e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(8); 1581-1586

Original Research Article

Study of Falls in Elderly: Role of Depression, Anxiety, and Cognitive Impairment as Risk Factors

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Received: 27-06-2025 / Revised: 25-07-2025 / Accepted: 27-08-2025
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Conflict of interest: Nil

Abstract:

Background: Falls are a major cause of morbidity and mortality in the elderly, often linked to functional decline, impaired balance, and psychological factors. Identifying predictors of recurrent falls is crucial for prevention. This study assessed the relationship between functional, cognitive, and affective status with fall incidence in older adults.

Methods: A hospital-based cross-sectional study was carried for 1 year among 184 patients aged ≥65 years in a tertiary care hospital. Functional status (Barthel Scale), cognition (AMTS), depression (GDS), and balance/gait (Tinetti Test) were assessed using standardized tools. Data were collected through structured interviews, observation, and medical records. Statistical tests included t-test, Kolmogorov–Smirnov, χ^2, correlation, and logistic regression with significance at $p < 0.05$.

Results: Fallers had significantly lower Barthel and Tinetti scores compared with non-fallers ($p < 0.001$), indicating reduced independence and balance as key risk factors. No significant differences were found in cognitive status or depression scores between fallers and non-fallers. However, increasing fall frequency correlated with lower Barthel scores, higher GDS scores, and poorer Tinetti performance ($p < 0.05$). Balance impairment and depressive symptoms emerged as strong predictors of recurrent falls.

Conclusion: Functional decline, impaired balance, and depressive symptoms were significantly associated with fall risk among elderly patients, underscoring the need for comprehensive geriatric assessment in fall prevention.

Keywords: Falls, Elderly, Barthel Scale, Tinetti Test, Depression, Cognition, Risk Factors.

Introduction

Falls, defined for epidemiological research as events resulting in a person inadvertently coming to rest on the ground, floor, or other lower level, are a major concern in geriatric populations [1]. Each year, nearly 30% of adults over the age of 65 living in their own homes experience at least one fall, yet almost half of them do not report these incidents to caregivers or healthcare providers. The prevalence is even higher among those in residential facilities, where approximately 45% of individuals in long-term care experience falls annually, and nearly 40% of these are recurrent [1–3]. Falls remain the leading cause of both fatal and non-fatal injuries in older adults, contributing to disability, reduced autonomy, lower quality of life, and significant caregiving challenges [1–6].

Globally, fall-related morbidity and mortality are substantial. In European Union countries, injuries affect about 105,000 older people annually, with nearly 40,000 deaths attributed to falls [1]. In the United States, the fatal injury rate from falls in individuals aged 60 years and above is 36.8 per 100,000, compared to 9.4 per 10,000 in Canada [1]. In 2013 alone, emergency departments treated over 2 million non-fatal fall-related injuries, of which more than 700,000 required hospitalizations [4]. Admission rates for fall-related injuries among older adults vary across countries, ranging from 1.6–3.0 per 10,000 in Australia, Canada, and the United Kingdom, to as high as 5.5–8.9 per 10,000 in Western Australia and Great Britain [1]. Hip fractures, traumatic brain injuries, and upper extremity injuries are among the most common causes of hospitalization, and recovery is often prolonged compared with admissions for other conditions. The associated financial burden is also significant, with direct medical costs of fall-related

injuries in people aged over 65 years exceeding 30 billion dollars in 2012 [1–7].

The risk of falls increases with advancing age and declining physical fitness, with contributing factors spanning biological, behavioral, environmental, and socio-economic domains [1]. Biological risks include age, gender, and comorbidities that impair the postural control system. Modifiable behavioral risks encompass alcohol misuse, inappropriate footwear, physical inactivity, and polypharmacy, while environmental challenges such as architectural barriers and uneven terrain also play a role. Socio-economic disadvantages, including low income, inadequate living standards, and limited healthcare access, further increase vulnerability [1]. In addition to these established factors, cognitive impairment, depression, and anxiety have emerged as critical determinants that may exacerbate fall risk in elderly populations. Identifying and addressing these psychological and cognitive components through comprehensive geriatric assessment (CGA) and functional tests [8] may help develop effective preventive strategies. Against this background, the present investigation focuses on the role of depression, anxiety, and cognitive impairment as risk factors for falls among community-dwelling elderly individuals.

Methods

Study Design and Setting: This was a hospital-based, cross-sectional study took place for 1 year in a tertiary care hospital. A total of 184 elderly patients aged 65 years and above were enrolled.

Participants and Recruitment: Inclusion criteria were: clinically stable condition without acute exacerbations, ability to ambulate independently, adequate cognitive capacity to cooperate, and voluntary participation. Patients meeting these criteria and attending the hospital during the study period were consecutively recruited. Each participant was informed about the purpose of the research, and assessments were performed in a supportive environment ensuring comfort and cooperation.

Data Collection: Data were collected through structured oral interviews with participants or caregivers, supplemented by observation and medical record review. The Geriatric Environmental Inquiry was used to document socio-demographic, economic, and health-related details, including fall circumstances. Functional status was measured with the Barthel Scale (BS), classifying patients as very dependent (0–20), moderately dependent (21–85), or independent (86–100). Cognitive function was assessed using the Abbreviated Mental Test Score (AMTS), categorizing severe impairment (0–3), moderate impairment (4–6), or normal function (>6). Depressive symptoms were evaluated with the short Geriatric Depression Scale (GDS), where scores of 11–15 indicated severe depression, 6–10 moderate depression, and 0–5 no depression. Balance and gait were assessed by the Tinetti Test (TT), classifying risk as high (≤18), moderate (19–23), or minimal (≥24). To ensure accuracy, information was cross-verified with medical documentation from physicians, nurses, and therapists.

Data Analysis: Data were checked for completeness and accuracy, coded, and analyzed using MS Excel 2007 and Statistica 10.0 (StatSoft Poland, Krakow, Poland). Descriptive statistics summarized participant characteristics. Group differences for qualitative variables were tested with the Student's t-test and Kolmogorov–Smirnov test. Associations between quantitative variables were examined with Pearson or Spearman correlation coefficients. Logistic regression analysis (Quasi-Newton estimation) was performed to identify independent predictors of recurrent falls (>1). Statistical significance was set at $\alpha = 0.05$.

Results

Fallers had significantly lower mean scores on both the Barthel Scale (83.62 ± 15.84) and the Tinetti Test (18.74 ± 7.29) compared with non-fallers (90.25 ± 12.36 and 22.14 ± 6.12, respectively). The Kolmogorov–Smirnov test confirmed that these differences were statistically significant, indicating that reduced functional independence and impaired balance were strongly associated with fall risk (Table 1).

Table 1: BS and TT results depending on fall incidence:

Scale	Fallers (n = 132) Mean (SD)	Non-Fallers (n = 52) Mean (SD)	p-value
BS	83.62 (15.84)	90.25 (12.36)	0.00
TT	18.74 (7.29)	22.14 (6.12)	0.00

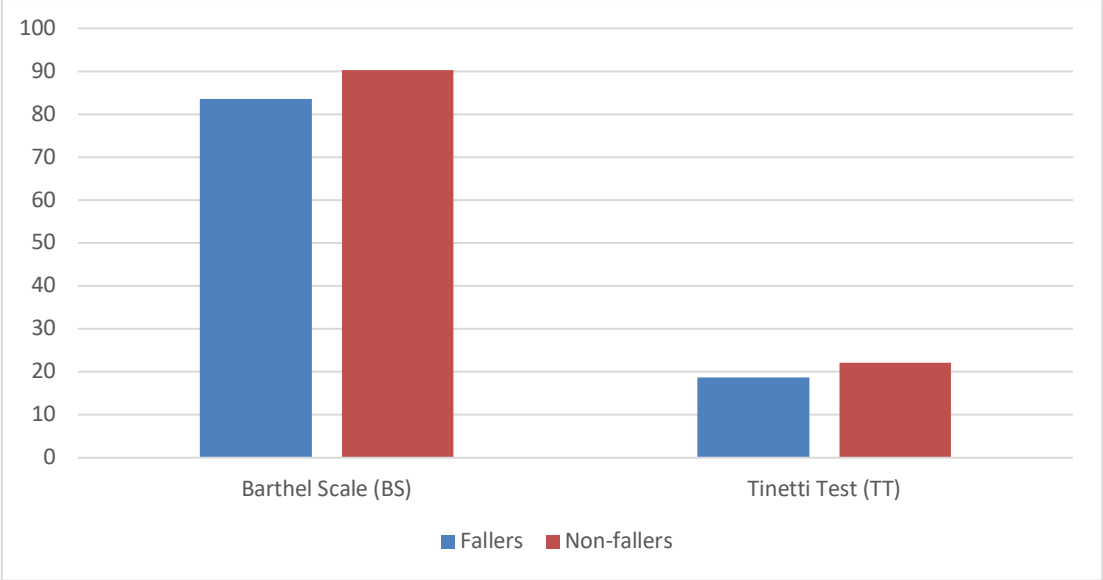

Figure 1: BS and TT results depending on fall incidence.

No significant differences were observed in cognitive function or depressive symptoms between fallers and non-fallers. The AMTS was similar in both groups (8.28 ± 1.65 vs. 8.34 ± 1.87, p = 0.78), as was the Geriatric Depression Scale (6.02 ± 3.14 vs. 5.41 ± 3.32, p = 0.42). This suggests that, in this sample, cognitive impairment and depressive symptoms were not independent predictors of falls (Table 2).

Table 2: AMTS and GDS results based on fall incidence:

Scale	Fallers (n = 132) Mean (SD)	Non-Fallers (n = 52) Mean (SD)	Student t-Test	p-value
AMTS	8.28 (1.65)	8.34 (1.87)	0.28	0.78
GDS	6.02 (3.14)	5.41 (3.32)	0.81	0.42

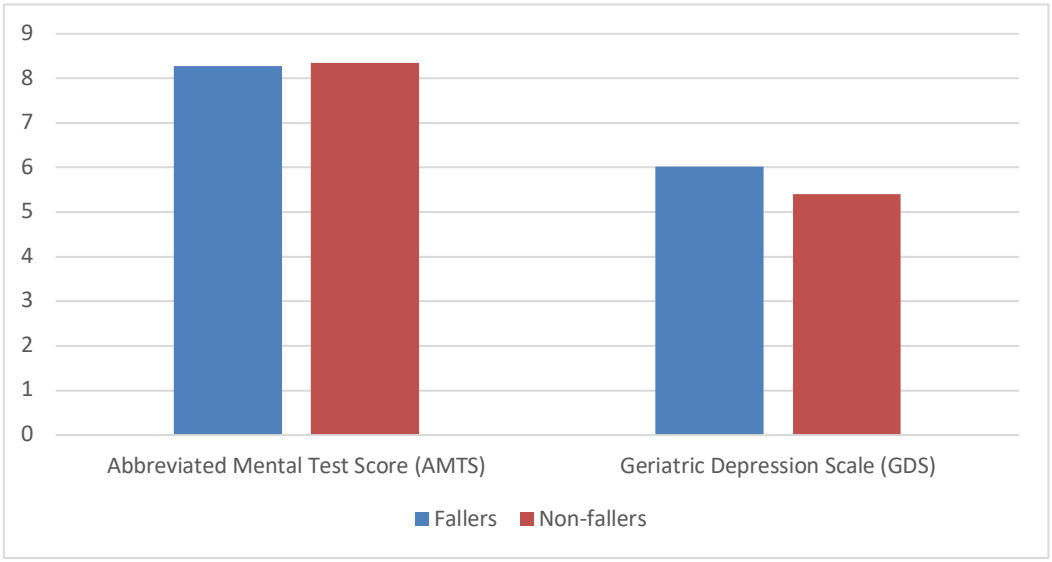

Figure 2: AMTS and GDS results depending on fall incidence.

Analysis of fall frequency in relation to functional and cognitive status revealed a significant association with Barthel Scale scores ($\chi^2 = 26.84$, $p < 0.001$). The proportion of patients with lower functional independence (21–85 points) increased progressively with the number of falls, while those with higher independence (86–100 points) were more common among non-fallers. In contrast, AMTS scores did not differ significantly across fall categories ($\chi^2 = 1.96$, $p = 0.88$), reinforcing the limited role of cognitive status in predicting falls in this cohort (Table 3).

Table 3: Correlation between number of falls and functional/cognitive status (Barthel Scale and AMTS).

Number of Falls	None	Once	Twice	Thrice or more	Total	Pearson's χ^2 Test	p-value
Barthel Scale (BS)						26.84	0.00
0–20 points	0 (0%)	0 (0%)	1 (2.1%)	0 (0%)	1 (0.5%)		
21–85 points	12(23.1%)	15(24.2%)	18(37.5%)	23 (60.5%)	68 (37.0%)		
86–100 points	40(76.9%)	47(75.8%)	30(62.5%)	15 (39.5%)	132(71.7%)		
AMTS						1.96	0.88
0–3 points	1 (1.9%)	1 (1.6%)	1 (2.1%)	1 (2.6%)	4 (2.2%)		
4–6 points	7 (13.5%)	8 (12.9%)	5 (10.4%)	6 (15.8%)	26 (14.1%)		
>6 points	44(84.6%)	53(85.5%)	42(87.5%)	31 (81.6%)	170(92.4%)		

Psychological and balance measures showed a significant relationship with fall frequency. Higher GDS scores were more prevalent among recurrent fallers, with severe depressive symptoms (11–15 points) increasing from 9.6% in non-fallers to 18.4% in those with ≥3 falls ($\chi^2 = 11.62$, $p = 0.03$). Similarly, Tinetti scores declined with increasing fall incidence, with 76.3% of patients with ≥3 falls classified in the high-risk category (≤18 points), compared with only 17.3% among non-fallers ($\chi^2 = 34.22$, $p < 0.001$). These findings highlight the role of depression and impaired balance as key fall-related risk factors (Table 4).

Table 4: Correlation between number of falls and psychological/functional status (GDS and TT).

Number of Falls	None	Once	Twice	Thrice or more	Total	Pearson's χ^2 Test	p-value
GDS						11.62	0.03
0–5 points	29(55.8%)	30(48.4%)	17(35.4%)	10 (26.3%)	86(46.7%)		
6–10 points	18(34.6%)	24(38.7%)	25(52.1%)	21 (55.3%)	88(47.8%)		
11–15 points	5 (9.6%)	8 (12.9%)	6 (12.5%)	7 (18.4%)	26(14.1%)		
Tinetti Test (TT)						34.22	0.00
0–18 points	9 (17.3%)	15(24.2%)	20(41.7%)	29 (76.3%)	73(39.7%)		
19–23 points	10(19.2%)	13(21.0%)	9 (18.8%)	5 (13.2%)	37(20.1%)		
24–28 points	33(63.5%)	34(54.8%)	19(39.6%)	4 (10.5%)	90(48.9%)		

Discussion

The present study revealed a prominent association between functional status and the history of falls. These findings were consistent with previous reports indicating that individuals with a history of falls tended to show lower independence in daily activities [9,10], and that reduced functional ability predisposed them to recurrent falls [11]. Some studies, however, reported that both poor physical condition and excessive physical activity could increase fall risk [12]. Kempen further emphasized that vision loss had a profound effect on daily activity, depression, and anxiety [13]. This study confirmed that the number of falls was linked with functional decline, aligning with Harnbrook's findings on the role of motor disability [14]. Other researchers similarly reported that physical status, vision impairment, urinary incontinence, and functional limitations were important determinants of multiple falls [2,15]. Tinetti highlighted that most falls occurred during minor shifts in the center of gravity [16], and gender appeared to influence both fall incidence and physical consequences [17]. Collectively, these studies confirmed that prior falls contributed to reduced activity, mobility impairment, and a greater predisposition of subsequent falls.

In this cohort, falls were significantly connected with altered balance and functional performance, consistent with earlier work showing that poor balance and gait disturbances were among the strongest predictors of falls in older adults [18–20]. In contrast, cognitive status and depressive symptoms did not show a direct association with fall incidence, a finding also reflected in some prior studies [21]. Nevertheless, evidence existed that depressive symptoms and impaired balance often coexisted with falls [22]. The present study found that higher Barthel Scale and Tinetti scores were protective against multiple falls, whereas higher AMTS scores unexpectedly correlated with increased fall risk, possibly reflecting greater physical activity among more cognitively intact individuals. GDS scores were not significantly related to repeated falls, though prior research linked depression with gait disturbances and fall risk [23–

25]. Vassallo similarly reported that cognitive impairment was often accompanied by disordered gait [26], and other studies suggested that cognitive disorders predicted higher fall incidence, injury risk, and mortality [27,28].

The interaction between cognitive function, affective status, and fall risk appeared complex. Evidence indicated that cognitive disturbances reduced motor efficiency and impaired balance-related parameters such as walking speed and postural stability [27,28]. Targeted interventions, such as balance and strength training programs in patients with Parkinson's disease, were shown to reduce falls but only in the early stages of disease [29]. Depression was also linked with increased fall risk [16], though some researchers suggested that antidepressant use, rather than depression itself, was the critical factor [30]. In line with prior studies, the present study highlighted that multiple factors—including fall history, visual disturbances, urinary incontinence, and psychotropic medication use—contributed to fall risk among elderly individuals [2]. Overall, while functional impairment and balance disturbances emerged as strong and consistent predictors, the roles of cognition and mood required further exploration in larger and more stratified populations.

Conclusion

The present study, conducted among 184 elderly patients in a tertiary care hospital, demonstrated that functional dependence, impaired balance, and depressive symptoms were significant predictors of falls, whereas cognitive impairment did not show a consistent association. Lower Barthel and Tinetti scores were strongly linked to fall incidence and recurrence, highlighting the central role of reduced independence and gait instability in fall risk. Although cognitive status was not independently associated with falls, higher depression scores and progressive functional decline were more prevalent among recurrent fallers. These findings emphasize the importance of comprehensive geriatric assessment, particularly targeting functional status, balance, and mood, for effective fall risk stratification and prevention in the elderly population.

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