

Original Article:

Effect of comorbidities and polypharmacy on fall risk among older adults

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Abstract

Introduction: Fall is considered by far one of the leading causes of morbidity and mortality in the elderly population. Fall is almost always multifactorial. This study looks into the relation between different comorbidities, polypharmacy and falls. **Methods:** A descriptive and prospective study, the study population comprised 150 elderly patients aged > 60 years old, males and females, patients with previous history of falls are excluded. Comorbidity burden, polypharmacy and risk of falls were assessed. **Results and Discussion:** There was a significant positive correlation between Number of comorbidities, medications and risk of falls and there was a significant association between high risk of falls and presence of DM, PVD, OLD CVA and UI. Also, there was a significant positive correlation between age and risk of falls. **Conclusion:** Multiple comorbidities, polypharmacy and increasing age increase risk of falls.

Keywords: Falls, comorbidities, polypharmacy.

*International Journal of Human and Health Sciences Vol. 06 No. 01 January'22 Page : 75-79
DOI: <http://dx.doi.org/10.31344/ijhhs.v6i1.380>*

Introduction

Life expectancy is increasing all over the world. Most people nowadays are expected to live into their sixties and beyond. By 2050, the world's population aged 60 years and older is expected to total 2 billion up from 900 million in 2015. With increased life expectancy, some elderly will age gracefully, others will experience decreased mobility and functional decline and increase susceptibility to falls.¹

Falls defined as an unanticipated incident in which a person come to rest on the ground or a lower level². Falls are the most common type of accidents among older people³. One in three people over 65 years of age experience at least one fall every year, and injuries occur in approximately 20% of such cases⁴ and It has been estimated that nearly 40% of falls in older people are preventable⁵.

The etiology of falls has always known to be multifactorial. Both intrinsic and extrinsic factors are involved in falls in older adults. Intrinsic

factors include comorbidities leading to decreased mobility, physiological changes with ageing in balance and coordination. Extrinsic factors including environmental hazards as slippery floors, unsecure stairs and poor lighting⁶. This research project focuses on the impact of the comorbidity burden on the risk of falls.

Medications are a well-recognized cause of falls in elderly. Classes of medications that have long been known as culprits are antipsychotics, sedatives, and hypnotics⁷. This current study investigates the effect of polypharmacy and correlation with falls.

Polypharmacy is defined as the prescription of multiple medications and it has been identified as one of the most important factors associated with falls among older people⁸⁻⁹.

Adverse effects of falls range from injuries to decrease mobility and fear of falling. Physical injuries include major lacerations, hip fractures, non-vertebral fractures. Other complications of

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falls and long lie include rhabdomyolysis, acute kidney injury, dehydration, aspiration pneumonia. Psychological adverse effects of falls are not by any means less important. These include fear of falling, decreased mobility, social isolation, depression, and institutionalization.¹

Materials and Methods

This descriptive and prospective study was conducted in Geriatrics and Gerontology Department Ain Shams University hospitals. The study population comprised 150 elderly patients aged > 60 years old, males and females, patients with previous history of falls are excluded, consent was obtained from all participants, all patients underwent comprehensive geriatric assessment (detailed medical history and examination, minimal state examination, geriatric depression scale, activities of daily living (ADLs), instrumental activities of daily living (IADLs) all patients underwent assessment with Charlson Comorbidity index and Hendrich fall risk model.

Comorbotidy burden was determined using the Charlson Comorbidity index, it was first developed in 1987 by Mary Charlson and colleagues as a weighted index to predict risk of death within 1 year of hospitalization for patients with specific comorbid conditions. Nineteen conditions were included in the index, each category is assigned a score of 1,2,3, and 6. These scores are summed up for an overall CCI score¹⁰.

This study utilizes the Hendrich fall risk model, a tool originally invented by nurses to be utilized in the acute care setting, it was designed to be quickly administered. It utilizes eight independent risk factors. confusion, disorientation, and impulsivity; symptomatic depression; altered elimination; dizziness or vertigo; male gender; administration of antiepileptics (or changes in dosage or cessation); administration of benzodiazepines; and poor performance in rising from a seated position in the Get-Up-and-Go test¹¹.

Data analysis

Analysis of data was performed by the 16th version of Statistical Package for Social Science (SPSS). Description of quantitative data was done in the form of Mean (M), Standard

Deviation (SD) and range. Frequency and percentage were done for qualitative variables.

Comparison of qualitative variables was done

using the Chi-square test. Correlation of two quantitative variables was done using the Pearson correlation.

Significance level measured according to P value (probability), $P > 0.05$ for insignificant, $P < 0.05$ for significant and $P < 0.01$ for highly significant.

Results

The study included 150 participants. The patients' mean age was $(65.95) \pm 4.724$ years. (48.7%) of them were women and (51.3%) were men. (72%) of them were not working and (28%) were working. (20.7%) of our patients were living alone but the rest (79.3%) living with others. (53.3%) were illiterate, (34%) educated for less than or equal 5 years and (12.7%) for more than 5 years education, and (64.7%) of them were nonsmokers but smokers were (35.3%) of patients (Table 1).

Number of comorbidities, number of medications had highly significant positive correlation with risk of falls so, patients suffer from multiple comorbidities and receiving multiple medications had higher risk of falls than others. Age also had high significant positive correlation with risk of falls so, risk of falls increases as age of the patient increases (Table 2).

The patients were classified as regard risk of falls to two groups (patients with high risk of falls and patients with low risk of falls) to evaluate the effect of different comorbidities on risk of falls and found that there was a significant association between high risk of falls and presence of DM, PVD, OLD CVA and UI (Table 3).

Table 1. Demographic data.

	Minimum	Maximum	Mean	SD
Age	60	80	65.95	4.724
		N	%	
Gender	Male	77	51.3%	
	Female	73	48.7%	
Occupation	Working	42	28%	
	not working	108	72%	
Living arrangement	with others	119	79.3%	
	Alone	31	20.7%	
Education	>5 yrs education	19	12.7%	
	<5 yrs education	51	34%	
	Illiterate	80	53.3%	
Smoking	No	97	64.7%	
	Yes	53	35.3%	

Table 2. Correlation of fall risk with number of comorbidities, medications and age.

	Hendrich II fall risk	
	Pearson correlation	p value
Charlson Comorbidity index (no. of comorbidities)	.788**	.000
No. of medications	.690**	.000
Age	.387**	0.000

** . Correlation is significant at the 0.01 level (2-tailed)

Discussion

Falls are one of the most common causes of injuries and dependence among the older population¹²⁻¹³. The falls frequency increases with increasing age.¹⁴ Many factors may contribute to falls such as biological, social, environmental, and behavioral risk factors among older adults¹⁵. Medications and polypharmacy are very important items to be considered during comprehensive geriatric assessment as one of the adverse events related to medications and polypharmacy in the elderly are falls¹⁶ and comorbidities are considered one of the most frequent intrinsic factors associated with falls¹⁷. Although the relationship between comorbidities and falls has not been studied well. This study examined factors increase risk of falls among elderly people especially polypharmacy and comorbidities association with the risk of falls in elderly patients. It involved 150 elderly patients both males and females underwent comprehensive geriatric assessment and evaluation for comorbidities and polypharmacy and risk of falls.

The current study provided evidence for the presence of association between comorbidities especially DM, PVD, OLD CVA or UI, polypharmacy and increasing age and high risk of falls.

The results of this study showed a significant positive correlation between number of comorbidities and risk of falls, patients with DM, PVD, OLD CVA and UI had higher risk of falls and also there was a significant positive correlation between number medications (polypharmacy), age and risk of falls.

These results are consistent with the results of the study done by Bittencourt *et al.* who concluded that there was an association found between the

risk of falls and comorbidities and found that diabetes mellitus was associated with high risk for falls (51.6% of diabetic patients presented a high risk of falls and it was 62.2% in the current study)¹⁸. Also, Wenhua *et al.* observed that the risk of falls in the comorbidity group was higher than that in the group without comorbidity and in patients more than 75 years old higher than in those less than 75 years old¹⁹.

Zaninotto *et al.* and Ziere *et al.* conducted a study on 6220 participants and found that 7.9% of falls occurred among people with polypharmacy (5–9 medications) and 14.8% among those reporting heightened polypharmacy (10 + medications) and this agreed with the results of the current study, however other studies suggest that polypharmacy alone is unlikely to be the risk factor for falls²⁰⁻²¹. The association between increased falls risk and polypharmacy appears more when the older person is taking a medication that is known to cause falls as a side effect which may double the risk of falls²⁰⁻²¹.

Conclusion

Multiple comorbidities, polypharmacy and increasing age increase risk of falls and risk of falls also can be affected with different comorbidities as shown in the previous results if the patient had diabetes mellitus, peripheral vascular disease, old cerebrovascular accidents or urinary incontinence made patient more liable and had higher risk of falls.

Recommendations:

- Screening for falls in older adults is considered a very important preventive method.
- Patients with multiple comorbidities are more liable for falls, so frequent assessment of falls is recommended in patients with multiple comorbidities and treatment of their comorbidities as possible.
- Physicians should try to avoid polypharmacy as possible in older adults to decrease risk of falls.
- Patients with DM, PVD, CVA OR UI need special care to decrease risk of falls.
- More future studies to investigate the effect of individualized medications on risk of falls.

Table 3. Comparison between patients with high risk and low risk of falls as regards different Comorbidities.

Comorbidities			High risk of falls		Low risk of falls		x ²	P value
		total	N	%	N	%		
DM	NO	68	25	36.8%	43	63.2%	9.618	0.002*
	YES	82	51	62.2%	31	37.8%		
HTN	NO	28	10	35.7%	18	64.3%	3.079	0.079
	YES	122	66	54.1%	56	45.9%		
ISHD	NO	104	50	48.1%	54	51.9%	0.910	0.340
	YES	46	26	56.5%	20	43.5%		
PVD	NO	113	47	41.6%	66	58.4%	15.090	0.000*
	YES	37	29	78.4%	8	21.6%		
CHF	NO	138	67	48.6%	71	51.4%	3.090	0.079
	YES	12	9	75%	3	25%		
COPD	NO	98	47	48%	51	52%	0.829	0.363
	YES	52	29	55.8%	23	44.2		
CVA	NO	135	63	46.7%	72	53.3%	8.642	0.003*
	YES	15	13	86.7%	2	13.3%		
OA	NO	92	41	44.6%	51	55.4%	3.544	0.060
	YES	58	35	60.3%	23	39.7%		
UI	NO	123	57	46.3%	66	53.7%	5.114	0.024*
	YES	27	19	70.4%	8	29.6%		

Acknowledgement: The authors thank to all the staff of Geriatrics and Gerontology department, Faculty of Medicine, Ain Shams University, Cairo, Egypt for providing the research facilities.

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding Statement: None declared.

Ethical consideration: Verbal consent was taken from every participant in this study.

Authors' contribution: HF Mahmoud, collected patient and data, analysed the results, wrote the paper and edited the manuscript. HEMZ Elmedany, collected some of the patients and wrote part of the paper.

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