



A Comparison of Fear of Falling in Older Adults with Physical Independence and Those with Hip Fracture Surgery

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Purpose: This study aimed to compare the level of fear of falling (FOF) and factors influencing FOF in older adults with physical independence versus with hip fracture surgery. **Methods:** Data for this cross-sectional study were collected from June to November 2021. The participants were 100 older adults with hip fracture surgery and 100 older adults who were physically independent. We examined the participants' sociodemographic characteristics, fall-related characteristics, and FOF using the Korean version of the Short Falls Efficacy Scale International. **Results:** Almost all the participants in both groups had moderate or high levels of concerns related to FOF. Factors influencing FOF were dizziness and being female. A history of falling in the past year (twice or more) was a significant factor affecting FOF among older adults who were physically independent, but not among those with hip fracture surgery. **Conclusion:** FOF is a risk factor for activity restriction and functional decline. Therefore, healthcare providers should routinely assess FOF among not only older adults with serious injuries from falls but also those with physical independence in the community. Moreover, nursing interventions for FOF in older adults with hip fracture surgery should be approached differently.

Key Words: Aged; Fear; Independent living; Hip fracture

INTRODUCTION

The incidence and number of falls tend to increase with age, making falls among older adults a major health concern that remains the focus of attention as we look ahead to Korea's super-aged society in 2025 (Lee et al., 2020). Falls and fall-related injuries in older adults are associated with high rates of hospitalization, mortality, healthcare costs, functional decline, and poor quality of life (Montero-Odasso et al., 2021). Among fall injuries, hip fractures are the most serious complication with high mortality rates; most older adults who experience hip fractures are characterized by functional decline and frailty (Bouvard, Annweiler, & Legrand, 2021; Veronese & Maggi, 2018), thereby making independent living difficult. Reducing

functional decline is essential for older adults with hip fractures. A previous study (Ko, Lee, Kim, & Baek, 2019) suggested that fear of falling (FOF) was a stronger predictor of functional decline than pre-fracture walking ability and depression. In addition, a recent study (Jaatinen, Luukkaala, Hongisto, Kujala, & Nuotio, 2022) found that 49% of older adults had experienced FOF after a hip fracture due to a simple fall, thereby confirming that it is a common psychological problem.

Notably, FOF was also commonly reported in community-dwelling older adults without hip fractures. In one study, 69.2% of community-dwelling older adults reported a FOF, and one in three reported limiting their activities owing to FOF (Merchant et al., 2020). The prevalence of FOF in Korean community-dwelling older adults

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was reported to be approximately 50~76%(Lee & Kim, 2021; Oh, Hong, Lee, & Han, 2017; Park, Yang, & Chung, 2017). Factors affecting FOF include general characteristics as well as physical and psychosocial aspects (Lee & Kim, 2021; Oh et al., 2017; Park et al., 2017). Of these, it is well known that fall history has the strongest influence on FOF among community-dwelling older adults (Oh et al., 2017; Park et al., 2017). Dizziness has also been reported as a risk factor for falls (Alyono, 2018; Lindell et al., 2020), and FOF (Lindell et al., 2020) in community-dwelling older adults.

However, studies on the association between FOF and dizziness in older Korean adults are limited. In addition, we could not find any study that identified the extent of FOF and its influencing factors among older adults with hip fractures in Korea. As mentioned above, older adults with and without hip fractures have been reported to have high FOF levels. As FOF is strongly associated with activity limitations (Merchant et al., 2020), systematic interventions are required to reduce FOF in both groups. In this study, we compared FOF levels and their influencing factors between physically independent older adults and those with hip fractures to improve healthcare providers' understanding of FOF and provide a basis for reflecting on it during interventions.

METHODS

1. Research Design

This cross-sectional study investigated the FOF and its influencing factors in older adults with physical independence and in those who underwent surgery after hip fracture.

2. Participants

One hundred older adults who underwent hip fracture surgery were recruited by convenience sampling as orthopedic surgery outpatients from a tertiary hospital in D City, South Korea. This study defined older adults with hip fracture surgery as those who had undergone surgery for hip fracture 6~12 months previously. The control group consisted of 100 physically independent older adults. They were recruited through convenience sampling from a local community senior welfare center that agreed to participate in the study. This study defined older adults with physical independence as those who can perform activities of daily living independently. The inclusion criteria for both groups were as follows: (1) older

adults aged ≥ 70 years; and (2) those who understood the purpose of the study and the content of the questionnaire, were able to communicate, and signed a written informed consent form to participate in the study. The exclusion criteria comprised those who took psychotropic medications owing to issues such as depression. Among physically independent older adults, those with hip fracture surgery were excluded.

To confirm the appropriateness of the sample size, G*Power software version 3.1.9.7. was used. The calculation applied a power of 0.90, significance at $p=.05$, an effect size of 0.15, and four predictors in linear multiple regression. The minimum sample size required was 99 patients. Therefore, an appropriate sample size ($n=100$ per group) was used.

3. Measures

We compared the factors influencing FOF in older adults who underwent hip fracture surgery with those who were physically independent. We examined socio-demographic characteristics (sex and age [early old age: 70~74 years; and late old age: ≥ 75 years]), fall-related characteristics (dizziness and number of falls experienced in the past year), and the Short Falls Efficacy Scale International (FES-I) Korean version (Ko, Lee, & Baek, 2022). The Short FES-I scores were used as the dependent variable.

4. Short FES-I

The Korean version (Ko et al., 2022) of the Short FES-I, originally developed by Kempen et al.(2008), was used to evaluate FOF. The Short FES-I consists of seven items, and participants respond to each item on a 4-point Likert scale (1=not at all concerned, 2=somewhat concerned, 3=quite concerned, and 4=very concerned). The responses to the 7 items were added, ranging from 7 (no concern about falling) to 28 (severe concern about falling). The cut off scores, according to Kempen et al.(2008), were as follows: low concern, 7~8; moderate concern, 9~13; and high concern, 14~28. Cronbach's α coefficients during tool development ranged from .93 to .95. The Cronbach's α coefficient for this study was .89.

5. Collecting Data

Prior to data collection, a researcher visited a welfare center and an orthopedic surgery outpatient clinic in person and obtained research approval according to the in-

stitutional procedures. The data were initially collected from older adults who visited one welfare center and one orthopedic outpatient clinic of a teaching hospital and agreed to participate in the primary study (Ko et al., 2022) to develop of the Korean version of the Short FES-I. This study used the general and fall-related characteristics and the short FES-I data collected from the same data. Data were collected from June to November 2021. Two trained research assistants explained the purpose, methods and procedure of the study and obtained written informed consent from the participants. They also explained the benefits and disadvantages of the research, especially that there are no penalties for withdrawing consent. They read the questionnaire and helped participants respond in-person. It took five to ten minutes per person to complete the questionnaire. The participants in this study were provided with gifts worth KRW 10,000.

6. Data Analysis

Data were analyzed using SPSS/WIN 23.0. The general and fall-related characteristics of the study participants were analyzed using frequency analysis and χ^2 test. The distribution of the short FES-I cut-off scale between the two groups was analyzed using the χ^2 test. Differences in the short FES-I scores according to general and fall-related characteristics between the groups were analyzed using an independent t-test and one-way analysis of variance (ANOVA). Post hoc test of ANOVA used Turkey's HSD. For variables that did not meet the normality test using the Kolmogorov-Smirnov test, the Mann-Whitney and Kruskal-Wallis tests were used for analysis. Multiple linear regression analysis was performed to investigate the factors influencing FOF in each group. The statistical significance level was set at $p < .05$ for all analyses.

7. Ethical Consideration

The Institutional Review Board of K Hospital (IRB File No. 2023-03-033) approved this cross-sectional study that

used secondary data (Ko et al., 2022) for this research purpose. Before collecting the data, a researcher obtained the research approval in accordance with the institutional procedure by visiting the welfare center and orthopedic surgery outpatient clinic in person. Written informed consent was obtained from the participants after a sufficient explanation of the purpose and methods of the study. Confidentiality and privacy were guaranteed and each data file was coded and anonymized.

RESULTS

1. General and Fall-related Characteristics of Older Adults with Physical Independence and with Hip Fracture Surgery

In terms of sex, in the group of physically independent older adults ($n=100$), 17 were male and 83 were female, while in the group of older adults after hip fracture surgery ($n=100$), 31 were male and 69 were female ($\chi^2=5.37$, $p=.021$). In terms of dizziness, 64 participants in the group with physical independence reported experiencing dizziness, while 42 participants in the group with hip fracture surgery reported experiencing dizziness ($\chi^2=9.71$, $p=.001$). In the past year, 31 individuals in the physically independent group had experienced falls once and 17 had experienced falls twice or more. In the group with hip fracture surgery, 75 individuals experienced falls once and 21 individuals experienced falls twice or more ($\chi^2=5.82$, $p < .001$) (Tables 1, 2).

2. Short FES-I Scores of Older Adults with Physical Independence and with Hip Fracture Surgery

The Short FES-I scores of the two groups were compared by dividing them into low- (7~8), moderate- (9~13), and high-concern (14~28) groups using a cut off scale. According to the cut-off the short FES-I, 11 (5.5%) among the total participants were classified as low concern, 45 (22.5%) were classified as moderate concern, and 144

Table 1. General Characteristics of Older Adults with Physical Independence Versus Those with Hip Fracture Surgery ($N=200$)

Variables	Categories	Older adults with physical independence ($n=100$)	Older adults with hip fracture surgery ($n=100$)	χ^2 (p)
		n (%)	n (%)	
Sex	Male	17 (17.0)	31 (31.0)	5.37 (.021)
	Female	83 (83.0)	69 (69.0)	
Age	Early old age (70~74 years)	12 (12.0)	21 (21.0)	2.94 (.085)
	Late old age (≥ 75 years)	88 (88.0)	79 (79.0)	

Table 2. Fall-Related Features of Older Adults with Physical Independence Versus Those with Hip Fracture Surgery (N=200)

Variables	Categories	Older adults with physical independence (n=100)	Older adults with hip fracture surgery (n=100)	χ^2 (p)
		n (%)	n (%)	
Dizziness	No	36 (36.0)	58 (58.0)	9.71 (.001)
	Yes	64 (64.0)	42 (42.0)	
Number of falls experienced in the past year	None	52 (52.0)	4 (4.0)	5.82 (<.001)
	Once	31 (31.0)	75 (75.0)	
	Twice or more	17 (17.0)	21 (21.0)	

Table 3. Short FES-I Scores of Older Adults with Physical Independence Versus Those with Hip Fracture Surgery (N=200)

Group	Low concern	Moderate concern	High concern	χ^2 (p)
	n (%)	n (%)	n (%)	
Total	11 (5.5)	45 (22.5)	144 (72.0)	8.07 (.027)
Older adults with physical independence	7 (3.5)	30 (15.0)	63 (31.5)	
Older adults with hip fracture surgery	4 (2.0)	15 (7.5)	81 (40.5)	

Note: Cut-off score of the Short Falls Efficacy Scale International (FES-I); low concern 7~8, moderate concern 9~13, high concern 14~28.

(72%) were classified as high concern. In the physically independent older adult group, seven individuals (3.5%) were categorized as having low concern, 30 (15.0%) were categorized as having moderate concern, and 63 (31.5%) were categorized as having high concern. In the group of older adults who underwent hip fracture surgery, 4 (2.0%) had low concern, 15 (7.5%) had moderate concern, and 81 (40.5%) had high concern ($\chi^2=8.07, p < .027$) (Table 3).

3. Short FES-I According to the General and Fall-related Characteristics of Older Adults with Physical Independence and with Hip Fracture Surgery

In the physically independent group, the mean Short FES-I scores according to sex were 11.94 ± 4.08 for males and 15.77 ± 4.62 for females ($t=-3.04, p=.002$). The mean scores according to the presence of dizziness were 13.33 ± 4.56 for "none" and 16.13 ± 4.58 for "present" ($t=-2.91, p=.004$). The mean scores according to the frequency of falls in the past year were 13.65 ± 3.97 for "none," 15.35 ± 4.63 for "once," and 19.18 ± 4.94 for "twice or more" ($F=15.21, p < .001$).

The average Short FES-I scores in the group with hip fracture surgery were 16.90 ± 5.28 in males and 18.99 ± 4.54 in females ($t=-2.01, p=.047$). The Short FES-I score was not significantly associated with older age, dizziness, or number of falls experienced in the past year (Table 4).

4. Factors Influencing FOF in Older Adults with Physical Independence and with Hip Fracture Surgery

As a result of examining multicollinearity before the regression analysis, the tolerance values of the variables were 0.98 to 0.99, which was more than 0.1, the value of the variation inflation factor was 1.01 to 1.02, which did not exceed 10. Therefore, there was no problem of multicollinearity between the independent variables. The Durbin-Watson value was 1.20 and the autocorrelation between the residuals was small, indicating that the regression model was suitable for testing the independence of the residuals.

To identify factors affecting FOF in the two groups and significant variables, such as sex, presence of dizziness, and recent experience of falls (twice or more), were transformed into dummy variables and included as predictors in the bivariate analysis. The regression model for FOF in the group with physical independence was significant ($F=11.28, p < .001$), with the most significant predictor being recent experience of falls (two or more times) ($\beta=.35, p < .001$), followed by the presence of dizziness ($\beta=.22, p < .05$) and female sex ($\beta=.21, p < .05$). These three variables explained 26.1% of the variance in FOF. In the group with hip fracture surgery, the regression model for FOF was significant ($F=3.01, p < .05$), with the variables of dizziness ($\beta=.21, p < .05$) and being female ($\beta=.22, p < .05$) being significant predictors (Table 5).

Table 4. Short FES-I Scores according to the General and Fall-Related Characteristics of Older Adults with Physical Independence Versus Those with Hip Fracture Surgery

Variables	Categories	Older adults with physical independence			Older adults with hip fracture surgery		
		M±SD	t, z, F (p)	Tukey HSD	M±SD	t, z, F (p)	Tukey HSD
Sex	Male	11.94±4.08	-3.04		16.90±5.28	-2.01	
	Female	15.77±4.62	(.002)		18.99±4.54	(.047)	
Age	Early old age (70~74 years)	14.67±4.37	-0.35		18.05±3.41	-0.65 [†]	
	Late old age (≥75 years)	15.18±4.81	(.720)		18.42±5.18	(.511)	
Dizziness	No	13.33±4.56	-2.91 [†]		17.53±4.49	-1.97	
	Yes	16.13±4.58	(.004)		19.45±5.16	(.051)	
Number of falls experienced in the past year	None ^a	13.65±3.97	15.21 [†]	a, b < c [§]	20.00±2.94	0.53 [†]	
	Once ^b	15.35±4.63	(<.001)		18.37±5.07	(.767)	
	Twice of more ^c	19.18±4.94			17.90±4.67		

M=mean; SD=standard deviation; Turkey's HSD=Tukey's honestly significant difference test. [†] Mann Whitney test: non-parametric test (two group comparison); [‡] Kruskal Wallis test: non-parametric test (≥3 group comparison); [§] Post hoc analysis of variance using Tukey's HSD.

Table 5. Factors Influencing Fear of Falling in Older Adults with Physical Independence Versus Those with Hip Fracture Surgery

Variables	Categories	Older adults with physical independence				Older adults with hip fracture surgery			
		B	SE	β	t	B	SE	β	t
(Constant)		10.80	1.07		10.09***	15.87	0.97		16.37***
Sex	Male (ref.)								
	Female	2.65	1.14	.21	2.34*	2.28	1.02	.22	2.23*
Dizziness;	No (ref.)								
	Yes	2.13	0.89	.22	2.41*	2.07	0.97	.21	2.13*
Number of falls experienced in the past year	None (ref.)								
	Twice or more	4.36	1.11	.35	3.92***	0.34	1.67	.02	0.21
F				11.28***				3.01*	
R ²				0.261				0.086	
Adj. R ²				0.238				0.057	

*p < .05, **p < .01, ***p < .001.

DISCUSSION

This study found that both older adults who had undergone hip fracture surgery and who had physical independence in their daily lives had significantly higher levels of FOF. Furthermore, a significant finding is that a history of falling is a strong predictor of FOF in older adults with physical independence but not in those who have undergone hip fracture surgery. This may suggest that nursing interventions related to FOF should be approached differently.

The results of this study showed that physically independent older adults reported more dizziness than those who had undergone hip fracture surgery. Dizziness can be

attributed to various factors, including the vestibular, visual, and somatosensory systems (Alyono, 2018). Additionally, upright postures and complex or moving visual stimuli during daily activities can accelerate dizziness (Popkirov, Staab, & Stone, 2018). They are likely to cause dizziness more in physically independent older adults than in older adults with activity limitation due to hip fractures (Bouvard et al., 2021; Veronese & Maggi, 2018). Further studies are needed to investigate the factors affecting dizziness in community-dwelling older adults.

In this study, dizziness was found to affect FOF in both groups. It is a common symptom among community-dwelling older adults and is strongly associated with fall risk (Alyono, 2018), making it a prominent issue that

should be considered in nursing interventions. Thus, clinical and community nurses should be well versed in detailed nursing history-taking and physical examination skills to identify the presence of dizziness. In addition, the female sex was found to be an influencing factor for FOF in both groups. The greater susceptibility of women to FOF than men is similar to previous findings in older adults with hip fractures (Bouvard et al., 2021) and community-dwelling older adults (Merchant et al., 2020).

In terms of fall history, older adults with hip fracture surgery experienced one or more falls more frequently than physically independent adults. They also showed higher FOF concerns than older adults with physical independence. These results are consistent with those of previous studies (Denkinger, Lukas, Nikolaus, & Hauer, 2015; Hadjistavropoulos, Delbaere, & Fitzgerald, 2011; Mackay, Ebert, Harbidge, & Hogan, 2021; Merchant et al., 2020; Jaatinen et al., 2022) in that falling experience and hip fractures as a serious injury may cause severe FOF concerns. Furthermore, most physically independent participants had moderate to high FOF concerns as assessed using the Short FES-I scale. This suggests that healthcare providers should routinely assess FOF as an under-recognized psychological problem, not only in older adults with hip fracture surgery but also in older adults with physical independence in the community, and consider interventions to actively reduce it.

Experiencing two or more falls in the past year was a very strong factor for older adults with physical independence but was not significant for those after hip fracture surgery. This result was consistent with those of previous studies (Oh et al., 2017; Park et al., 2017) showing that the most influential factor regarding FOF among older adults living in the community was a history of falls. Therefore, preventing falls and providing appropriate post-fall care are essential for reducing FOF and its negative consequences. FOF mainly manifests after a fall (Hadjistavropoulos et al., 2011) but can be caused by a variety of factors, including impaired physical functioning (Martinez-Arnau, Prieto-Contreras, & Perez-Ros, 2021), frailty (Martinez-Arnau et al., 2021; Merchant et al., 2020), and depression (Lee & Kim, 2021).

In this study, the explanatory power of FOF in older adults after hip fracture surgery was very low, suggesting that several factors were not included herein. In the future, a broader and deeper understanding of the factors associated with FOF in older adults after hip fracture surgery will be required to inform the development of disease-specific interventions. In addition, efforts should be made to implement and disseminate active fall prevention edu-

cation programs to community-dwelling older adults. Older age was not a factor affecting FOF in either group. This result differed from those of previous studies (Mackay et al., 2021; Martinez-Arnau et al., 2021), while one study (Denkinger et al., 2015) found that older age was a significant factor in activity restriction related to FOF but not to FOF itself. Further studies are required to investigate its explicit influence on FOF.

The limitations of this study are as follows: first, the analysis was based on secondary data and did not include various factors that affected FOF. Second, the results cannot be generalized, because the participants in this study were older adults who visited a single university hospital or senior welfare center. In addition, this study included adults aged 70 years and older, thus excluding those aged 65 to 70 years. However, this study is significant in that it is the first to identify and compare the level of FOF between older adults with physical independence and after hip fracture surgery, and can serve as a basis for the development of interventions to reduce FOF. Based on the results of this study, we make the following suggestions: first, it is necessary to conduct a study that comprehensively identifies the physical, mental, and cognitive factors that affect FOF. Second, intervention programs to reduce fall severity and FOF should include detailed assessments and interventions for dizziness. Third, it is necessary to identify FOF in individuals with conditions other than hip fractures to develop disease-specific interventions.

CONCLUSION

In this study, the FOF of moderate to severe level was found to be high in both groups. Factors affecting FOF in both groups were the female sex and dizziness, while recent experience of falls (twice or more) only affected physically independent older adults. Healthcare providers should routinely assess FOF not only in older adults with serious injuries from falls but also in those with physical independence in the community. Nursing interventions for FOF among older adults with hip fracture surgery should be approached differently.

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