

# Causes of Non-Compliance in Diagnosed Primary Open-Angle Glaucoma Patients

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## ABSTRACT

### BACKGROUND

Glaucoma consists of a group of optic neuropathies characterized by progressive degeneration of retinal ganglion cells. These cells are central nervous system neurons that have their cell bodies in the inner retina and axons in the optic nerve. Degeneration of these cells results in optic disc cupping and vision loss. The objective of this study was to determine the cause of noncompliance in diagnosed cases of open angle glaucoma in Rohtak district of Haryana.

### METHODS

A total of 50 patients having confirmed diagnosis of primary open-angle glaucoma on anti-glaucoma medication of either sex attending the glaucoma clinic of PGIMS, Rohtak, was enrolled in this follow up study. Diagnosed patients of glaucoma on treatment underwent applanation tonometry for intraocular pressure and patients were asked about number of times they missed their medication and what were the reasons for the same. Visual field analysis was done at the end of follow up period of 4 months. The data was analysed using SPSS (Statistical Package for Social Sciences) version 21.0. Chi square test was applied for comparison. Point of statistical significance was considered if  $p < 0.05$ .

### RESULTS

68.0% patients were compliant to the treatment and 32.0% patients were non-compliant. 43.8% (7 patients) were non-compliant due to forgetfulness, 31.3% (5 patients) due to high cost of drugs, 6.3% due to improper instillation, long duration of treatment, side effect of medication and more number of drugs.

### CONCLUSIONS

In our study, it was also observed that forgetfulness (60%) was the most common cause of non-compliance in high income groups whereas high cost of drug (25%) was the most common cause of non-compliance in low income groups. In our study, lower compliance was found in elderly patients (above 60 years of age) which may be due to the reduced vision, coordination or memory and lack of family support.

### KEYWORDS

Glaucoma, Non-Compliance, Anti Glaucoma Drugs

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*DOI: 10.18410/jebmh/2020/227*

*Financial or Other Competing Interests:  
None.*

*How to Cite This Article:*

*Sachdeva S, Kumar S, Rathi M, et al.  
Causes of non-compliance in diagnosed  
primary open-angle glaucoma patients.  
J. Evid. Based Med. Healthc. 2020; 7(22),  
1047-1052. DOI:  
10.18410/jebmh/2020/227*

*Submission 06-02-2020,  
Peer Review 11-02-2020,  
Acceptance 11-03-2020,  
Published 26-05-2020.*



## BACKGROUND

Glaucoma is a group of optic neuropathies characterized by progressive degeneration of retinal ganglion cells. Degeneration of these cells results in optic disc cupping and vision loss.<sup>1</sup>

Worldwide more than 70 million people have been affected with glaucoma and out of them 10% are bilaterally blind, making it the leading cause of irreversible blindness in the world.<sup>2</sup> Glaucoma can remain asymptomatic initially, resulting in a high likelihood that the number of affected individuals is much higher than the number known to have it.<sup>3,4</sup> Population-level survey suggest that only 13.5% of people with glaucoma are aware that they have it.<sup>5</sup> In India, according to a survey the prevalence of glaucoma was 2.6%, of primary open-angle glaucoma it was 1.7%, of angle-closure glaucoma it was 0.5% and secondary glaucoma excluding pseudoexfoliation was 0.3%.<sup>6,7</sup>

Ocular hypotensive medications are used by 86% of patients with glaucoma and are the most common treatment for glaucoma.<sup>8</sup> Adherence to ocular hypotensive medications is a critical part of secondary prevention of visual impairment from glaucoma. Medications are very effective in reducing the development or worsening of glaucoma by at least 60%.<sup>9</sup> However, adherence with prescribed glaucoma treatments is notably poor.<sup>10-13</sup> While glaucoma medications require treatment every day, a recent study showed that only 56% of patients used more than 75% of the expected doses.<sup>14</sup> Several studies show an average estimate of non-adherence at 40%.<sup>11,15,16</sup> Other studies have noted that non-adherence is thought to be a leading cause of blindness in glaucoma.<sup>17-19</sup> Thus compliance with medication is quite problematic and is major obstacle in successful treatment of glaucoma.

Using eye drops has its own set of challenges that must be recognized and addressed at the clinical level. Lacey and associates found adherence to be associated with factors such as fear of blindness, forgetfulness, difficulty with drop application, and age.<sup>20</sup> Friedman and associates showed adherence to be associated with factors such as method of communication, patient education, risk of vision loss, cost, traveling, side effects, and demographic factors.<sup>21</sup> Other researchers have shown that low health literacy is associated with poor adherence.<sup>22,23</sup> Some studies have shown that glaucoma patients frequently have difficulty with drop instillation by missing the eye and/or by touching the eye with the eye drop bottle tip.<sup>24,25</sup>

Maximizing patient adherence to medication has the potential to reduce the number of surgical interventions required to treat glaucoma, prevent unnecessary vision loss, and save the overall health care system money in the long run.

As per available literature no such study has been conducted in north India. Hence this study is being conducted to assess treatment compliance in glaucoma patients and contributing factors to non-compliance.

## METHODS

The present follow up and questionnaire based study was carried out on 50 patients in Regional Institute of Ophthalmology, Pt. B.D. Sharma PGIMS, Rohtak. A total of 50 patients having confirmed diagnosis of primary open-angle glaucoma on anti-glaucoma medication of either sex attending the glaucoma clinic of PGIMS, Rohtak, were enrolled in this follow up study. A detailed medical and surgical history was recorded in each case. The following inclusion and exclusion criteria were followed respectively.

### Inclusion Criteria

All diagnosed patients of primary open-angle glaucoma on anti-glaucoma medication for at least one year.

### Exclusion Criteria

Mentally and physically disabled patients limiting instillation of medication.

An informed consent of patients was taken. A detailed history including data regarding demographic features was recorded. The best corrected visual acuity, intra ocular pressure with applanation tonometry, visual field analysis with Humphrey Field Analyzer, gonioscopy was done and recorded. A detailed history about the present treatment was taken.

The patients were called for follow up examination after every 4 weeks till 4 months and applanation tonometry was done at every visit and the medication compliance was asked. The causes of non-compliance were documented at every visit. Visual field analysis was done at the end of follow up period of 4 months.

### Statistical Analysis

The data was entered in Microsoft excel spreadsheet. The data was analysed using SPSS (Statistical Package for the Social Sciences) version 21.0. Student's t-test and Chi square test was applied for comparison. Point of statistical significance was considered if  $p < 0.05$ .

## RESULTS

The present study was carried out on 50 patients in Regional Institute of Ophthalmology, Pt. B.D. Sharma PGIMS, Rohtak during the academic year 2017-18. Patients having confirmed diagnosis of primary open-angle glaucoma on anti-glaucoma medication of either sex attending the glaucoma clinic of PGIMS, Rohtak, were enrolled in this study and the following observations were made. A total of 68.0% patients were compliant to the treatment and 32.0% patients were non-compliant. (Table-1)

29.4% patients in the compliant group were in age range (years) 41 - 50. 29.4% patients in the compliant group had age (years) 51 - 60. 23.5% patients in the compliant group had age (years) 61 - 70. 17.6% patients in the compliant group had age (years) 71 - 80. 12.5% patients in the non-compliant group had age (years) 41 - 50. 31.3% patients in the non-compliant group had age (years) 51 - 60. 12.5% patients in the non-compliant group had age (years) 61 - 70. 43.8% patients in the non-compliant group had age (years) 71 - 80. There was no significant difference in the two groups in terms of age (years) ( $\chi^2 = 4.822, p = 0.107$ ). (Table-2)

50.0% patients in the compliant group were male. 50.0% patients in the compliant group were females. 62.5% patients in the non-compliant group were males. 37.5% patients in the non-compliant group were females. There was no significant difference in the two groups in terms of gender ( $\chi^2 = 0.684, p = 0.546$ ). (Table-3)

2.9% patients in the compliant group had education below matric. 8.8% patients in the compliant group had education upto matric. 61.8% patients in the compliant group had education Graduate level. 26.5% patients in the compliant group had education status of postgraduate. 18.8% patients in the non-compliant group had education below matric. 6.3% patients in the non-compliant group had education level of matric. 75.0% patients in the non-compliant group were graduates. There was a significant difference in the two groups in terms of education ( $\chi^2 = 8.013, p = 0.033$ ). (Table-4)

23.5% patients in the compliant group had high income. 38.2% patients in the compliant group had income in middle range. 38.2% patients in the compliant group had low income. 31.3% patients in the non-compliant group had high income. 18.8% patients in the non-compliant group had income in middle range. 50.0% patients in the non-compliant group had low income. There was no significant difference in the two groups in terms of Income ( $\chi^2 = 1.899, p = 0.377$ ). (Table-5)

11.8% patients in the compliant group were using Alpha-2 Agonists (AA), 41.2% Beta Blockers (BB), 32.4% patients Prostaglandin Analogues (PGA), 11.8% a combination of BB + CAI and 2.9% patients a combination of PGA + CAI. 31.3% patients in the non-compliant group were prescribed Beta Blocker (BB), 12.5% patients Prostaglandin Analogue (PGA), 6.3% patients were on combination of BB + CAI, 6.3% a combination of BB + PGA, 18.8% patients a combination of PGA + AA, 12.5% patients PGA + BB and 12.5% patients on combination of PGA + CAI. There was a significant difference in the two groups in terms of Treatment Given ( $\chi^2 = 18.552, p = 0.006$ ).

85.3% patients in the compliant group were on single drug therapy, 14.7% patients on a combined therapy whereas 43.8% patients in the non-compliant group on a single drug and. 56.3% patients on a combination of 2 drugs. There was a significant difference in the two groups in terms of treatment given ( $\chi^2 = 9.314, p = 0.005$ ). (Table-6)

Status	Frequency	Percentage
Compliant	34	68.0%
Non-Compliant	16	32.0%
Total	50	100.0%

**Table 1. Distribution of the Patients in Terms of Compliance Status**

Age (Years)	Status				Total		Chi-Square Test	
	Compliant		Non-Compliant		N	%	$\chi^2$	P Value
	N	%	N	%				
41 - 50	10	29.4%	2	12.5%	12	24.0%	4.822	0.107
51 - 60	10	29.4%	5	31.3%	15	30.0%		
61 - 70	8	23.5%	2	12.5%	10	20.0%		
71 - 80	6	17.6%	7	43.8%	13	26.0%		
Total	34	100.0%	16	100.0%	50	100.0%		

**Table 2. Distribution of Patients in Terms of Age, and Its Association with Compliance**

Gender	Status				Total		Chi-Square Test	
	Compliant		Non-Compliant		N	%	$\chi^2$	P Value
	N	%	N	%				
Male	17	50.0%	10	62.5%	27	54.0%	0.684	0.546
Female	17	50.0%	6	37.5%	23	46.0%		
Total	34	100.0%	16	100.0%	50	100.0%		

**Table 3. Distribution of the Patients in Terms of Gender, and Its Association with Compliance**

Education	Status				Total		Chi-Square Test	
	Compliant		Non-Compliant		N	%	$\chi^2$	P Value
	N	%	N	%				
Below Matric	1	2.9%	3	18.8%	4	8.0%	8.013	0.033
Matric	3	8.8%	1	6.3%	4	8.0%		
Graduate	21	61.8%	12	75.0%	33	66.0%		
Postgraduate	9	26.5%	0	0.0%	9	18.0%		
Total	34	100.0%	16	100.0%	50	100.0%		

**Table 4. Distribution of Patients in Terms of Education, and Its Association with Compliance**

Income	Status				Total		Chi-Square Test	
	Compliant		Non-Compliant		N	%	$\chi^2$	P Value
	N	%	N	%				
High	8	23.5%	5	31.3%	13	26.0%	1.899	0.377
Middle	13	38.2%	3	18.8%	16	32.0%		
Low	13	38.2%	8	50.0%	21	42.0%		
Total	34	100.0%	16	100.0%	50	100.0%		

**Table 5. Distribution of Patients in Terms of Income, and Its Association with Compliance**

Treatment Given	Status				Total		Chi-Square Test	
	Compliant		Non-Compliant		N	%	$\chi^2$	P Value
	N	%	N	%				
Alpha-2 Agonist (AA)	4	11.8%	0	0.0%	4	8.0%	18.552	0.006
Beta Blocker (BB)	14	41.2%	5	31.3%	19	38.0%		
Prostaglandin Analogue (PGA)	11	32.4%	2	12.5%	13	26.0%		
BB+CAI	4	11.8%	1	6.3%	5	10.0%		
BB+PGA	0	0.0%	1	6.3%	1	2.0%		
PGA+AA	0	0.0%	3	18.8%	3	6.0%		
PGA+BB	0	0.0%	2	12.5%	2	4.0%		
PGA+CAI	1	2.9%	2	12.5%	3	6.0%		
Total	34	100.0%	16	100.0%	50	100.0%		
Single	29	85.3%	7	43.8%	36	72.0%		
Combined	5	14.7%	9	56.3%	14	28.0%		
Total	34	100.0%	16	100.0%	50	100.0%		

**Table 6. Distribution of Patients in Terms of Treatment Given, and Its Association with Compliance**

## DISCUSSION

The present study was carried out on 50 patients in Regional Institute of Ophthalmology, Pt. B. D. Sharma PGIMS, Rohtak

during the academic year 2017-18. An informed consent of patients was taken. A detailed history including data regarding demographic features was recorded. The best corrected visual acuity, intra ocular pressure with applanation tonometry, visual field analysis with Humphrey Field Analyzer, gonioscopy was done and recorded. A detailed history about the present treatment was taken. The patients were called for follow up examination after every 4 weeks till 4 months and following observations were made. Out of the total 50 patients enrolled in the study, 34 (68%) were compliant with the treatment and 16 (32%) were non-compliant to the treatment prescribed. In a study done by Onyenye and Ejimadu, 57.8% of the patients were found to be good compliers of anti-glaucoma therapy though only 46.6% of respondents knew the consequence of not complying with medical therapy.<sup>26,27</sup> This discrepancy between the compliance could be due to a difference in sample size in two studies.

### Reasons for Non-Compliance

43.8% (7 patients) were non-compliant due to forgetfulness, 31.3% (5 patients) due to high cost of drugs, 6.3% due to improper instillation, long duration of treatment, side effect of medication and more number of drugs each. It was also observed that the patients with higher education status were less compliant with medication but the relationship of educational status of the patient with noncompliance is not significant with  $p > 0.05$ .

In our study it was also observed that forgetfulness (60%) was most common cause of noncompliance in high income groups whereas high cost of drug (25%) was most common cause of noncompliance in low income groups. There was no significant association between reason for non-compliance and income overall ( $\chi^2 = 8.008$ ,  $p = 0.956$ ). In a study conducted by Osterberg et al, when patients were questioned about barriers to adherence, the following reasons were cited: forgetfulness (30%), other priorities (11%), lack of information (9%), emotional factors (7%) and 27% of individuals surveyed did not provide a reason.<sup>27</sup> This was also in accordance to our study as forgetfulness was the main cause of noncompliance.

### Age Distribution and Its Relation to Compliance

29.4% patients in the compliant group had age (years) 41 - 50. 29.4% patients in the compliant group had age (years) 51 - 60. 23.5% patients in the compliant group had age (years) 61 - 70. 17.6% patients in the compliant group had age (years) 71 - 80. 12.5% patients in the non-compliant group had age (years) 41 - 50. 31.3% patients in the non-compliant group had age (years) 51 - 60. 12.5% patients in the non-compliant group had age (years) 61 - 70. 43.8% patients in the non-compliant group had age (years) 71 - 80. There was no significant difference in the two groups in terms of age (years) ( $\chi^2 = 4.822$ ,  $p = 0.107$ ).

In our study, lower compliance was found in elderly patients above 60 years of age which may be due to the

reduced vision, coordination or memory and lack of family support. These results are similar to the study done by Hussein et al.<sup>28</sup>

### Gender Distribution and Its Relation to Compliance

In the present study 50.0% patients in the compliant group were male. 50.0% patients in the compliant group were females. 62.5% patients in the non-compliant group were males. 37.5% patients in the non-compliant group were females. There was no significant difference in the two groups in terms of gender ( $\chi^2 = 0.684$ ,  $p = 0.546$ ).

In a study conducted by Hussein et al, in the female group, 78 patients (54.6% of females) were found to be compliant. In the male group, 126 patients (42.4% of males) were found to be compliant.<sup>28</sup>

### Education Status and Its Relation to Non-Compliance

In our study, in below metric group, 25% patients were compliant and 75% patients were non-compliant. In metric group, 75% patients were compliant and 25% patients were non-compliant. In higher education group, 71.42% patients were compliant and 28.58% patients were non-compliant.

In a study done by Hussein et al, 25.11% patients were compliant in below metric group, 70.14% patients were compliant in metric group and 81.35% patients were compliant in higher education group. Results of our study are comparable to this study.

### Occupational Status and Its Relation to Compliance

In the present study, 47.1% patients in the compliant group were businessmen. 8.8% patients in the compliant group were engineer. 8.8% patients in the compliant group were shopkeeper. 5.9% patients in the compliant group had private job. 5.9% patients in the compliant group were teachers. 2.9% patients in the compliant group had occupation status of army personnel, bank manager, doctor, lab technician, police and property dealer each. 18.8% patients in the non-compliant group were businessmen. 6.3% patients in the non-compliant group were engineer. 12.5% patients in the non-compliant group were shopkeepers. 6.3% patients in the non-compliant group had private jobs. 6.3% patients in the non-compliant group were teachers, bank manager and police officer. 12.5% patients in the non-compliant group were farmers. 18.8% patients in the non-compliant group had other occupation. There was no significant difference in the two groups in terms of occupation ( $\chi^2 = 15.259$ ,  $p = 0.243$ ). No relevant study comparing occupation status with compliance was found even after through literature research.

### Annual Income and Its Relation to Compliance

It was observed in our study that, 23.5% patients in the compliant group had high income, 38.2% patients in the compliant group had income in middle income range and

38.2% patients in the compliant group had low income. 31.3% patients in the non-compliant group had high income, 18.8% patients in the non-compliant group had income in middle income range and 50.0% patients in the non-compliant group had low income. There was no significant difference in the two groups in terms of Income ( $\chi^2 = 1.899$ ,  $p = 0.377$ ). In accordance with our study, poor adherence to medication has been shown to increase healthcare costs in the United States. According to Osterberg et al., of all medication related hospital admissions in the US, 33–69% are due to poor medication adherence, with a resultant cost of around \$100 billion a year.<sup>28</sup>

### Visual Acuity and Its Association to Non-Compliance

97.1% patients in the compliant group had Visual Acuity-Best (Either Eye) 6/6 - 6/18. 2.9% patients in the compliant group had Visual Acuity-Best (Either Eye) <6/18 - 6/60. 0.0% patients in the compliant group had Visual Acuity-Best (Either Eye) <6/60 - 3/60. 56.3% patients in the non-compliant group had Visual Acuity-Best (Either Eye) 6/6 - 6/18. 37.5% patients in the non-compliant group had Visual Acuity-Best (Either Eye) <6/18 - 6/60. 6.3% patients in the non-compliant group had Visual Acuity-Best (Either Eye) <6/60 - 3/60. There was a significant difference in the two groups in terms of Visual Acuity-Best (Either Eye) ( $\chi^2 = 13.564$ ,  $p = 0.001$ ).

In the present study, it was observed that non-compliant patients had a lower visual acuity in the better eye as compared to compliant group. This signifies the importance of compliance in the preservation of visual acuity in glaucoma patients.

### Treatment Given and Its Association with Compliance

In this study, 11.8% patients in the compliant group were using Alpha-2 Agonists (AA), 41.2% Beta Blockers (BB), 32.4% patients Prostaglandin Analogues (PGA), 11.8% a combination of BB + CAI and 2.9% patients a combination of PGA + CAI. 31.3% patients in the non-compliant group were prescribed Beta Blocker (BB), 12.5% patients Prostaglandin Analogue (PGA), 6.3% patients were on combination of BB + CAI, 6.3% a combination of BB + PGA, 18.8% patients a combination of PGA + AA, 12.5% patients PGA + BB and 12.5% patients on combination of PGA + CAI. There was a significant difference in the two groups in terms of Treatment Given ( $\chi^2 = 18.552$ ,  $p = 0.006$ ).

85.3% patients in the compliant group were on single drug therapy, 14.7% patients on a combined therapy whereas 43.8% patients in the non-compliant group on a single drug and 56.3% patients on a combination of 2 drugs. There was a significant difference in the two groups in terms of treatment given ( $\chi^2 = 9.314$ ,  $p = 0.005$ ).

This was in accordance with the study conducted by Robin et al and Olthoff et al, where they found an inverse relationship between number and frequency of dosage and patient adherence.<sup>28,29</sup>

## CONCLUSIONS

From this study we conclude that forgetfulness (60%) is the most common cause of noncompliance in high income groups whereas high cost of drug (25%) was the most common cause of noncompliance in low income groups. In our study, lower compliance was found in elderly patients above 60 years of age which may be due to the reduced vision, coordination or memory and lack of family support. Maximizing patient adherence to medication has the potential to reduce the number of surgical interventions required to treat glaucoma, prevent unnecessary vision loss, and save the overall healthcare system money in the long run. Thus, identifying a non-compliant patient and paying careful attention to the cause of non-compliance is as important as diagnosing glaucoma and prescribing appropriate treatment and interventions to improve medication adherence must address each patient's unique set of barriers.

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