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Original Article

Factors Associated with Non-Adherence to Glaucoma Treatment in a Korean Nationwide Survey

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Abstract

Background: Glaucoma is a main cause of blindness despite the effectiveness of treatments, and adherence to treatment is a critical aspect of glaucoma management. We aimed to identify the factors associated with non-adherence to treatment among Korean glaucoma patients.

Methods: Data were collected from 4,833 glaucoma patients during the Korea Community Health Survey (KCHS) in 2008 and 2011 regarding current treatment for glaucoma, demographics, comorbidities, perceived health status, and health-related behaviors were subjected to analysis. A multivariable regression model was applied to identify factors related to non-treatment for glaucoma.

Results: Approximately, half of the 4,883 patients failed to adhere to treatment. Compared to the treatment group, the non-treatment group had lower social status, fewer comorbid conditions, were more optimistic about their health statuses, and more likely to adopt unhealthy behaviors. Stepwise regression analysis showed that poor social status (low level of education and unmarried), self-perception of a satisfactory health status, and unhealthy behaviors (smoking and no flu-vaccination) were significantly associated with non-adherent to treatment.

Conclusion: More attention should be paid to glaucoma patients with low social status or that are overconfident about their health. Future prospective studies that more comprehensively assess treatment compliance, are needed to confirm our findings.

Keywords: Glaucoma; Health Behaviors; Treatment Adherence; Socioeconomic status

Introduction

Glaucoma remains a major cause of blindness despite the availability of effective treatment. Adequate control of intraocular pressure can mitigate the progression of glaucoma (1), but glaucomatous visual loss may occur, due to its asymptomatic nature, during the final stages of disease progression. In this context, compliance with treatment is critical for effective glaucoma management. Several reports have well-demonstrated glaucoma patients with poor adherence to treatment suffer more severe glaucoma-related vision loss (2, 3).

However, comparatively little is known of the factors that contribute to noncompliance. While several studies have investigated factors associated with adherence to glaucoma management and

concluded that compliance may depend on glaucoma medication itself, especially with respect to adverse effects and discomfort during use (4-6). Others have suggested demographics (e.g., race, economic status, educational attainment, marital status) and psychosocial factors (e.g., motivation, self-efficacy, and depression) are determinants of adherence (7-9). However, little is known of relations between health-related behavioral factors and noncompliance with treatment.

Although perfect adherence may be an unrealistic goal for most patients, it is nonetheless important to be aware of drivers and barriers to treatment and to be able to identify patients that tend to demonstrate less adherent behavior. This study was undertaken to identify factors associated with no adherence to glaucoma treatment using the data of the largest survey conducted to date.

Materials and Methods

Design and participants

This study was conducted using data from the Korea Community Health Survey (KCHS) database. KCHS surveys conducted annually since 2008 using a multistage sampling design and provide nationally representative data. KCHS data was obtained by trained investigators that visited selected households and conducted face-to-face interviews with adult household members aged ≥ 19 years. Information on glaucoma was obtained in 2008 and 2011, and 5,272 patients with glaucoma were identified. After excluding patients concurrently treated for stroke, myocardial infarction, or major depressive disorder, we included 4,883 patients in the analysis. More detailed information about KCHS data can be found elsewhere (10).

Prior to data collection, individuals were informed that they had been selected to participate in the KCHS and could refuse to participate as stipulated by the National Health Enhancement Act. All participants provided written informed consent, and researchers followed the guidelines set forth in the Declaration of Helsinki. The Institutional Review Board (IRB) of the Korea Centers for Disease Control and Prevention approved the KCHS, and the IRB of Gachon University Gil Medical Center approved the protocol of the present study (IRB no., GCIRB2020-462).

Measures

Participants were asked whether they had been diagnosed with glaucoma by a physician or were currently being treated for glaucoma. According to the responses obtained, participants were allocated to a 'treatment group' or a 'non-treatment group'. Information was also collected on demographics (age, sex, economic status, attained educational level, and marital status), physician-diagnosed comorbidities (hypertension, type 2 diabetes, and cataract), perceived health status, and health-related behaviors (obesity, current smoking, drinking, salt consumption, influenza vaccination, and oral health examination). Low income was defined as the receipt of medical aid, and a low educational level was considered as less than a middle school education. Marital status was dichotomized as married or unmarried (divorced, separated, or single). Perceived health status (11) and a salty diet (12) were each assessed using a 5 point Likert scale: participants were classified into two groups (poor vs. not poor and salty vs. not salty, respectively). Obesity was defined as a body mass index (BMI) of > 25 kg/m^2. Those that smoked at the time of interviews were classified as current smokers. Participants were considered "frequent drinkers" if they drank more than 2 days per week. Receipt of flu vaccination and an oral health examination within the previous year were also checked.

Statistical analysis

Descriptive statistics were presented as means±standard deviations or numbers (percentages). The significances of intergroup differences were determined using the *t*-test or the chi-squared test, as appropriate. A backward stepwise multivariate regression model was used to identify factors related to adherence to glaucoma treatment, and to calculate odds ratios (ORs) and 95% confidence intervals (CIs). The analysis was conducted using STATA SE 9.2 (Stata Corp.,

College Station, TX, USA), and statistical significance was accepted for *P* values < 0.05.

Results

Table 1 shows the characteristics of participants according to adherence to glaucoma treatment.

Table 1: Characteristics of participants by adherence to glaucoma treatment

Variable	*Treatment (n=2,295)*	*No treatment (n=2,588)*	*P-value*
Demographics			
Age, yr	66.9±11.3	67.2±12.8	0.365
Female sex	1,378 (60.0)	1,644 (63.5)	0.012
Coverage for low income	234 (10.2)	266 (10.3)	0.927
Low educational attainment[a]	1,628 (71.1)	1,982 (76.7)	<0.001
Unmarried[b]	792 (35.3)	1,012 (40.7)	<0.001
Comorbid conditions			
Hypertension	1,066 (46.5)	1,134 (43.8)	0.065
Type 2 diabetes	572 (24.9)	492 (19.0)	<0.001
Cataract	950 (41.4)	952 (36.8)	0.001
Perceived health status, poor	1,312 (57.2)	1,370 (53.0)	0.003
Health-related behaviors			
Obesity[c]	483 (22.4)	559 (23.5)	0.405
Current smoking	121 (10.5)	127 (13.6)	0.028
Frequent drinking	170 (14.7)	173 (18.5)	0.019
Salty diet	727 (31.7)	856 (33.1)	0.303
Influenza vaccination	1,626 (71.1)	1,744 (67.4)	0.006
Oral health examination	388 (16.9)	342 (13.2)	<0.001

Data are presented as means±standard deviations or numbers (%). *P*-values were determined using the independent *t* test or the chi squared test. Significant *P* values are indicated in bold font

Table 2 presents factors associated with non-adherence to glaucoma treatment. The likelihood ratio of non-treatment was higher for participants with a low educational level (OR, 1.74; 95% CI, 1.40–2.17; *P*<0.001), unmarried participants (OR, 1.23; 95% CI, 1.00–1.50; *P*=0.048). Other cases are presented in the table.

[a]Middle school or lower

[b]Including divorced, separation for any reason, and single.

[c]body mass index ≥25 kg/m^2

Table 2: Factors associated with non-treatment compliance with glaucoma treatment

Variable	*Odds ratio[a]*	*95% confidence interval*	*P-value*
No receiving influenza vaccination	1.31	1.07–1.62	0.011
Current smoking	1.44	1.08–1.92	0.014
Perceived health status not poor	1.41	1.16–1.72	<0.001
Low educational attainment	1.74	1.40–2.17	<0.001
Unmarried	1.23	1.00–1.50	0.048

[a]Obtained by multivariate logistic regression analysis adjusted for demographics (age, sex, economic status, educational level, and marital status), comorbid conditions (hypertension, type 2 diabetes, and cataract), perceived health status, and health-related behaviors (obesity, current smoking, frequent drinking, salty diet, influenza vaccination, and oral health examination)

Discussion

Glaucoma patients are particularly prone to treatment nonadherence because of the chronic nature of the disease and the lack of early symptoms (13), but improving patient adherence lowers the cost burden of glaucoma and improves outcomes (14). This nationwide survey showed that glaucoma patients with a poor social status (low educational attainment and unmarried), that

perceived their health status as not of undue concern, current smokers and those that had not received a flu vaccination are less likely to adhere to glaucoma treatment. One retrospective study with a design similar to that of the present study reported that social factors such as smoking and living alone were associated with noncompliance to follow-up after glaucoma screening (15).

Social support has consistently been linked to better health outcomes and adherence to treatment for patients with chronic conditions. Ophthalmic screening participants that lived alone were twice as likely to be noncompliant to treatment (15). We also found that unmarried glaucoma patients were at risk of non-compliance to treatment. Our results also showed a low educational level was related to non-compliance. As previously reported, lower educational attainment has a substantial impact on overall health status and may contribute to poor adherence and overall health (16). Educational level is a predictor of knowledge and awareness of glaucoma by patients and their relatives (17). Educational attainment has a significant negative impact on poor adherence to glaucoma medication (18).

The present study also showed patient overconfidence regarding health status, smoking, and non-receipt of a flu vaccination were associated with non-adherence to treatment. In an interventional study (19), hypochondriasis was related to poor adherence to glaucoma medication and suggested that hypochondriac patients may regard the side effects of medication as an indicator of worsening disease status. However, the subjects recruited were receiving medical treatments and earned respectable incomes, and thus, their results may not be comparable to ours.

We speculated that overconfidence regarding health status reflects a general lack of health concern. Indisputably, adherence is poorer among those that do not understand the importance of treatment (20-22), and during the initial phases of glaucoma, patient education about the risks of blindness is particularly important (22, 23). Nonetheless, these efforts should be targeted and individualized, rather than simply providing general information on the disease and its treatment, and individuals' attitudes to therapy should be identified and utilized to encourage compliance (24, 25). Motivational interviewing has been demonstrated to improve medication adherence among patients with chronic diseases and could be used to improve treatment compliance in glaucoma (26).

This study had some limitations. First, due to the cross-sectional nature of this study, we were unable to determine the causalities of relationships between patient characteristics (e.g., socioeconomic status, concurrent conditions, or perceived health status) and adherence to treatment. Second, due to the retrospective nature of the survey database, we were not able to access additional clinical information (e.g., type of glaucoma or disease duration from diagnosis) or unmeasured survey items (e.g., the reason for not receiving treatment or patients' attitudes or knowledge of glaucoma or its treatment). Third, treatment adherence was determined using simple questions, which raises the possibility of reporting errors. Adherence data can be obtained using self-reports, by objective measurement using electronic monitoring systems, or using health insurance claims, and it has been demonstrated that adherence rates calculated using data obtained using these sources are comparable (27). Fourth, treatment status and medication adherence have been shown to vary between countries, cultures, and social environments, and these topics were not addressed in the present study (28).

Despite these limitations, this is the largest study conducted to date on the association between health-related behavioral factors and adherence to glaucoma treatment. Based on the results obtained, we recommended glaucoma patients with risk factors of non-adherence, such as poor social status and overconfidence regarding health status, be afforded additional attention, individualized education, and encouraged to comply with treatment. Future prospective studies are required to more comprehensively assess compliance with glaucoma treatment and to investigate the applicabilities of our findings in other ethnic groups.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors

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Conflict of interest

The authors declare that there is no conflict of interest.

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