

Cost-related non-adherence to glaucoma medication in glaucoma patients attending an eye hospital in Western Nepal

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Abstract

Objective

The objective of this study was to assess the magnitude and factors associated with cost-related non-adherence (CRNA) to medical glaucoma therapy.

Methods

A cross-sectional hospital based study was conducted at Dhangadhi Netralaya Eye Hospital in the western Nepal. The study included all consecutive glaucoma patients aged 18 and above and have been under medical glaucoma therapy for at least six months. A face-to-face interview was conducted to record the socio-demographic details of the participants and to assess non-adherence to therapy.

Analysis

The burden of CRNA was assessed by estimating the proportion of CRNA with 95% confidence interval (CI). The association between dependent variable (CRNA) and independent variables: age, gender, presenting visual acuity right eye, duration of glaucoma, number of bottles of glaucoma medicines prescribed, presence of systemic disease(s) and disability were assessed in a bivariate analysis. A logistic regression was conducted to adjust the confounding variables. A p-value less than 0.05 was considered significant.

Results

The study included 132 participants; 80 males (60.6%) and 52 females (39.4%). The mean age of the included participants was 60.1 years (SD \pm 12.6; range 28 to 82 years). The majority of included participants had primary open angle glaucoma (37.9%) followed by primary angle closure glaucoma (22.7%). The mean duration of glaucoma was 4.2 years and the mean duration of medication was 4 years. CRNA was observed in 14 (10.6%; 95% CI 6.1 -17.5) patients. In a bivariate analysis, age (p=0.545), gender (p=0.0842), presenting visual acuity (p=0.899), employment status (p=0.230), and presence of disability (p=0.161) showed statistically insignificant association with medication non-adherence while number of medicine bottles prescribed (p<0.001) and duration of glaucoma (p=0.0432) showed statistically significant

association. Similarly, in a logistic regression, gender, number of glaucoma medicines prescribed and presence of systemic disease(s) showed statistically significant association with CRNA.

Conclusion

The cost-related non-adherence to glaucoma medical therapy was present in 1 in 10 individuals with glaucoma. Gender, presence of systemic disease(s) or co-morbidity and number of glaucoma medicines prescribed were significantly associated with cost-related non-adherences.

Key messages

What is already known on this topic?

The medical management of glaucoma involves a long term medication. Therefore, a good adherence to the prescribed therapy is important. However, adherence to glaucoma medication is often poor.

What this study adds

Cost is an important barrier to glaucoma medication. Gender, presence of systemic disease(s) or co-morbidity and number of glaucoma medicines prescribed are significantly associated with cost-related non-adherence to glaucoma medical management

How this study might affect research, practice or policy

This study provides significant implications both at clinical and policy levels. Understanding the magnitude and factors associated with non-adherence to medication are important to formulate policies to reduce the non-adherence rates.

Introduction

Glaucoma is a leading cause of irreversible vision impairment globally.¹ The medical management of glaucoma involves a long term medication. A good adherence to the prescribed therapy is necessary; however, unfortunately, adherence to therapy is often poor. Among the many causes of medication non-adherences such as, forgetfulness, difficulty with drop administration, shortages of medicines particularly in the rural areas and complexity of medication regimen, cost has also been an important determinant for non-adherence.²⁻⁷ In one of the recent reviews on glaucoma medication adherences, Moore et al² reported higher medication costs, a significant factor for medication non-adherence. Similarly, in a recent study in North India, nearly one-quarter of medication non-adherences were because of cost issues.³

Cost-related non-adherence is a condition when a patient does not take their medications as prescribed because of financial an issues. They may lower the dosage, skip taking medications, follow-up late, revert to alternative medications or borrow money/take a loan to overcome the cost of therapy. Although nearly 2%⁸ of Nepalese population is found to have glaucoma and a substantial number is expected to have the disease in the coming years, there have not been robust evidence on the cost and cost-related adherence to glaucoma therapy. Cost has been an important barrier in undertaking therapy, more particularly in the developing countries.⁹⁻¹¹ Understanding the burden and risk factors for cost-related glaucoma medication non-adherence are therefore important, particularly to reduce glaucoma related visual disability and also for formulating policies to minimize non-adherences. In this regard, this study was aimed to assess the magnitude of CRNA and associated factors for non-adherence.

Materials and Methods

This was a cross-sectional hospital based study conducted at Dhangadhi Netralaya Eye Hospital in the western part of Nepal. The study was approved by the Ethical committee of Nepal Health Research Council (protocol ref no.: 54). Informed and written consents were obtained from all participants before recruiting them to the study.

The study included all consecutive glaucoma patients attending the hospital from 01 October 2023 to 31 March 2024 and have been under medical glaucoma therapy for at least six months. Only patients aged 18 and above were included in the study. All patients were seen by a

glaucoma specialist at the hospital and a diagnosis was made based on clinical examinations. Visual acuity in the included participants was assessed using a Snellen chart and the recorded Snellen acuity was converted to decimal acuity. Participants with presenting visual acuity less than 6/12 in the better eye were categorized as visually impaired while those with <3/60 in the better eye were categorized as blind.

A face-to-face interview was conducted to record the socio-demographic details of the participants and to assess non-adherence to therapy. CRNA was considered if, in the last six months, the patient: a) reduced, or skipped medication dosage to save money b) delayed filling prescription because of cost issues, c) reverted to alternative therapies because of cost, or d) added anything to the eye drops to last longer.

Data analysis was conducted in R software (version 4.3.3).¹² First, the data were entered in MS-Excel where the data were cleaned and coded. Next, the excel sheet was imported to R where analysis was performed. Univariate analysis was computed using percentage for categorical variables while mean \pm SD were calculated for numerical variables. The burden of CRNA was assessed by estimating the proportion of CRNA with 95% confidence interval (CI).

A bivariate analysis was conducted to assess the association between dependent variable (CRNA) and independent variables: age, gender, presenting visual acuity right eye, duration of glaucoma, number of bottles of glaucoma medicines prescribed, presence of systemic disease(s) and disability. A chi-square test was used for categorical variables while for a numerical independent variable, a Mann-Whitney U test or t-test was used depending on the distribution of the data. Further, to adjust for the confounding variables, a logistic regression analysis was performed using the Enter method and odds ratio were estimated. A p-value less than 0.05 was considered significant.

Results

The study included 132 participants; 80 males (60.6%) and 52 females (39.4%). The mean age of the included participants was 60.1 years (SD \pm 12.6; range 28 to 82 years). The demographic characteristics of included participants is presented in Table 1.

Table 1. Demographic characteristics of included participants

Age (mean \pm SD), years	60.1 \pm 12.6
Gender (male/female), %	80 (60.6) 52 (39.4)
Systemic diseases associated, n (%)	31 (23.5)
Disability, n (%)	7 (5.3)
Employed, n (%)	39 (29.5)

The study included patients with different types of glaucoma who were under topical glaucoma medication for more than six months. The majority of included participants had primary open angle glaucoma (37.9%) followed by primary angle closure glaucoma (22.7%). The details of the type of glaucoma in the included participants are presented in Table 2. The mean duration of glaucoma was 4.2 years and the mean duration of medication was 4 years. Single glaucoma medicine bottle was prescribed in 83 patients (62.9%) and multiple bottles in 37.1% patients: 2 bottles in 28.8% and three bottles in 8.3% of included participants.

Table 2. Types of glaucoma in the included participants

Type of Glaucoma	Right eye n (%)	Left eye n (%)
POAG	47 (35.6)	50 (37.9)
POAG (end stage)	7 (5.3)	3 (2.3)
POAG with GOA	6 (4.5)	9 (6.8)
PACG	28 (21.2)	30 (22.7)
PACG with GOA	1 (0.8)	0 (0.0)
PACG (acute attack)	1 (0.8)	0 (0.0)
PACG (end stage)	1 (0.8)	2 (1.5)
Secondary glaucoma	1 (0.8)	1 (0.8)
CACG	6 (4.5)	8 (6.1)

CACG (end stage)	2 (1.5)	0 (0.0)
Glaucoma in pseudophakia	17 (12.9)	15 (11.4)
NTG	13 (9.8)	12 (9.1)
NTG End Stage	1 (0.8)	1 (0.8)
OHT	1 (0.8)	1 (0.8)

POAG: primary open angle glaucoma; GOA: Glaucomatous optic atrophy;

PACG: primary angle closure glaucoma; CACG: chronic angle closure glaucoma;

NTG: Normal tension glaucoma; OHT: ocular hypertension

The mean presenting decimal visual acuity in the included participants was 0.43 ± 0.31 (6/14 snellen equivalent) in both eyes. Visual impairment and blindness was present in 53.0% and 15.2% of the included participants. At least one CRNA behavior was observed in 14 (10.6%; 95% CI 6.1 -17.5) patients. The major findings of the study are presented in Table 3.

Table 3. Major findings of the study

Presenting VA (decimal), mean \pm sd	
Right eye	0.43 \pm 0.31
Left eye	0.43 \pm 0.31
Visual Impairment VA<6/12 (better eye)	70 (53.0%)
Blindness VA<3/60 (better eye)	20 (15.2%)
Duration of glaucoma, mean \pm sd, years	4.2 \pm 4.2
Duration of glaucoma, median (IQR), years	3 (2-5)
Duration of glaucoma medical therapy, mean \pm sd (years)	4.0 \pm 3.8
Duration of glaucoma medical therapy, median (IQR), years	3 (2-5)
Number of glaucoma bottles prescribed, mean (range)	1.5 (1-3)
Number of patients prescribed 1 or more bottles	
1 bottle	83 (62.9%)
2 bottles	38 (28.8%)
3 bottles	11 (8.3%)
Patients with IOP control	120 (90.9%)
Patients who replaced eyedrops without consultation	19 (14.4%)

Patients who added substances to eyedrops to last longer	7 (5.3%)
Reported at least one CRNA behavior	14 (10.6%)

IQR: interquartile range; sd: standard deviation; VA: visual acuity

In a Mann-Whitney U test, age and presenting visual acuity showed statistically insignificant association with medication non-adherence (age $p=0.545$, and presenting acuity $p=0.899$) while number of medicine bottles prescribed ($p<0.001$) and duration of glaucoma ($p=0.0432$) showed statistically significant association. Similarly, association of non-adherence with gender was assessed using a Chi-square test while associated systemic disease(s), presence of disability and employment status was assessed using Fisher's exact test. Gender ($\chi^2=2.981$, $p=0.0842$), employment status (OR=2.72, $p=0.230$), and presence of disability (OR=0.27, $p=0.161$) were not statistically significant while presence of systemic disease(s) (OR=0.89, $p<0.001$) showed statistically significant association with CRNA. Further, when confounding variables were adjusted in a logistic regression, gender, number of glaucoma medicines prescribed and presence of systemic disease(s) showed statistically significant association with CRNA. Presence of systemic disease(s) increased the risk of non-adherence by nearly 22 times while prescribing more than one medicine for glaucoma increased the risk by nearly 7 folds. The results of logistic regression are presented in Table 4.

Table 4. Logistic regression showing odds ratio and p-value

Variables	Odds Ratio	p-value
Age	0.99	0.802
Gender (males)	0.16	0.013
Presenting VA	3.23	0.324
Glaucoma duration	0.99	0.38
Bottles prescribed	6.72	0.001
Disability	0.58	0.633
Systemic disease(s)	22.51	0.014
Employment	0.9	0.94

Discussion

The present study was conducted to assess CRNA to glaucoma medical therapy. In a consecutive sample of 132 patients with different types of glaucoma, CRNA was observed in 10.6% of participants. The patients showing non-adherence to medication were found to skip, reduce or add something to the drops to last longer or save money. The study also determined the factors associated with CRNA. Gender, glaucoma multi-medication, and presence of systemic diseases were factors significantly associated with glaucoma medication non-adherence.

Cost is an important barrier to glaucoma therapy; however, there have not been many studies that have assessed non-adherence because of cost issues. Buys *et al*⁶ conducted a study in a Canadian population and estimated 25.8% CRNA in glaucoma patients aged 25-64 years and 7.1% in people aged above 65 years; a cumulative 15.5% non-adherence was observed when all age groups were considered. Interestingly, they found a greater non-adherence in younger patients compared to the elderly. Unlike in Buys *et al*⁶ study, we did not find a significant association between age and non-adherence. It may be because in Buys *et al* study, majority of elderly people used insurance to purchase medicines while most of the young patients did not have the insurance.

Similarly, Gupta *et al*¹³ compared cost related issues in patients with glaucoma and without glaucoma. They found that patients with glaucoma faced significantly more cost related challenges than those without glaucoma. In their study, CRNA was reported in 32% of patients while another 20% asked their doctor to prescribe cheaper drugs. The proportion of CRNA reported by Gupta *et al*¹³ is much higher than that reported in our study.

In another study conducted in the United States, Blumberg *et al*⁵ reviewed the Medicare Current Beneficiary Survey data from 2004 to 2009 to assess the trends in cost reduction and cost saving behaviors of Medicare beneficiaries with glaucoma before and after the administration of Medicare prescription drug benefit. They reported 21% CRNA in 2004 which reduced to 7.6% in 2009 after the implementation of the Medicare prescription drug benefit. They also analysed the independent risk factors associated with CRNA and found that the associated risk factors were lower income, younger age, self-reported visual disability, and limitations in activities of daily

living. Further, individuals without any form of prescription drug coverage or with greater co-morbidities were more likely to show CRNA behavior. In our study, although we did not study the effect of income on CRNA; our results are consistent with Blumberg *et al*⁵ study which showed presence of co-morbidity as a significant risk factor for CRNA. Presence of systemic disease(s) increased the risk of non-adherence by 22 folds in our study. This appreciably high non-adherence rate in co-morbid patients in our sample may be because of high costs incurred in purchasing medicines for multiple diseases. Most importantly, no patients in our sample used insurance to purchase medicines. Also, literature suggests that individuals with multi-morbidity usually experience increased out-of-the pocket health care expenses and are more prone to cost related non-adherences.¹⁴⁻¹⁷

Another important factor for medication non-adherence in our study was multi-medication. Prescribing complex multi-drug regimens is common in glaucoma medical management, particularly, when the intraocular pressure cannot be controlled with a single medication.¹⁸ However, added number of drugs is found to significantly decrease medication adherence. These findings are consistent with a recent comprehensive systematic review which reported complex eye drop regimens as one of the important factors for non-adherences.¹⁹

Our present study has several strengths. First, we were able to prospectively assess the burden of CRNA in a Nepalese cohort with glaucoma. Reports on CRNA in glaucoma patients in Nepalese population are scarce and therefore, this study provides important baseline data for further large population based studies. Although the results of our study are important and interesting, there are certain limitations of the study. Most importantly, the present study was limited by the number of participants included in the study. A larger sample size would have produced more robust results. Because glaucoma is not a very common disease, it is always difficult to include a large number of participants in a prospective study. However, the authors recommend that more studies in different geographic locations of the country with larger sample sizes be conducted for the generalizability of the findings.

Conclusion

Adherence to medication therapy is an important aspect of glaucoma management. In low-and-middle-income countries non adherence to medication due to higher cost of medication plays a crucial role. The results of our study showed that cost-related non-adherence was present in 1 in 10 individuals with glaucoma. Gender, presence of systemic disease(s) or co-morbidity and number of glaucoma medicines prescribed were significantly associated with cost-related non-adherences.

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