

Influencing factors of fear of falling among glaucoma patients in west China: a cross-sectional study

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Received: 2022-08-30 Accepted: 2022-11-11

Abstract

• **AIM:** To investigate the current situation and influencing factors of fear of falling in glaucoma patients in western China.

• **METHODS:** In this cross-sectional study, glaucoma patients treated in the Ophthalmology Department of West China Hospital of Sichuan University were conducted to investigate the demographic data, visual acuity, visual field, activities of daily living, risk of falling, fear of falling and psychological states. Generalized linear model was used for multivariate analysis with fear of falling as dependent variable and other factors as independent variables.

• **RESULTS:** The mean score of the Chinese version modified Fall Efficacy Scale (MFES) was 7.52 ± 2.09 points. Univariate analysis and multivariate analysis showed that the history of falls within one year, visual acuity, visual field, risk of falling, activities of daily living and psychological states had statistically difference on fear of falling ($P < 0.05$).

• **CONCLUSION:** Glaucoma patients in west China have relatively high risk of fear of falling. History of falling within 1y, severe visual function impairment, high risk of falling, incapable of independence of daily living, and abnormal psychological state are risk factors of fear of falling among glaucoma patients.

• **KEYWORDS:** glaucoma; fear of falling; influencing factors

DOI:10.18240/ijo.2023.04.10

Citation: Ren J, Zhang X, Lin H, Zeng JH. Influencing factors of fear of falling among glaucoma patients in west China: a cross-sectional study. *Int J Ophthalmol* 2023;16(4):563-570

INTRODUCTION

Glaucoma refers to the optic nerve injury induced by pathological intraocular pressure (IOP) elevation, which can cause irreversible damage to patients' visual acuity and visual field. Glaucoma is the second leading cause of blindness worldwide. It has been estimated that about 79.64 million patients are living with primary glaucoma worldwide. The number of patients with primary glaucoma in China was reported to be 21.82 million, accounting for 27.4% of all primary glaucoma patients globally. The decline in quality of life and social burden caused by glaucoma are markedly pronounced^[1]. This vulnerable group has a lot of health issues that require special attention. Previous studies have demonstrated that the prevalence of anxiety and depression is higher in glaucoma patients than in the general population^[2]. Due to the damage to visual functions, such as visual field impairment, the incidence of falling among glaucoma patients is also higher compared to the general population^[3].

Fear of falling reduces confidence and efficacy during everyday activities^[4]. In fact, fear of falling has been described as "an exaggerated concern of falling that leads to excess restriction of activities"^[5]. Such exaggerated concern and worry could induce avoidant behaviors among patients^[6], increase anxiety^[7], and lead to various other negative outcomes, such as increased falling accidents, osteoporosis, constipation^[8], and reduced social participation^[9]. In addition, the damage fear of falling inflicts on physical and cognitive functions are both higher than falling per se^[10].

Previous studies on fear of falling were mainly performed in communities or hospitalized elderlies^[11-12], or patients with chronic diseases associated with physical dysfunctions, such as obesity^[13] and Parkinson's disease^[14]. However, very few studies investigated the fear of falling in patients with impairments in visual function. In addition, no previous studies have investigated the fear of falling among glaucoma patients. The negative emotions induced by fear of falling could form a vicious circle with the progression of glaucoma, thus severely influencing the quality of life of patients.

The aim of this study was to explore the current status and influencing factors of fear of falling among glaucoma patients from western China. The findings of this study could help

identify glaucoma patients with the risk of fear of falling and provide evidence for developing corresponding preventive and interventional strategies.

SUBJECTS AND METHODS

Ethical Approval This study was approved by the Biomedical Ethics Committee of West China Hospital of Sichuan University, with an ethics review number of 2021 (Review No.1426). All recruited patients gave their written informed consent before their inclusion as participants in this study.

Study Design and Subjects This cross-sectional study included glaucoma patients treated in the Ophthalmology Department of West China Hospital of Sichuan University and planned to receive surgical treatment between December 2021 and July 2022. Patients were recruited using the convenience sampling method. The West China Hospital of Sichuan University is a grade A tertiary hospital and the diagnosis and treatment center for mysterious and severe diseases in west China.

The inclusion criteria were as follows: 1) patients diagnosed with glaucoma or suspected of glaucoma and those who underwent anti-glaucoma treatment for >6mo; 2) aged ≥ 18 years old; 3) volunteered to participate in this study. The exclusion criteria were: 1) patients diagnosed with psychiatric diseases; 2) patients diagnosed with other systemic diseases that require bed rest, and those incapable of independently doing off-bed activities; 3) patients with communication disorders or cognitive impairment who could not complete the survey.

Survey Methods The survey was performed by face-to-face interview, which lasted for approximately 30min. The interviewer collected the following data: 1) demographic characteristics of patients (such as age, sex, and educational level); 2) clinical data (such as medical diagnosis, visual acuity, and visual field); 3) fear of falling and risk factors [Barthel Index Scale, Morse Fall Scale (MFS), Modified Fall Efficacy Scale (MFES), and Huaxi emotional-distress index (HEI)].

Tools of Survey

Chinese version Modified Fall Efficacy Scale The evaluation of fear of falling was performed using the Chinese version MFES translated by Hao and Liu^[15]. The original Fall Efficacy Scale (FES) was firstly developed by Tinetti *et al*^[16] and was modified by Hill *et al*^[17] in 1996. The modification added 4 items of outdoor activities and thus acquired the MFES with 14 items in 2 dimensions (indoor activities and outdoor activities). The Cronbach's α coefficient of the Chinese version MFES was 0.977^[15]. The scale evaluates the confidence of not falling when doing 14 activities; 9 activities are indoor activities and 5 activities are outdoor activities. Each item is scored at 11 levels from 0 to 10 points, with 0 point indicating no confidence at all, 5 points indicating fair confidence, and 10 points indicating

extreme confidence. The scores of each item are added to acquire the total score of MFES, with lower scores indicating lower confidence of not falling, *i.e.*, greater fear of falling.

Morse Fall Scale The risk of falling in patients was evaluated using the Chinese version of the MFS. MFS was developed by Professor Janice Morse from the University of Pennsylvania, USA, in 1989, specifically for predicting the probability of falling. The scale was translated into Chinese by Chow *et al*^[18] and was used to evaluate 954 Chinese patients in the Hong Kong Hospital. The findings showed that the sensitivity, specificity, and internal consistency validity were 31%, 83%, and 0.97, respectively. MFS has several advantages in evaluating the risk of falling in hospitalized patients, such as short time, low cost, being simple, and providing rapid results, and thus has been extensively applied. Chinese MFS version consists of 6 items, *i.e.*, history of fall, secondary diagnosis, ambulatory aids, intravenous therapy, gait, and mental status. The items have different classifications and scores. The highest score for the Chinese version of MFS is 125; a higher score indicates a higher risk of falling^[18].

Barthel Index Scale The activities of daily living of patients were evaluated by using the Barthel Index Scale (BI)^[19], which comprises 10 aspects, including bathing, grooming, dressing, bowel movement, bladder movement, toilet use, transfers (bed to chair and back), mobility (on level surfaces). The total score of the scale is 100 points, where 100 points indicate fully independent, 75-95 points indicate mild dysfunction and slight dependence, 50-70 points indicate moderate dysfunction and moderate dependence, 25-45 indicate severe dysfunction and severe dependence, and 0-20 points indicate extremely severe dysfunction and total dependence. BI not only distinguishes individuals with impaired activities of daily living from individuals with fully independent activities of daily living but also reflects the severity of impairments of activities of daily living. BI has been extensively applied, as it is simple to use, has high validity and reliability, and has high sensitivity^[20].

Huaxi emotional-distress index The psychological states of patients were evaluated by using HEI^[21]. This scale was developed by the West China Hospital of Sichuan University, which is mainly used for the rapid screening and evaluation of emotion-related disorders and psychological health status and can also evaluate the negative emotions of hospitalized patients with depression, such as depressive emotion, anxious emotion, and suicidal ideation. HEI can be completed within a short time (2-3min). It consists of 9 items that are scored by the 5-level Likert scale, with 0 point indicating "never", 1 point indicating "occasionally", 2 points indicating "some of the time", 3 points indicating "most of the time", and 4 points indicating "nearly all the time". The total HEI score ranges from 0-36 points, with a total score ≤ 8 points indicating no

negative emotions, 9-12 points indicating slight negative emotions, 13-16 points indicating moderate negative emotions, and ≥ 17 points indicating severe negative emotions. This scale was designed for the screening of patients with depression or anxiety in non-psychiatric clinical practices. The total Cronbach's α coefficient of HEI was 0.917^[22].

Visual field and visual acuity The Humphrey visual criteria were used to classify visual field into the early, middle, and late stages according to the Hodapp-Parrish-Anderson (HPA) visual field staging system^[23], i.e., patients with the average deviation > -6 dB were classified in the early stage, patients with the average deviation ≥ -12 dB but ≤ -6 dB were classified in the middle stage, and patients with the average deviation < -12 dB were classified in the late stage. To evaluate the influences of visual fields of bilateral eyes on fear of falling, the visual field of the eyes was classified into 6 grades as follows: both eyes in the early stage were defined as grade 1, one eye in the early stage and another eye in the middle stage was defined as grade 2, both eyes in the middle stage was defined as grade 3, one eye in early stage and another eye in the late stage was defined as grade 4, one eye in the middle stage and another eye in the late stage was defined as grade 5, and both eyes in the late stage was defined as grade 6.

The visual acuity was evaluated based on the *Consultation on Development of Standards for Characterization of Vision Loss and Visual Functioning* issued by the World Health Organization (WHO) in 2003. In brief, best-corrected visual acuity (BCVA) ≥ 0.3 was considered with no damage and was classified as grade 0, BCVA < 0.3 but ≥ 0.1 was considered with moderate damage and was classified as grade 1, BCVA < 0.1 but ≥ 0.05 was considered with severe damage and was classified as grade 2, BCVA < 0.05 but ≥ 0.02 or counts fingers (CF) 1 m was considered as blindness and was classified as grade 3, BCVA > 0.02 or CF 1m and \geq light perception (LP) was considered as blindness and was classified as grade 4, and BCVA of no light perception (NLP) was considered as blindness and was classified as grade 5 (Table 1)^[24].

Statistical Analysis The quantitative data and qualitative data in this study were described by means and standard deviations or ratios (constituent ratios), respectively. For the univariate analysis, an independent *t*-test was used for the comparison of binary variables, and an analysis of variances for a completely randomized design was used for the comparison of polytomous variables. SNK test was used for the pair-wise comparisons if there were statistically significant differences. A generalized linear model was used for the multivariate analysis.

RESULTS

A total of 100 patients with glaucoma meeting the inclusion and exclusion criteria were included in this study. The patients were 20-82y, and their mean age was 59.04 \pm 14.83y. The mean

Table 1 Proposed revision of categories of visual impairment

Category	Presenting distance visual acuity	
	Worse than	Equal to or better than
Mild or visual impairment (0)		3/10 (0.3)
Moderate visual impairment (1)	3.2/10 (0.3)	1/10 (0.1)
Severe visual impairment (2)	1/10 (0.1)	1/20 (0.05)
Blindness (3)	1/20 (0.05)	1/50 (0.02) ^a
Blindness (4)	1/50 (0.02) ^a	Light perception
Blindness (5)		NLP

^aOr counts fingers at 1 m. NLP: No light perception.

Table 2 Baseline for continuous variables

Variables	Mean \pm SD
MFES score	7.52 \pm 2.09
Age (y)	59.04 \pm 14.83

MFES: Chinese version Modified Fall Efficacy Scale.

score of the Chinese version of MFES was 7.52 \pm 2.09 points (Table 2). The other baseline characteristics of the patients are shown in Table 3.

Univariate analysis of fall efficacy scores showed that falling history, occupation, educational level, BCVA, visual field, BI score, HEI score, and MFS score were statistically significant ($P < 0.05$). The further pair-wise comparisons of occupation, educational level, BCVA, visual field, and MFS score between groups showed the following: 1) workers or farmers significantly differed from professionals, office clerks, students, cadres, or civil servants, while the differences between other groups were not statistically significant; 2) patients with the educational level of college or higher were significantly different from elementary school or lower, as well as junior middle school, while the differences between other groups were not statistically significant; 3) the BCVA was significantly different between every two grades; 4) the visual field was significantly different between grade 6 and all other grades, as well as between grade 5 and grade 3 or lower, but did not significantly differ between other grades; and 5) the risk of falling was significantly different between the moderate risk group and low-risk groups, but not significantly different between other groups (Table 4).

The generalized linear model used in this study for the multivariate analysis included variables with statistical significance in univariate analysis (Table 5). The findings showed that history of falling within 1y, BCVA, visual field, MFS score, BI score, and HEI score significantly influenced the falling ($P < 0.05$). Specifically, patients with a history of falling within 1y had lower MFES scores (mean: 1.07 points lower); patients with BCVA of ≥ 2 had lower MFES scores than patients with grade 0 BCVA (mean: 2.15 points lower); patients with the visual field of grade 6 had lower MFES scores than patients with \leq grade 3 visual field (mean: 1.29

Table 3 The distributions of baseline characteristics among study population (n=100)

Variables	n (%)
Diagnosis	
Open angle glaucoma	57 (57)
Angle-closure glaucoma	43 (43)
Time since the first diagnosis of glaucoma	
Within 6mo	24 (24)
7-12mo	22 (22)
13-24mo	15 (15)
More than 24mo	39 (39)
Gender	
Male	48 (48)
Female	52 (52)
Marital status	
Unmarried	5 (5)
Married	87 (87)
Divorced or widowed	8 (8)
History of falls (within 1y)	
No	74 (74)
Yes	26 (26)
Occupation	
Students, cadres, civil servants	9 (9)
Worker or farmer	34 (34)
Professional or technical person	26 (26)
Other	31 (31)
Level of education	
None or less than elementary school	23 (23)
Junior high schools	28 (28)
Senior school/technical secondary school	19 (19)
College	15 (15)
Undergraduates and above	15 (15)
Living with	
Alone	12 (12)
Spouse	42 (42)
Spouse and children	36 (36)
Other	10 (10)
Visual acuity	
Grade 0	79 (79)
Grade 1	10 (10)
Grade 2 and above	11 (11)
Visual field	
Grade 3 and below	14 (14)
Grade 4	25 (25)
Grade 5	21 (21)
Grade 6	40 (40)
Activities of daily living	
Fully independent	41 (41)
Mild dependence or less	59 (59)
Psychological states	
No negative emotion	92 (92)
Negative emotions	8 (8)
Risk of falling	
Low risk	56 (56)
Moderate risk	32 (32)
High risk	12 (12)
Body mass index	
Lean	4 (4)
Normal	54 (54)
Overweight	34 (34)
Obesity	8 (8)
Chronic diseases	
Yes	41 (41)
No	59 (59)
History of trauma or surgery	
Yes	92 (92)
No	8 (8)

Table 4 The fall efficacy score of different variables and its comparison

Variables	Fall efficacy score	t/F	P
Diagnosis		t=-0.25	0.80
Open angle glaucoma	7.47±2.21		
Angle-closure glaucoma	7.58±1.95		
Time since the first diagnosis of glaucoma		F=0.93	0.43
Within 6mo	7.55±2.19		
7-12mo	7.81±2.32		
13-24mo	8.04±2.16		
More than 24mo	7.12±2.09		
Gender		t=1.63	0.11
Male	7.87±1.92		
Female	7.19±2.21		
Marital status		F=1.26	0.29
Unmarried	7.89±2.63		
Married	7.60±2.07		
Divorced or widowed	6.41±1.91		
History of falls (within 1y)		t=5.84	0.00
No	8.14±1.81		
Yes	5.73±1.83		
Occupation		F=4.40	0.01
Students, cadres, civil servants	8.83±1.92 ^a		
Worker or farmer	6.70±2.07 ^a		
Professional or technical person	8.26±1.74 ^a		
Other	7.40±2.12		
Level of education		F=5.33	0.00
None or less than elementary school	6.52±2.04 ^a		
Junior high schools	7.87±1.95 ^a		
Senior school / Technical secondary school	6.72±2.18		
College	7.77±2.07		
Undergraduates and above	9.15±1.02 ^a		
Living with		F=0.52	0.67
Alone	7.09±2.03		
Spouse	7.72±2.03		
Spouse and children	7.56±2.32		
Other	6.99±1.67		
Visual acuity		F=31.04	0.00
Grade 0	8.14±1.72 ^a		
Grade 1	6.24±1.19 ^a		
Grade 2 and above	4.18±1.43 ^a		
Visual field		F=20.19	0.00
Grade 3 and below	9.52±1.66 ^a		
Grade 4	8.52±1.39 ^a		
Grade 5	7.77±1.59 ^a		
Grade 6	6.06±1.85 ^a		
Activities of daily living		t=7.53	0.00
Fully independent	9.03±1.54		
Mild dependence or less	6.46±1.76		
Psychological states		t=6.56	0.00
No negative emotion	7.77±1.94		
Negative emotions	4.50±1.29		
Risk of falling		F=8.72	0.00
Low risk	8.09±1.89 ^a		
Moderate risk	7.24±1.89 ^a		
High risk	5.57±2.37 ^a		
Body mass index		F=0.21	0.89
Lean	7.49±2.32		
Normal	7.46±2.29		
Overweight	7.67±1.80		
Obesity	7.03±1.79		
Chronic diseases		t=-1.25	0.21
Yes	7.26±2.03		
No	7.78±2.14		
History of trauma or surgery		t=-0.20	0.84
Yes	7.47±2.20		
No	7.56±2.01		

^aSign consistency means pairwise comparison. P<0.05.

Table 5 Multiple linear regression analysis of fall efficacy score in glaucoma patients

n=100

Variables	Non-standard partial regression coefficients		β'	t	P	95%CI	
	β	Std. Err					
Intercept	9.27	0.56		16.70	0.00	8.17	10.37
History of falls (within 1y) (with no as the control group)							
Yes	-1.07	0.28	-0.23	-3.82	0.00	-1.63	-0.51
Occupation (with worker or farmer as the control group)							
Students, cadres, civil servants	0.34	0.46	0.05	0.74	0.46	-0.57	1.24
Professional or technical person	0.24	0.31	0.05	0.76	0.45	-0.39	0.86
Other	-0.01	0.28	-0.00	-0.04	0.97	-0.57	0.55
Level of education (with undergraduates and above as the control group)							
None or less than elementary school	-0.50	0.39	-0.10	-1.27	0.21	-1.28	0.28
Junior high schools	-0.13	0.34	-0.03	-0.39	0.70	-0.82	0.55
Senior school/technical secondary school	-0.66	0.37	-0.12	-1.76	0.08	-1.40	0.09
College	-0.25	0.38	-0.04	-0.66	0.51	-1.00	0.50
Visual acuity (with grade 0 as the control group)							
Grade 1	-0.53	0.36	-0.08	-1.46	0.15	-1.24	0.19
Grade 2 and above	-2.15	0.38	-0.32	-5.72	0.00	-2.89	-1.40
Visual field (with grade 3 and below as the control group)							
Grade 4	-0.31	0.37	-0.07	-0.84	0.40	-1.05	0.43
Grade 5	-0.69	0.38	-0.14	-1.82	0.07	-1.44	0.06
Grade 6	-1.29	0.37	-0.30	-3.49	0.00	-2.03	-0.56
Risk of falling (with high risk as the control group)							
Low risk	0.82	0.37	0.19	2.18	0.03	0.07	1.56
Moderate risk	0.40	0.38	0.09	1.06	0.30	-0.36	1.16
Activities of daily living (with fully independent as the control group)							
Mild dependence or less	-1.20	0.25	-0.28	-4.85	0.00	-1.70	-0.71
Psychological states (with no negative emotion as the control group)							
Negative emotion	-1.21	0.40	-0.16	-3.03	0.00	-2.01	-0.42

Regression model testing: $F=21.18$, $P<0.01$; Goodness of fit: coefficient of determination=0.78.

points lower); patients with MFS scores of high risk had lower MFES scores than patients with MFS scores of low risk (mean: 11.415 points lower); patients with the activities of daily living (ADL) dependence had lower MFES scores than patients with ADL independence (mean: 1.20 points lower); patients with abnormal HEI scores had lower MFES scores than patients with normal HEI scores (mean: 1.21 points lower). Educational level and occupation had no significant impact on the MFES score.

DISCUSSION

This study aimed to investigate the current status of fear of falling and influencing factors among patients with glaucoma. The mean MFES score in glaucoma patients (7.52 ± 2.09) was lower than the mean MFES score in elderlies (≥ 60 y) in communities in China (8.21 ; 95%CI: 6.34, 9.64)^[25]. All the subjects in this study were adult glaucoma patients whose ages ranged from 20 to 82y, indicating that the fear of falling was higher in glaucoma patients than in elderlies in communities. These findings also indicated that fear of falling was not only present in the elderly. On the contrary, adult glaucoma patients of all age groups feared falling due to various causes such as

visual injuries. In this study, age did not associated fear of falling in glaucoma patients, which is inconsistent with the findings reported by Scheffer *et al*^[8] and Dietze-Hermosa *et al*^[26]. The review by Scheffer *et al*^[8] in community elderlies and study by Dietze-Hermosa *et al*^[26] in fitness research facility elderlies in University of Texas showed that older subjects had higher levels of fear of falling. However, the study of Shin *et al*^[27] in community elderlies in Korea and Chamroonkiadtikun *et al*^[28] in middle-aged and elderlies at primary care clinics showed that fear of falling was not associated with age. Further analyses showed that age per se was not a risk factor of fear of falling; however, different dysfunctions that appeared with advanced age were the risk factors of fear of falling. Therefore, we should not only pay attention to the elderly when investigating the fear of falling. Patients with diseases that could lead to dysfunctions such as glaucoma should also be considered, as fear of falling could also be associated with them. Previous studies^[28] have demonstrated that female elderly had a higher fear of falling than their male counterparts because elderly women were more concerned about health^[29] and possible

adverse outcomes of falling. Yet, this study included middle-aged and young patients with glaucoma, and sex did not result as a risk factor of fear of falling. We, therefore, speculate that young or middle-aged females and males did not differ in fear of falling, and young or middle-aged females were not overly focused on health issues or possible adverse outcomes of falling.

More studies are needed to investigate the risk factors of fear of falling in glaucoma patients. The univariate and multivariate analyses in this study showed that the MFES score was lower in glaucoma patients with a history of falling within 1y, indicating that glaucoma patients with a history of falling within 1y had a higher risk of fear of falling, which was consistent with the findings of various previous studies^[30-31]. In their review, Zhang *et al*^[31] showed that even if falling did not cause physical injuries, it could induce the fear of falling in subjects. These findings indicated that falling per se could induce anxiety and fear, consequently reducing confidence and inducing the fear of falling.

In the previous studies on the association between visual impairments and fear of falling, visual impairments were mainly defined by BCVA, contrast sensitivity, or a visual field of one eye^[32-33]. Still, the BCVA, contrast sensitivity, or visual field of one eye could not reliably reflect the visual functions of subjects or the influences of visual impairments on daily living. Therefore, herein we investigated the visual acuity and visual field of both eyes in patients with glaucoma that were graded according to international criteria, after which the visual acuity and visual field of both eyes were classified into 6 grades for statistical analysis. The findings showed that the MFES score was lower in glaucoma patients with poorer visual acuities and visual fields in bilateral eyes, indicating that glaucoma patients with more severe visual impairments had lower confidence and had higher levels of fear of falling. These findings were consistent with various previous studies, indicating that reduction of physical functions of perceptions could induce fear of falling^[34-35]. Further analysis showed that glaucoma patients with severe impairments or blindness in bilateral eyes (grade 2 or higher) had lower MFES scores ($P<0.05$), just as the glaucoma patients with late stage of visual fields in bilateral eyes (grade 6, $P<0.05$). These findings indicated that glaucoma patients with relatively severe visual impairments in bilateral eyes could suffer from the fear of falling. The glaucoma injuries to visual functions of patients are irreversible. Therefore, medical workers should use effective and timely interventions to prevent the visual impairments of glaucoma patients from progressing to severe impairments.

Glaucoma patients with the MFS score of high risk had lower MFES scores, which indicated that a higher risk of falling was

associated with higher levels of fear of falling. The MFS^[36] evaluates the risk of falling from 6 aspects, *i.e.*, history of fall, underlying disease, ambulatory aids, gait, cognitive status, and intravenous therapy, of which the history of fall, walking capability, use of ambulatory aids, and gait were all identified as risk factors of fear of falling^[37]. Evaluation of the risk of falls is a routine evaluation in clinical practice, and nursing staff should pay attention to the presence of fear of falling in patients with a high risk of falling.

BI reflects the subject's dependence on performing daily activities. The findings of this study showed that glaucoma patients with the BI grade of dependence had lower MFES scores, indicating that glaucoma patients incapable of living independently had higher levels of fear of falling. In light of the conditions in the real world, glaucoma patients with poorer visual functions had lower levels of living independently and higher levels of fear of falling. Choi and Ko^[38] showed that fear of falling could lead to activity limitation, consequently reducing independence in daily activities. Reduced independence in daily activities could, in turn, induce the fear of falling, thus forming a vicious circle and ultimately leading to activity restrictions for patients.

In this study, HEI was used to evaluate the psychological states of glaucoma patients, which showed that glaucoma patients with abnormal psychological states had higher levels of fear of falling. Different previous studies^[39-40] have demonstrated that psychological states such as anxiety and depression were associated with fear of falling or were risk factors for fear of falling. Furthermore, the prevalence of anxiety and depression was higher in glaucoma patients than in the general population^[41]. Therefore, we speculated that glaucoma patients were more susceptible to fear of falling.

In conclusion, glaucoma patients in west China have a relatively high risk of fear of falling. History of falling within 1y, severe visual function impairment, high risk of MFS score, incapable of independent daily living, and abnormal psychological state are all risk factors of fear of falling among glaucoma patients.

ACKNOWLEDGEMENTS

Conflicts of Interest: Ren J, None; Zhang X, None; Lin H, None; Zeng JH, None.

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