disease as mild, moderate, and severe and plan their treatment accordingly.^[18] While appointments for severe patients cannot be delayed, hospital visits for the patients falling under mild and moderate category can be pushed back till there is improvement in the COVID situation. A more proactive approach from our side can be to send trained personnel who have tested negative for COVID and reach out to the patients for screening and preliminary management under specialist guidance. Adhering to all sanitation protocols at ground level with handheld tonometers and portable fundus cameras and visual field analyzers, clinical pictures and data can be collected which can be analyzed properly at the base hospital. A simple examination like digital tonometry to assess intraocular pressure can also be done by general physicians which require no extra equipment. Primary health care providers can be trained about the use of portable fundus cameras which can be used to capture fundus images and then forwarded to the specialist for teleconsultation. Counseling glaucoma patients about compliance to medications and advising follow-up with specialists for patients who need it is something that general physicians can do. This saves the patient from traveling amidst the pandemic, decreases the risk of infection and reaffirms their faith on the system. While treating glaucoma cases that may become refractory within a short span, a more aggressive approach can be taken. Opting for a safe surgical management in such cases which are at risk of non-compliance to medication or loss of follow-up can help salvage useful vision.

Having said that we also need to focus on spreading awareness about the disease. To a certain degree, the lack of awareness about the symptoms and of the irreversible nature of the disease not

only amongst the patients but also amongst general physicians contribute to the problem.^[19] With each passing day number of COVID cases are again on rise in India after a relatively quiet gap. The second wave has been more deadly in the country with the healthcare system trying to cope up with available resources for saving lives. Eye care will certainly suffer this around too amid the lockdown.

Loss of vision effectively leads to loss of employment and compromises the quality of patients day to day life not only physically but socially and financially as well. Three of our patients had active professional life as teacher and personal business establishment and this means of their livelihood was cut short because of the unavoidable situation brought about by the pandemic. Looking at the psychological and socioeconomic impact of glaucoma, we dread what lies in future.^[20,21] Setting up standard treatment protocols both at ground level and base hospitals can make us better prepared to deal with the problem.

A total of fifteen cases may seem a small number but considering the background, frequency, timing and the succession with which the cases presented to our outdoor, the gravity of the problem cannot be ignored. This appears to be the tip of the iceberg masking the magnitude of the real issue. It would be totally worth it if we could avoid the painful clinical manifestation and hold on to the remote possibility of retaining vision had the treatment been given at the right time. This sure is an uphill task for a developing economy like ours but where there is a great disparity between the amenities available and actual number of patients needing these services. First, teleconsultations should be being planned and staggered appointments being given to people who absolutely need it. Physical examination has to be carried out keeping in mind the safety of both the patient and the health care provider. Though tricky, doing what is absolutely necessary and avoiding what can be avoided in a particular situation is the

key. Current pandemic is testing our clinical acumen as well as compassion as health care providers. We can at least control if not stop the visual damage by framing, implementing and adhering to the newer protocols. Telemedicine has emerged as a game changer and can be used as a novel tool to solve our purpose.^[22]

Conclusion

Small but dedicated steps to implement the change in management protocol can go a long way to achieve our goal. Screening by apps or through phone calls for people who have access to it and by personnel for patients who do not have access to these facilities can be done. Categorizing them into mild, moderate and severe groups on basis of their need for institutional care will help decrease visual morbidity. Out of all our patients, we could salvage vision for only five and went ahead with palliative treatment for the rest. To us it may be one eye lost but for the patient it not only has personal but also social, psychological and financial loss. The eyes we lost to the first wave of COVID should act as a warning for us. We should realize as well as propagate the public health importance of the glaucoma looking at its visual, social and psychological implications. We have tried to implement these steps at our level starting with teleophthalmological consultations.

Controlling damage due to glaucoma at a late stage presentation is difficult and unpredictable. Hence, the take home message is that not only ophthalmologists but general physicians should be aware of the apparently minor symptoms masking the sinister disease. Collaboration at all levels leading to healthy physician–patient relationship at primary level as well as between physician and ophthalmologist will prevent the near miss events and help curb the menace at a greater level.^[23] This should be a learning lesson for us to go ahead into the uncertain post-COVID era with a definite plan of action to prevent needless blindness.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Key messages

Patients with glaucoma and retinal diseases need timely action and regular follow up which was hampered due to COVID-19 and the subsequent lockdown. The general physicians are first point of contact for majority of these patients. Their role in identifying seemingly normal complaints which may progress to irreversible vision loss is paramount in this perspective. They can treat minor complaints and refer cases that require specialist treatment. Through treatment and follow up of fifteen such patients we try to find out a sustainable means of catering to

such patients so that avoidable ocular morbidity can be handled properly in our setting.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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