ORIGINAL ARTICLE

Trickle Down Effects of Covid-19 on Glaucoma Patients

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ABSTRACT

Purpose: To report the adherence of Glaucoma patients to anti-glaucoma medical therapy during lockdown period of covid-19 and to evaluate the factors that lead to non-adherence to medical therapy.

Study Design: Cross sectional survey.

Place and Duration of Study: Al-Shifa Trust Eye Hospital, Rawalpindi from August 2020 to October 2020.

Methods: A total of 210 patients diagnosed with glaucoma were included. Exclusion criteria was newly diagnosed cases of glaucoma and patients who were non-compliant before lockdown. Patients' age, gender, marital status, occupation, residence, monthly income bracket, type of glaucoma, duration of glaucoma, number and type of anti-glaucoma medication and any other co-morbidity like diabetes or hypertension were asked from the patient. The patients were evaluated for best corrected visual acuity (BCVA), intraocular pressure (IOP) and retinal nerve fiber layer thickness (RNFL). Before lockdown, BCVA, IOP and RNFL thickness were taken from computerized data of our hospital. Patients were asked about the compliance of the anti-glaucoma therapy and the factors that lead to non-compliance (if any).

Results: Out of 210 individuals, there were 131 (62.4%) males and 79 (37.6%) females. About 169 (80.5%) patients reported non-compliance to anti-glaucoma drugs during the lockdown period. Non-availability of medicines was the most common reason given by 77 (57.5%) individuals, followed by lack of money by 44 (32.8%) patients.

Conclusion: A high proportion of non-compliance to anti-glaucoma therapy was seen in glaucoma patients during pandemic. Low literacy rate, non-availability of medicines and lack of money were major reasons for non-compliance.

Key Words: Covid-19, Glaucoma, Intra ocular Pressure.

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INTRODUCTION

Glaucoma is one of the leading causes of blindness worldwide. It is a chronic vision threatening disease that causes progressive optic neuropathy and visual field defects. It normally goes unnoticed at onset as it is asymptomatic unless at an advanced stage.[1] The global prevalence of glaucoma is 3.54%.[2] In Pakistan, according to one study, 1.8 million cases were reported to have glaucoma. Half of these cases have already lost vision.[3] Loss of vision causes a significant burden on healthcare system.[4]

The treatment regimen for glaucoma is unforgiving. Normally topical antiglaucoma, surgery or laser therapy is done in these patients.[5] So far, the most common modality of glaucoma treatment is

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topical anti-glaucoma therapy. However, they do have the problem that they may need a sustained use of up to three to four drugs at one time, with lack of consistency a major cause of failure in the treatment.[6]

The Novel Corona Virus Disease 19 (COVID 19), which hit Pakistan on 26 February 2020, is the newest global challenge to healthcare.[7] This pandemic has put a lot of stress on the healthcare system. The long-term effects of this pandemic on chronic conditions is worth considering, especially the possible mismanagement of the same during the lockdown period.[8] Chronic diseases require continuous use of medications and non-adherence to these medications can cause progression of the disease and other harmful effects on whole body. This pandemic has affected individuals by causing anxiety, depression, fear and financial problems.

Adherence to anti-glaucoma medications has always been an issue especially in people of third world countries, which ultimately leads to irreversible damage to optic nerve.[9] The current pandemic have led to worsening of this situation. We have investigated the effects of this pandemic on the patient's ability to effectively continue with their anti-glaucoma regimen.

METHODS

This observational cross-sectional study was conducted at the Department of Glaucoma, Al-Shifa Trust Eye Hospital, Rawalpindi from August 2020 to October 2020, after approval from the institutional ethics review committee. Non-probability convenient sampling was used. Inclusion criteria was all patients presenting to glaucoma department with a confirmed diagnosis of glaucoma and who were already on anti-glaucoma treatment. Newly diagnosed cases of glaucoma and patients who were non-compliant before lockdown were excluded from the study. Non-compliance before lockdown was assessed by computerized records of the patients. Written informed consent was taken from all patients.

Patients' age, gender, marital status, occupation, residence, monthly income bracket, type of glaucoma, duration of glaucoma, number and type of anti-glaucoma medications and any other co-morbidity like diabetes or hypertension were asked from the patients. The patients were assessed for best corrected visual acuity (BCVA), intraocular pressure (IOP), retinal nerve fiber layer thickness (RNFL) and fundus evaluation to see cup-disc ratio (CDR). Before lockdown, BCVA, IOP and RNFL thickness were taken from computerized data of our hospital. Patients were enquired about the compliance to the anti-glaucoma drugs and the factors that lead to non-compliance. Non-compliance was defined as missing topical drops for more than 3 consecutive days.

For statistical analysis, paired t-test was applied to compare the pre and post lockdown parameters of glaucoma patients. P-value $\leq$ 0.05 was taken statistically significant at 95% confidence interval. Data analysis was done using SPSS 21.

RESULTS

Of 210 individuals, there were 131 (62.4%) males and 79 (37.6%) females. The mean age of the patients was 57.8 years, ranging from 18 to 86. Half of the individuals (50%) were illiterate, 62 (29.5%) were educated up to the primary level, 37 (17.6%) were up to the secondary level and only 6 (2.8%) had university level qualifications. One hundred and seventy four 174 (82.8%) people had a monthly income of less than 20 thousand, 25 (11.9%) were earning between 21 and 40 thousand, 8 (3.8%) were earning 41 to 60 thousands and only 39 (1.4%) were earning above 60 thousand rupees per month. Majority were house wives (31.4%), 12.4% were retired personnel, 12.4% were laborers, 8.6% were shopkeepers and 12.9% were unemployed. We found compliance to anti-glaucoma therapy to be strongly correlated with education with a Spearman coefficient of +1.00 at a ($p < 0.01$). There were 71 (33.8%) patients with only 1 seeing eye. Fifty people (23.8%) were using topical antiglaucoma drugs for right eye, 47 (22.4%) for the left eye, while 113 (53.8%) individuals were using it in both eyes. About 180 (85.7%) individuals were being treated for primary open angle glaucoma, 17 (8.1%) for primary angle closure glaucoma, and 13 (6.2%) for secondary glaucoma. Fifteen (7.1%) individuals had isolated diabetes, while 39 (18.6%) patients had isolated hypertension, with 19 (9%) individuals having both.

After preliminary analysis of normality, paired sample t test was applied to compare the IOP, RNFL and visual acuity before and after lockdown among glaucoma patients. Details are shown in table 1 and 2. No statistically significant association was found among non-compliance with age, gender, duration of glaucoma, number of anti-glaucoma drops or only eyed patients.

Table 1: *Comparison of glaucoma assessment parameters before and after lockdown (n=210).IOP= intraocular pressure, RNFL= Retinal nerve fiber layer.*

Variables	Before Lockdown (Mean ± SD)	After Lockdown (Mean ± SD)	Mean Difference	t (df)	p-value	95% Confidence Interval of the Difference	
						Lower	Upper
Visual Acuity Right Eye	0.51 ±0.29	0.47 ± 0.29	-2.012	-4.75	< 0.001	-2.849	-1.176
Visual Acuity Left Eye	0.49 ± 0.30	0.48 ± 0.30	-1.962	-4.70	< 0.001	-2.786	-1.139
IOP Right Eye	14.15 ± 3.75	16.13 ± 5.88	2.061	5.18	< 0.001	1.276	2.846
IOP Left Eye	14.34 ± 3.80	16.31 ± 5.95	2.431	6.39	< 0.001	1.681	3.182
RNFL thickness Right Eye	68.69 ± 22.68	66.63 ± 22.64	.03496	5.73	< 0.001	.02292	.04700
RNFL thickness Left Eye	66.89 ± 22.71	64.46 ± 23.69	.02677	4.02	< 0.001	.01361	.03993

Table 2: *Visual and IOP parameters.*

	Visual acuity (VA)	Before Lockdown n(%)	After Lockdown n(%)		IOP (mmHg)	Before Lockdown n(%)	After Lockdown n(%)
Right Eye	VA 6/6 – 6/12	83 (50.9%)	74 (45.4%)	**Right Eye**	15 or less	112 (68.7%)	92 (56.4%)
	Mild (6/12 – 6/18)	23 (14.1%)	25 (15.3%)		>15 – 20	42 (25.7%)	48 (29.4%)
	Moderate (6/18 – 6/60)	45 (27.6%)	49 (30%)		>20 – 25	7 (4.3%)	9 (5.5%)
	VA < 6/60	12 (7.4%)	15 (9.2%)		>25 – 30	1 (0.6%)	7 (4.3%)
					>30	1 (0.6%)	7 (4.3%)
	Total	**163 (100%)**	**163 (100%)**		**Total**	**163 (100%)**	**163 (100%)**
Left Eye	VA 6/6 – 6/12	76 (47.5%)	73 (45.6%)	**Left Eye**	15 or less	110 (68.7%)	90 (56.2%)
	Mild 6/12 – 6/18	31 (19.3%)	26 (16.25%)		>15 – 20	44 (27.5%)	44 (27.5%)
	Moderate 6/18 – 6/60	44 (27.5%)	46 (28.7%)		>20 – 25	3 (1.9%)	14 (8.7%)
	VA < 6/60	9 (5.6%)	15 (9.4%)		>25 – 30	2 (1.2%)	5 (3.1)
					>30	1 (0.6%)	7 (4.4%)
	Total	**160 (100%)**	**160 (100%)**		**Total**	**160 (100%)**	**160 (100%)**

Table 3: *Reasons for non-compliance during lockdown.*

Isolated Reasons		Frequency n(%)	Combined Reasons/Frequency n(%)	
A.	Lack of knowledge	2 (1.4%)	A+E	1 (2.8%)
B.	Lack of money	44 (32.8%)	A+B	6 (17.1%)
C.	Loss of job	2 (1.4%)	A+F	3 (8.6%)
D.	Did not want to leave home	4 (2.9%)	B+D	1 (2.8%)
E.	Lack of health care facility	3 (2.2%)	B+E	1 (2.8%)
F.	Unavailability of Medicine	77 (57.5%)	B+C	2 (5.7%)
G.	Side-effects of drops	1 (0.7%)	B+F	19 (54.3%)
H.	Transport problem	1 (0.7%)	C+F	2 (5.7%)
	Total	134		35

DISCUSSION

COVID-19 pandemic has emerged as a singular healthcare challenge confronting the global citizenry both in terms of its colossal impact on the healthcare system and as a micro and macroeconomic catastrophe.[10] In terms of attention to patient health, chronic disease management has suffered as healthcare systems are overwhelmed with treating COVID-19 patients. The health care providers are less able to track the progression of conditions such as diabetes, kidney diseases, cardiovascular conditions, and glaucoma, etc. This apathy to chronic diseases, displayed by both healthcare systems and individuals, may lead to worsening of these conditions and lead to serious complications.[11]

This study was conducted to determine the status of non-compliance to anti-glaucoma treatment in patients as a result of a four-month lockdown in Pakistan. During this period Ophthalmology clinics remained essentially closed. More affluent patients may still had limited recourses to medical facilities in terms of private clinics, but the more deprived majority may have suffered adverse complications.

In our study, we included those patients only that were properly compliant with their glaucoma treatment regimen to get results that more or less reflected non-compliance only due to COVID-19 pandemic. The main findings of our survey are the relatively high noncompliance rates (80.5%). This is understandably higher than noncompliance rate in a study conducted in Israeli Arab patients before the

times of COVID where noncompliance rate was 53.6% with noncompliance primarily attributed to a poor understanding of the disease.[12] In another study by Tamrat et al in 2015, about 67.5% patients were reported non-adherent to anti-glaucoma treatment which again is not as high as in our study.[13] We find that the leading causes for non-compliance in our patients were unavailability of medications due to the lockdown (77 individuals,57.5%) followed by lack of financial resources to acquire the medications (44 patients, 32.8%). This, as expected, are different from leading causes cited by patients in a similar study conducted pre-COVID in the year 2016 in Pakistan where the leading causes were identified as a difficult follow up regimen in terms of a variety of medications to be self-administered and various side effects that prompted patients to take their glaucoma medication intermittently.[14]

We have found a strong statistically significant correlation ($p < 0.01$) between education level and compliance to anti-glaucoma therapy by utilizing the Spearman test that resulted in a correlation coefficient of +1.00. This is consistent with the findings of an earlier study, where the authors reported compliance to be strongest in educated patients and non-compliance to be highest in the least educated patients.[15]

We do not find the number of eyes drops to be correlated to noncompliance with glaucoma therapy which is inconsistent with the findings of Hasebe et al and Lulu et al.[16,17] There was no statistically significant correlation between glaucoma therapy compliance and patient's age. This contradicts the findings of Tadesse et al, who found younger patients to be more compliant. This may be the result of an overwhelmingly large number of less educated patients in our study whereas Tadesse et al might had found compliance in younger generation due to better access to education leading to a better understanding of the disease.[18] While it may seem counterintuitive, we did not find any association of glaucoma noncompliance with patients who had one seeing eye versus two.

The primary strength of our study is that it was initiated under unique conditions of lockdown due to the COVID-19 pandemic and is certainly one of a kind considering noncompliance rates of glaucoma and resulting effects on Pakistani patients. The main limitation of this study was that some results were based on a questionnaire where patients' recall-bias as well as bias to please the physician may contribute to incorrect reporting of glaucoma medication noncompliance. However, we do have an independent check on the disease progression in terms of VA, IOP control and RNFL thickness.

We have seen in this study that there is a very strong correlation between educational attainment and compliance with glaucoma regimen.[19,20] Further, the biggest hurdle faced by the patients in this pandemic was the timely availability of proper medication. We recommend that in times of pandemic the state can do a better job of educating the masses regarding various chronic conditions and counsel them via mass media to stick to their medication regimen. Extraordinary efforts are needed to ensure that individuals' chronic conditions do not worsen in times of pandemic. This includes, but is not limited to, consultation via phone and other media and medicines delivery at the doorsteps. At a very minimum, drug availability at pharmacies must be ensured, with the possibility of obtaining continuing medicines for chronic conditions from primary healthcare facilities.

CONCLUSION

The COVID-19 pandemic has caused a statistically significant increase in the rate of non-compliance to glaucoma medication principally resulting from non-availability of medications and lack of financial resources. Low literacy resulting in poor understanding of the disease probably compounded the situation. This non-compliance has resulted in a statistically significant increase in IOP and decrease in VA and RNFL thickness\ compared with the pre-pandemic situation among patients presenting to our tertiary care facility.

Ethical Approval

The study was approved by the Institutional review board/ Ethical review board. **(ERC-52/AST-20)**

Conflict of Interest

Authors declared no conflict of interest.

REFERENCES

1. **Kastner A, King AJ.** Advanced glaucoma at diagnosis: current perspectives. Eye (Lond). 2020; **34 (1):** 116-128. doi:10.1038/s41433-019-0637-2.
2. **Khandelwal RR, Raje DV, Khandelwal R.** Clinical profile and burden of primary glaucoma in rural camp patients attending a tertiary care center in India. J Clin Ophthalmol Res. 2019; **7:** 55-60. doi:10.4103/jcor.jcor-79-18.

3. **Khan L, Ali M, Qasim M, Jabeen F, Hussain B.** Molecular basis of glaucoma and its therapeutical analysis in Pakistan: an overview. Biomed Res Ther. 2017; **4 (03):** 1210-1227. doi: 10.15419/ bmrat. v4i03.158.
4. **Williams AM, Huang W, Muir KW, Stinnett SS, Stone JS, Rosdahl JA.** Identifying risk factors for blindness from primary open-angle glaucoma by race: a case–control study. Clin Ophthalmol. 2018; **12:** 377-383. doi: 10.2147/OPTH.S143417.
5. **Motlagh BF.** Medical therapy versus trabeculectomy in patients with open-angle glaucoma. Arq Bras Oftalmol. 2016; **79 (4):** 233-237. doi:10.5935/0004-2749.20160067.
6. **Butt NH, Ayub MH, Ali MH.** Challenges in the management of glaucoma in developing countries. Taiwan J Ophthalmol. 2016; **6 (3):** 119-122. doi: 10.1016/j.tjo.2016.01.004.
7. **Waris A, Atta UK, Ali M, Asmat A, Baset A.** COVID-19 outbreak: current scenario of Pakistan. New Microbe New Infect. 2020; **35:** 100681. doi: 10.1016/j.nmni.2020.100681.
8. **Chudasama YV, Gillies CL, Zaccardi F, Coles B, Davies MJ, Seidu S, et al.** Impact of COVID-19 on routine care for chronic diseases: A global survey of views from healthcare professionals. Diabetes Metab Syndr. 2020; **14 (5):** 965-967. doi: 10.1016/j.dsx.2020.06.042.
9. **Rajurkar K, Dubey S, Gupta PP, John D, Chauhan L.** Compliance to topical anti-glaucoma medications among patients at a tertiary hospital in North India. J Curr Ophthalmol. 2018; **30 (2):** 125-129. doi: 10.1016/j.joco.2017.09.002.
10. **Kamran M, Jafri W.** Severity of Disease from COVID-19 in Patients with Obesity and MAFLD: Is there an association? J Coll Physicians Surg Pak. 2020; **30 (9):** 891-893. doi: 10.29271/jcpsp.2020.09.891.
11. **Liu N, Huang R, Baldacchino T, Sud A, Sud K, Khadra M, et al.** Telehealth for Noncritical Patients With Chronic Diseases During the COVID-19 Pandemic. J Med Internet Res. 2020; **22 (8)**: e19493. doi: 10.2196/19493.
12. **Abu Hussein NB, Eissa IM, Abdel-Kader AA.** Analysis of Factors Affecting Patients' Compliance to Topical Antiglaucoma Medications in Egypt as a Developing Country Model. J Ophthalmol. 2015; **2015:** 234157. doi:10.1155/2015/234157.
13. **Tamrat L, Gessesse GW, Gelaw Y.** Adherence to topical glaucoma medications in Ethiopian patients. Middle East Afr J Ophthalmol. 2015; **22 (1):** 59-63. doi:10.4103/0974-9233.148350.
14. **Khan H, Mahsood YJ, Gul N, Ilyas O, Jan S.** Factors Responsible for Non-Compliance of Glaucoma Patients to Topical Medications in Our Setup. Pak J Ophthalmol. 2018; **34 (4):** 265-271. doi:10.36351/pjo.v34i4.266.
15. **Abu Hussein NB, Eissa IM, Abdel-Kader AA.** Analysis of Factors Affecting Patients' Compliance to Topical Antiglaucoma Medications in Egypt as a Developing Country Model. J Ophthalmol. 2015; **2015:** 234157. doi:/10.1155/2015/234157.
16. **Hasebe Y, Kashiwagi K, Tsumura T, Suzuki Y, Yoshikawa K, Suzumura H, et al.** Changes in adherence and associated factors among patients on newly introduced prostaglandin analog and timolol fixed-combination therapy. Patient Prefer Adherence. 2018; **12:** 1567-77. doi:/10.2147/PPA.S168921.
17. **Lulu-bahiyya UI, Sreeja PA.** Assessment of Topical Glaucoma Side Effects and Adherence to the Glaucoma Medications in Eye Care Centres at Palakkad- a Prospective Study. Int J Pharm Pharm Res. 2017; **9 (3):** 234-243.
18. **Tadesse F, Mulugeta A.** Compliance to topical anti-glaucoma medication among glaucoma patients at Menelik II Tertiary Hospital, Addis Ababa, Ethiopia. Ethiop J Health Dev. 2015; **29 (1):** 31-36.
19. **Rudd P.** In search of the gold standard for compliance measurement. Archives of Internal Medicine. 1979; **139 (6):** 627-628.
20. **Konstas AG, Maskaleris G, Gratsonidis S, Sardelli C.** Compliance and viewpoint of glaucoma patients in Greece. Eye, 2000; **14 (5):** 752-756.

Authors' Designation and Contribution

Amna Rizwan; Registrar: *Concepts, Design, Literature search, Data acquisition, Data analysis, Manuscript review.*

Mahmood Ali; Associate Professor: *Manuscript editing, Manuscript review.*

Farah Akhtar; Professor: *Concepts, Design, Literature search, Manuscript review.*

Ume Sughra; Associate Professor: *Data analysis, Statistical analysis, Manuscript review.*

Syed Ali Hasan Naqvi; Medical Officer: *Data analysis, Manuscript review.*