Original Article

Falls amongst elderly attending the outpatient's clinic in the Geriatric medicine, in Ain Shams University Hospitals: Prevalence and risk factors.

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ABSTRACT

Background: Studies showed that falls in the elderly are among the most serious public health problems in this era due to the considerable increase in fall-related morbidity and mortality in the aging population. Therefore, this study investigates and documents the current prevalence and detection of fall risk factors amongst elderly outpatients.

Aim of the Work: Is to assess the prevalence of falls and detect the risk factors among elderly patients attending the Geriatrics outpatient clinic at Ain Shams University Hospitals.

Methods: This is cross-sectional quantitative research study that was conducted at Ain Shams University Hospitals. It included all elderly patients presented to Geriatrics outpatient's clinic (OPC). Patients included in this study underwent Comprehensive Geriatric Assessment (CGA), fall risk assessment scale, home fall prevention checklist for older adults, timed up and go test and 30-Second Chair stand and 4 Stage Balance Test.

Results: The multivariate logistic regression analysis showed that the most important factors predicting falls were; Fall Risk Assessment score >5 and Home Environmental safety score ≥4, followed by use of assistive device, neurologic disorders, musculoskeletal disorders, anemia, poor vision, polypharmacy, depression, neuromotor disorders, stroke, low body mass index, environmental obstacles, inappropriate clothing, poor scores in ADL, IADL, TUGT, 30 Second chair stand test, 4 Stage Balance test.

Conclusion: Age, high number of medications, multiple comorbidities and gait or balance disorders are independent risk factors for falls.

Key words: Falls; Risk Factors; Elderly; Outpatients

Introduction

According to the World Health Organization falls are defined as "inadvertently coming to rest on the ground, floor or other lower level, excluding intentional change in position to rest in furniture, wall or other objects." The same report by the ***WHO***[(1)] shows that the rate of falls

among older people in recent studies worldwide ranges from 4% to 35% and increases steadily with age.

There is a demographic transition in many parts of the world including the Middle East, where there is an increase in the proportion of the elderly population[2]. Indeed, studies have reported that age is a critical risk factor for falling[3]. This strong association between age and falls can be attributed to an age-induced decline in physical, sensory, and cognitive function, as well as an increase in the number of comorbid conditions [2].

A recent study conducted by ***Alabdullgader and Rabbani***[4] amongst the elderly population in Saudi Arabia identified four different risk factors of falls. These risk factors included age of more than 80 years, polypharmacy, environmental factors, and level of education.

Another study conducted in Saudi Arabia by ***Almegbel et al.***[5] also noted many significant risks of falls including staying in a rented house, not having a caregiver, use of too many medications, use of walking aids, stress, and the presence of cerebrovascular accidents.

Falls amongst the elderly population have many negative consequences. According to the report by ***Xue et al.***[6], falls have been the second leading cause of preventable deaths in the home, citing an example of Missouri in the United States, which had 870 fall-related deaths reported in 2020. Incidences of hip fractures, that arise from falls, were more prevalent during the lockdowns of the COVID-19 pandemic [7]. There was also a notably higher incidence of hip fractures, especially in older adults who were living alone[6].

Another significant challenge reported among patients who experience a fall is psychological problems. Studies show that a substantial proportion of patients who suffer from fall end up with stress and not being able to stand and walk[8]. Fall-related injuries have also increased and there are chances of a further increase in the future due to the dynamic changes in environment and comorbidities.

Materials and Methods

Type of study: A cross-sectional quantitative study.

Study settings: Geriatrics outpatient clinic, at Ain Shams University Hospital (ASUH).

ASUH is 3500-bed teaching hospital in Cairo, Egypt. It includes two main hospitals, El Demerdash Hospital and Ain Shams General Hospital. Owning to its location in the middle of Cairo, it serves over five million persons. This hospital is a tertiary referral centre, fully equipped to receive trauma patients.

Study period: seven months; from November 2022 to May 2023.

Study population: patients attending the Geriatrics outpatient clinic, at (ASUH) both males and females. Our inclusion criteria were patients older than 60 years old, who accepted and consented to participate in the study. Non-Arabic speakers were excluded.

Sampling method: Consecutive sample.

Estimated sample size: Using Epi info 7 program for sample size and assuming the prevalence of rate of falls about 20% and at 95% confidence level, sample size of 250 persons were recruited.

Study Procedures:

All participants were interviewed after signing a written informed consent. All patients underwent Comprehensive geriatric assessment, fall risk assessment scale, home fall prevention checklist for older adults, timed up and go test (TUGT), 30-Second Chair stand and 4 Stage Balance test.

Comprehensive Geriatric Assessment (CGA): CGA is defined as a multidisciplinary diagnostic and treatment process that identifies medical, psychosocial, and functional capabilities of an older adult in order to develop a coordinated plan to maximize overall health with aging

Fall risk Assessment Scale[9]: details and scoring methods presented in the index page under the title Morse Fall scale.

Home fall prevention checklist for older adults[10]: The CDC recommended home fall prevention checklist for older adults are presented in the index page.

Timed up and go Test (TUGT) [11]: is a simple, quick and widely used clinical performance-based measure of lower extremity function, mobility and fall risk. Begin by having the patient sit back in a standard armchair and identify a line 3 meters, or 10 feet away, on the floor. On the word "Go," begin timing. Stop timing after patient sits back down. Record time. The score consists of the time taken to complete the test activity, in seconds. It is reported that on average, healthy individuals between the ages of 60-80 years complete the TUG in 13 seconds or less.

30-Second Chair stand test: The chair stand test is similar to a squat test to measure leg strength, in which participants stand up repeatedly from a chair for 30 seconds. This test is part of the Senior Fitness Test Protocol, and is designed to test the functional fitness of seniors. Purpose: This test assesses leg strength and endurance[12].

4 Stage Balance test [13]: Assesses static balance and measures an individual's ability to hold a series of four balance positions, each more challenging than the previous, for at least 10 seconds each.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage. The Comparison between groups with qualitative data was done by using ***Chi-square test*** and ***Fisher's exact test*** instead of Chi-square test only when the expected count in any cell less than 5. ***The confidence interval was set to 95%*** and the margin of error accepted was set to

5%. So, the p-value was considered significant when<0.05.

Ethical Considerations

An approval for the study was granted before starting the subject's recruitment process. The approval was obtained from the ethical committee of Scientific Research and the Research Review Board, Faculty of Medicine, Ain Shams University. Explaining the purpose of the study and assuring the confidentiality of all participants, as well as a verbal informed consent was obtained from the participant or a responsible care giver for those who were incapable to give consent. The ethical committee approved using verbal consent.

RESULTS

The history of falling and fall associations. There were 87 fallers (34.8%) and 163 patients (65.2%) were non fallers; while range of falls was 1 to 15 with mean 3.21±1.14. As for fall associations 79 patients (90.8%) reported falling in the morning and 36 patients (41.4%) fell at night. Regarding fall location, 70 patients fell outdoors (80.5%) and 46 patients (52.9%) fell indoors. Complications reported were injury in 30 patients (34.5%), hospitalization in 31 patients (35.6%) and functional decline in 43 patients (49.4%). Finally, there were psychological effects of falling; 82 patients (94.3%) was afraid of falls (where older people may fear falling again, so mobility is sometimes reduced because confidence is lost. Some people may even avoid certain activities (eg, shopping, cleaning) because of this fear) ***(14)*****.** Fear of falling was detected by direct question and confirmed by the fall efficacy scale. Patients were asked about history of depression; 5 patients (5.7%) were depressed (Table 1).

When comparing fallers to non-fallers regarding the use of assistive devices and the causes for it, there was a highly statistically significant relationship between fall and the use of assistive devices, having a neurologic condition (we asked about old stroke, prefrail neuropathy , and Parkinson disease) and musculoskeletal problems which include mainly arthritis , old fractures, osteoporosis ,and foot problems (Table 2).

There was a statistically significant higher frequency of IHD, HTN, DM, cerebrovascular diseases, anemia, poor vision and polypharmacy in fallers compared to non-fallers (p value <0.05). A highly statistically significant frequency of cognitive impairment, depression, neuromotor problems, stroke, neuropathy, and low body mass index (<20) was found in fallers compared to non-fallers (p value <0.05). Also, a highly statistically significant higher frequency of environmental obstacles, poor lighting, and inappropriate clothing, was found in Fallers group (82.8%, 85.1% and 70.1% respectively) compared to non-fallers group (63.2%, 71.2% and

35.6% respectively) (p-value <0.05) (Table 3).

A statistically significant difference between Fallers group and non-fallers group according to prior history, visual impairment, impaired functional, environmental hazards, poly pharmacy, pain and cognitive impairment, with p-value (p<0.05). Also, there was a statistically significant higher score of fall risk assessment in fallers group was 6 (5-6) comparing to non-fallers group was 3 (2-3) (p-value<0.001). This table shows a statistically significant difference between Fallers group and non-fallers group according to stairs hazards, house floor hazards, poor electricity connections and poor sanitation, with p-value (p<0.05). Also, there was a statistically significant higher score of home environmental safety hazards in fallers group was 5 (4-5) comparing to non-fallers group was 4 (3-4), with (p-value <0.001) (Table 4).

The multivariate logistic regression analysis of the most important factors predicting falls, which are: Fall Risk Assessment score >5 and Home Environmental safety score ≥4, followed by use of assistive device, neurologic disorders, musculoskeletal problems, diabetes, cerebrovascular diseases, anemia, poor vision, polypharmacy, cognitive impairment, depression, neuromotor, stroke, low body mass index, environmental obstacles, inappropriate clothing, ADL, IADL, TUGT, 30: Second chair stand Test, 4Stage Balance test, with p-value (p<0.05); while the rest of the parameters have insignificant predictors, with p-value (p>0.05) (Table 5).

Table (1): Falling in the preceding year and fall associated conditions among the study participants.

History of fall in the past year	No.	%
Fallers	87	34.8%
Non fallers	163	65.2%
Number of falls		
Range	1-15	
Mean±SD	3.21±1.14	
Assessment of fall (n=87)		
Time of fall		
Morning	79	90.8%
Night	36	41.4%
Place of fall		
Outdoor	70	80.5%
Indoor	46	52.9%
Complication		
Injury	30	34.5%
Hospitalization	31	35.6%
Functional decline	43	49.4%
Psychological effect		
Fear of fall	82	94.3%
Depression	5	5.7%

Table (2): Comparison between Fallers and Non fallers regarding the use of assistive device and the causes for it

	Fallers (n=87)		Non fallers (n=163)		Test value	P-value	Sig.
	No.	%	No.	%			
Use of assistive device	85	97.7%	69	42.3%	73.519	0.000	HS
Neurological disorder	31	35.6%	7	4.3%	43.218	0.000	HS
Musculoskeletal problems	46	52.9%	6	3.7%	83.325	0.000	HS

Table (3): Comparison between Fallers and Non fallers according to intrinsic factor and extrinsic factors contributing to fall

Intrinsic factor	Fallers (n=87)		Non fallers (n=163)		Test value	P-value	Sig.
	No.	%	No.	%			
Past medical history							
IHD	30	34.5%	34	20.9%	5.528	0.019	S
HTN	65	74.7%	90	55.2%	7.235	0.007	S
COPD	35	40.2%	39	23.9%	3.492	0.062	NS
DM	74	85.1%	122	74.8%	44.557	0.000	HS
Cerebrovascular diseases	51	58.6%	13	8.0%	64.856	0.000	HS
Arrythmias	16	18.4%	1	.6%	0.121	0.728	NS
Anemia	37	42.5%	63	38.7%	53.504	0.000	HS
Poor vision	66	75.9%	45	27.6%	13.086	0.000	HS
Polypharmacy	85	97.7%	49	30.1%	104.349	0.000	HS
Cognitive impairment	**39**	44.8%	39	23.9%	11.544	0.001	HS
Depression	**48**	55.2%	52	31.9%	12.799	0.000	HS
Neuromotor	**35**	40.2%	3	1.8%	28.286	0.000	HS
Parkinson's disease	**18**	20.7%	21	12.9%	2.625	0.105	NS
Stroke	**24**	27.6%	13	8.0%	17.300	0.000	HS
Neuropathy	**59**	67.8%	139	85.3%	10.497	0.001	S
Arthritis	**74**	85.1%	125	76.7%	2.447	0.118	NS
Low body mass index	**55**	63.2%	51	31.3%	23.680	0.000	HS
Environmental obstacles	**72**	82.8%	103	63.2%	10.343	0.001	HS
Poor lighting	**74**	85.1%	116	71.2%	6.002	0.014	S
Inappropriate clothing	**61**	70.1%	58	35.6%	27.119	0.000	HS

IHD: Ischemic heart disease; HTN: Hypertension; COPD: Chronic obstructive pulmonary disease; DM: Diabetes mellitus

Table (4): Comparison between Fallers and Non fallers according to Fall Risk Assessment and home environmental safety assessment

Fall Risk Assessment	Fallers (n=87)		Non fallers (n=163)		Test value	P-value	Sig.
	No.	%	No.	%			
Age+65	85	97.7%	162	99.4%	1.359	0.244	NS
Diagnosis	2	2.3%	4	2.5%	0.008	0.928	NS
Prior history	85	97.7%	0	0.0%	239.326	0.000	HS
Incontinence	4	4.6%	6	3.7%	0.111	0.739	NS
Visual impairment	65	74.7%	35	21.5%	66.994	0.000	HS
Impaired functional	40	46.0%	14	8.7%	46.088	0.000	HS
Environmental hazards	78	89.7%	93	57.1%	27.891	0.000	HS
Poly pharmacy	80	92.0%	33	20.5%	116.272	0.000	HS
Pain affecting	66	75.9%	61	37.4%	33.533	0.000	HS
Cognitive impairment	39	44.8%	39	23.9%	11.544	0.001	HS
Interpretation score							
1 to 2 risk	0	0.0%	64	39.3%	199.355	0.000	HS
3 to 5 risk	13	14.9%	99	60.7%			
6 to 8 risk	74	85.1%	0	0.0%			
Total score of fall risk assessment							
Median (IQR)	6 (5-6)		3 (2-3)		6.682	0.000	HS
Home Environmental safety Assessment							
Stairs hazards	85	97.7%	144	88.3%	6.455	0.011	S
House floor hazards	87	100.0%	153	93.9%	5.560	0.018	S
Poor of electricity connections	73	83.9%	112	68.7%	6.808	0.009	S
Poor lighting	80	92.0%	137	84.0%	3.094	0.079	Ns
Poor sanitation	67	77.0%	26	16.0%	90.529	0.000	HS
Interpretation score							
1 to 2 risk	0	0.0%	15	9.2%	117.473	0.000	HS
3 risk	0	0.0%	48	29.4%			
4 risk	43	49.4%	100	61.3%			
5 risk	44	50.6%	0	0.0%			
Total score of home environmental safety							
Median (IQR)	5 (4-5)		4 (3-4)		7.113	0.000	HS

Table (5): Multivariate logistic regression analysis for the parameters predicting of the fall among study group.

	B	Wald test	P value	Odds ratio	95% C.I.	
					Lower	Upper
Anemia	1.000	5.298	**0.024***	3.832	0.727	5.529
Home Environmental safety score ≥4	2.852	10.565	**<0.001****	3.814	2.512	7.679
Neurologic	1.034	5.965	**0.025***	3.740	2.074	8.544
Fall Risk Assessment score >5	2.742	10.159	**<0.001****	3.668	2.415	7.384
Polypharmacy	0.590	5.272	**0.029***	3.435	0.546	5.919
Stroke	2.535	9.391	**0.016***	3.390	2.233	6.826
Inappropriate clothing	2.438	9.030	**0.017***	3.260	2.147	6.563
ADL	2.344	8.683	**0.018***	3.135	2.064	6.311
Musculoskeletal	0.383	3.424	**0.039***	2.932	1.355	6.844
Use of assistive device	1.675	7.953	**0.023***	2.889	1.526	5.907
4Stage Balance test	0.744	3.984	**0.027***	2.792	1.254	4.784
DM	1.431	6.567	**0.022***	2.790	0.457	5.823
Depression	1.844	4.983	**0.014***	2.760	0.228	4.734
Poor vision	0.236	3.410	**0.036***	2.637	1.078	4.572
Cerebrovascular diseases	0.381	3.649	**0.040***	1.981	0.895	3.460
Neuromotor	1.812	8.602	**0.020***	1.962	0.569	3.389
Cognitive impairment	1.376	6.314	**0.024***	1.759	0.439	5.599
Environmental obstacles	0.586	4.079	**0.031***	1.510	1.378	5.328
Low body mass index	0.564	3.922	**0.032***	1.452	1.226	5.122
TUGT	0.501	3.487	**0.032***	1.291	1.178	4.554
30:Second chair stand Test	0.428	2.980	**0.034***	1.103	1.007	3.892
IADL	0.396	2.755	**0.038***	1.020	0.931	3.598

DM: Diabetes mellitus; ADL: Activity of daily living; IADL: Instruments Activity daily living; TUGT: Time up and go test

Discussion

Ain Shams University Hospital is a tertiary health care center and considered a major referral center from surrounding hospitals and other governorates in Egypt. Thus, the collected sample could be considered a highly representative for assessment of the prevalence of falls the precipitating risk factors among the elderly patients attending the Geriatrics outpatient clinic.

There is very little information available about the epidemiology of falls in Egypt, and the associated risk factors in elderly population.

Preventing the occurrence of fall is a public health priority in our society, given the ongoing transition to the super-ageing society. In our work we tried to address this problem and some of its prevalent precipitating risk factors.

Numerous studies found higher prevalence of falls among women than men. Lower amount of lean body mass and of muscular force compared to men of the same age, higher loss of bone mass due to the reduction in estrogen level, increasing the

probability of osteoporosis and higher prevalence of chronic diseases.

On the other hand, ***Wu et al.***[15] study on elderly aged 65years and above showed that 14.5% of community-dwelling seniors fell in previous 12 months. It is lower than the current study rates, possible reasons included different activity patterns, more frequent squatting resulting in greater lower limb functional strength, shorter body stature with lower center of gravity and consequently less falls[9].

Studies that examined the relation between falls and age are numerous. One example is ***Dsouz'a et al.***[16] study which assessed the relation between falls and age in India on 190 participants 60 years and older. They found that fallers were significantly older than non-fallers and the prevalence of falls increased with age.

This was supported by ***Kamel et al.***[17] cross sectional study about risk factors of falls that was conducted on 340 elders in Urban Suez as they found 16.2% of their studied group living alone with a significant difference regarding history of falls (p value <0.02) and that no significant difference between fallers and non-fallers as regard education level, body mass index and smoking.

However, this disagreed with, ***Wu et al.***[18] who found 58% of their studied group had depressive symptoms but there was no significant difference between fallers and non-fallers (P.value< 0.62).

Hypnotic drugs are important drugs which target central nervous system and have negative effects on cognition, gait, and balance and are associated with increase falls in long-term use and withdrawal of psychotropic medication as a single intervention may hence reduce falls[19].

Identifying older adults at high risk of falls in primary care may be difficult. When identifying the risk of falls not only intrinsic but also extrinsic and behavioral factors need to be considered. So, there are a substantial number of fall-risk screening tools described[19].

This agreed with, ***Nandy et al.***[20] study to assess predictive validity of fall risk assessment too (FRAT); they found that FRAT specificity was 80 to 97 percent but sensitivity was only 15 to 59%. It has a high specificity and a positive predictive value of 0.57.

However, this disagreed with ***Beauchet et al.***[21] study where Static balance was assessed using the OLST. The sensitivity and positive predictive value of OLST were low.

This agreed with ***Murphy et al.***[22] study who found that FRAT has the ability to discriminate between fallers and non-fallers (p value <.001). And sensitivity of the test was 73%, specificity 88% and risk of falls increases with decreases FRT score (negative correlation).

However, the larger study by ***Lin et al.***[23] for psychometric comparisons of the Timed Up and Go, One-Leg

Stand, Functional Reach, and Tinetti Balance Measures in Community-Dwelling Older People suggested that FRAT test had almost no discriminatory ability between fallers and non-fallers (area under ROC curve was 0.51 with no confidence interval (CI) given).

So, screening for falls is important using falls risk assessment tools that should be applied on all elderly to identify early who is at risk of falls and those who need early prevention and thus decreasing impact of falls on elderly populations.

The limitations of the study are worthy of mention; this study was a hospital-based study, hence there was a limited number of cases with relatively smaller sample size relative to study outcomes, and not being a multicentric study.

Conclusion

From our study we can conclude that age, number of medications, number of chronic diseases and gait or balance disorders are independent risk factors for falls. The more the number of drugs prescribed, the higher the risk of falls. Special using of anti-depressants, diuretics and hypnotics drugs and FRAT is the most accurate tool in detecting falls risk among elderly populations.

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1- Morse fall risk Assessment tool: https://networkofcare.org/library/Morse%20Fall%20Scale.pdf
2- Home fall prevention checklist for older adults: https://www.cdc.gov/steadi/pdf/check_for_safety_brochure-a.pdf