Falls in institutions for older adults: characterization of fall occurrences and associated risk factors

Quedas em Instituições para idosos: caracterização dos episódios de quedas e fatores de risco associados

Cristina Rosa Soares Lavareda Baixinho[1], Maria dos Anjos Coelho Rodrigues Dixe[2]

[1] Nurse, Master in School Health. Professor at the Lisbon School of Nursing. Lisbon, Portugal. E-mail: crbaixinho@esel.pt.

[2] Nurse, Doctor in Nursing. Instructor at the Superior School of Health of the Polytechnic of Leiria. Leiria, Portugal. E-mail: manjos.dixe@gmail.com.

ABSTRACT

Falls are the main accident for older adults, with consequences on functionality. Older adults impose restrictions or have restrictions imposed on their activities for fear of new falls. This prospective longitudinal study was conducted with 104 institutionalized older adults during six months with the following goals: to determine the prevalence of falls, to characterize the falls according to place, time, resulting injuries, supervision of the older adult, action performed at the time of the fall, and to relate the occurrence of the fall to the risk of falling, medical diagnoses, number of medications in use, type of medication, degree of dependency, age, and gender. The prevalence of falls was 37.5%, and they happened mostly in the bedroom, while walking after getting up from the bed. Those under risk in the Morse Fall Scale (p=0.034) and on sedatives (p=0.007) face a higher prevalence of falls. This study enables the possibility of making suggestions for practice, training and investigation.

Descriptors: Homes for the Aged; Accidental Falls; Risk Factors.

RESUMO

As quedas são o principal acidente nos idosos e têm repercussões na funcionalidade. Os idosos por medo de nova queda impõem ou vêm ser-lhes impostas restrições à sua atividade. Estudo longitudinal prospectivo, realizado em 104 idosos institucionalizados, ao longo de seis meses, com os objetivos: determinar a prevalência de quedas, caracterizar a queda quanto ao local, horário, lesões resultantes, vigilância do idoso, atividade que estava a ser executada no momento da queda e relacionar a ocorrência de queda com o risco de queda, diagnósticos médicos, número de medicamentos que o idoso faz uso, tipo de medicamento, grau de dependência, idade e sexo. A prevalência de quedas foi de 37,5%, estas ocorrem predominantemente no quarto, durante a marcha ao levantar da cama. Tem maior prevalência de quedas quem tem risco na escala de Morse (p=0,034) e consome sedativos (p=0,007). Este estudo permite fazer sugestões para a prática, formação e investigação.

Descritores: Instituição de Longa Permanência para Idosos; Acidentes por Quedas; Fatores de Risco.

INTRODUCTION

Population aging estimates say that in 2020 older adults will be 20.4% of the world population, and 24.2% in 2030. The aging index should increase to 146.5% and 190.3%, respectively[1].

This demographic shift is a clear change in public health problems, with new etiological profiles of morbidity and mortality, with risk factors for falls representing a clear influence on these profiles.

The relationship between falls and institutionalization of older adults is complex because of the direction of the relationship, which, for the most part, contributes to the decision of admitting older adults to Long-Term Care Facilities (LTCF)[2]. However, it can also be a consequence of institutionalization, since its incidence is higher and the consequences worse when compared to those that happen in the community[3].

According to family members' reports, falls are the main reason to seek an LTCF, especially when falls occur repeatedly and with serious consequences[2]. This can have an effect on institutionalization, as previous falls are a risk factor for new falls[3]

The estimate for incidence of falls among older adults in LTCFs is between 34% and 67%[4], being a serious and global problem[5-6]. Occurrence is significantly higher[6-8] than that of the community, as approximately 60% of older adults fall annually[9], with the risk of one in two older adults suffering new falls within a six-month period [8], thus leading to reduced autonomy and independence[10] and possible changes in care requirements.

Beyond the intrinsic and extrinsic risk factors identified for older adults who live in the community, literature presents others risks for the institutionalized population, because they are less independent and more frequently affected by chronic diseases when compared to those who are not institutionalized[3]. The physical space and the presence of workers make the environment different from their homes and can represent an additional risk[3]. The higher incidence of falls among older adults who live in LTCFs is explained by the suffering with the absence of family members, absence of physical activity and the higher load of illnesses and incapacities[11].

Some older adults are institutionalized when they are independent or with mild dependencies, but the loss of daily routines and the release from a series of daily activities contribute to increasing inactivity, reducing physical aptitude and, consequently, increasing the risk of falling, morbidity and mortality[8].

Despite the evidence regarding risk factors[3,7,9-10,12] and preventive measures[2,4-10], study results are insufficient to understand the complexity of this phenomenon, particularly concerning institutionalized older adults.

The objectification of risk factors is crucial to establish and individualize preventive measures according to the identified risks[5-7], hence the importance of investigating this issue. The aim of this study was: to determine the prevalence of falls among institutionalized older adults; to characterize falls regarding location, time, resulting injuries, awareness of the older adults, activity that was underway at the time of the fall; to establish a relationship between the occurrence of the fall and the risk of falling, medical diagnoses, number of medications in use, type of medication, degree of dependency, age, and gender.

METHOD

This is a longitudinal and prospective study conducted in an LTCF from January until June 2014. The sample consisted of 104 older adults from an LTCF. The population of older adults was 106 and the percentage of participation in the study was of 98.1%. Inclusion criteria were being 65 years of age or older and being institutionalized. The two clients who were excluded were younger than 65.

For data collection, we used an instrument to record the occurrences of falls. This instrument contained information regarding age, gender, institutionalization

length, physical activity practice, day, time and location of the fall, mechanism of fall, resulting injuries, if the fall was witnessed, who observed the older adults after the incidents, if there was need for observation by a health technician and measures adopted after the fall.

In addition to the collected data, other aspects were also assessed, such as the risk of falling, using the Morse Fall Scale adapted and validated for the Portuguese reality[13]. The items assessed on the scale are: History of falls, secondary diagnoses, assistance for walking, intravenous therapy, posture when walking and being transferred and mental state. Scores in the scale vary between zero and 125 points, with older adults classified in no risk (0–24), low risk (25–50) or high risk (≥ 51)[13]. We also assessed the degree of dependency through the modified Barthel index validated for the Portuguese reality[14], which assesses independence/dependence in activities of daily living: personal hygiene, bathing, dressing, self-feeding, transferring, going up/down stairs, walking (or using a wheelchair), bowel movement and urination. The scale scores between zero and 100 points and classifies the subjects in total dependency (0-20), severe dependency (21-60), moderate dependency (61-90), mild dependency (91-99) and independent (100). The body mass index (BMI), calculated using weight and height (weight/height^2), is analyzed in the clinical process of the client, using the BMI classification recommended by the WHO for the older adult population[15] and observing the quality of gait to identify alterations[16]. We also consulted the records of medical diagnoses, therapy, previous falls and use of walking assistance.

For data treatment, we used descriptive statistics (relative and absolute frequency, average and standard deviation) and nonparametric inferential statistics (Manny Whitney and Chi-squared) since the variables under analysis do not present normal distribution (determined through the Kolmogorov-Smirnov test), with a value of p<0.05 considered significant.

The Research Ethics Committee of the Portuguese Catholic University approved the study. Older adults without cognitive decline signed a Free and Informed Consent form.

RESULTS

Among the 104 older adults, 69.2% is female and 30.8% male, with an average age of 81.9 (SD=6.9), with a minimum of 65 years of age and a maximum of 98.

Regarding physical activities, 9.6% of older adults answered positively. Among them, 50% exercise twice a week and the other 50% exercise three times a week, with each session lasting 30 minutes.

There is a high percentage of older adults who are not able to walk (41.3%) and 28.8% use walking-aid devices. Among the 29.8% who do not use any devices, 9.6% do not present alterations in gait.

Regarding BMI, 34.6% have adequate weight for their height, 38.3% are overweight, 17.3% obese, 2.9% morbidly obese and 6.7% underweight.

Among the 104 participants, 7.7% are totally independent, 92.3% are dependent on some kind of help to perform their activities of daily living (ADL). 26% have mild dependency, 23.1% moderate, 14.4% severe and 28.8% are totally dependent.

Concerning the number of medicines taken daily, it varies between zero and 15, some of which are taken twice or more daily, 52% of the sample uses eight or more different medicines.

The most consumed medications are anti-hypertensives (58.7%), antacids / anti-ulcer (53.8%), laxatives (47.1%), anticoagulant / antithrombotic (45.2%), benzodiazepines (37.5%) and antidepressants (36.5%). The most frequent type of use is a single medication from each pharmacological group (Table 1).

Analysis of Table 2 shows that the most common diagnoses in the study's population are arterial hypertension (55.8%), dementia (18.3%), diabetes mellitus (16.3%) and Alzheimer (14.4%).

Table 1: Distribution of the types of medications used by the older adults. Lisbon, Portugal, 2014.

Drugs	Nº	%
Antihypertensive	61	58.7
Vasodilators	20	19.2
Antiarrhythmic	9	8.7
Lipid lowering agents	23	22.1
Anticoagulant / antithrombotic	47	45.2
Antacids / ulcer	56	53.8
Laxatives	49	47.1
Antiemetic / antinauseants	12	11.5
Antiparkinsonian	15	14.4
Treating cognitive disorders	7	6.7
Benzodiazepines	39	37.5
Sedatives	27	26
Analgesics / antipyretics	10	9.6
Analgesic drugs	8	7.7
Psychotropics	17	16.3
Antipsychotics	36	34.6
Antidepressants	38	36.5
Thyroid hormones	4	3.8
Antihistamines	5	4.8
Corticosteroids	8	7.7
Diuretics	31	29.8
Antiinflammatory	17	16.3
Muscle relaxants	2	1.9
Antiasthmatic and bronchodilators	8	7.7
Antiepileptic	12	11.5
Oral antidiabetic	14	13.5
Insulin	1	1
Antibiotics	1	1
Alzheimer treatment	13	12.5
Analeptics	1	1
Others	58	55.8

Table 2: Distribution of the sample according to diagnoses. Lisbon, Portugal, 2014.

Diagnosis	N	%
Arterial hypertension	58	55.8
Heart failure	10	9.6
Diabetes mellitus	17	16.3
Copd	9	8.7
Asthma	2	1.9
Parkinson	8	7.7
Alzheimer	15	14.4
Depression	25	24
Stroke	25	24
Osteoporosis	14	13.5
Amputation	2	1.9
Alcoholism	5	4.8
Psychotic illness	7	6.7
Arterial insufficiency	4	3.8
Epilepsy	2	1.9
Dementia	19	18.3
Cancer	9	8.7
Thyroid disease	4	3.8
Others	9	8.7

The assessment of the risk of falling, using the Morse fall scale, made it possible to find that 29.8% of the population presents no risk of falling, most has a low risk of falling (53.9%) and 16.3% has a high risk of falling. Data from the fall records show that 37.5% suffered at least one fall throughout the six months.

The number of falls varied between one and six, with 23.1% falling once, 7.7% twice, 1.9% three times, 1.9% four, 1.9% five and one older adult fell six times in six months. Older adults fall during the three periods of the day, 47.9% of falls happened in the morning, 22.5% in the afternoon and 28.2% in the evening. It was not possible to determine the time of one of the falls (1.4%).

Regarding the location of the falls, the most common was the bedroom (30%), followed by the living room (28.5%) and bathroom (21.5%). For 37.1%, the fall occurred while walking, and for 25.7% when getting up from the bed (Table 3).

Table 3: Distribution of activities being performed by older adults at the time of the falls. Lisbon, Portugal, 2014.

Nº of the fall	Get up from bed	Lay down on bed	Sit on toilet	Get up from toilet	During Shower	Get up from couch	While walking	Others
1st fall	11	1	2	0	3	4	13	4
2nd fall	4	0	0	4	1	0	6	0
3rd fall	1	0	0	0	1	1	4	0
4th fall	2	1	0	1	1	0	0	1
5th fall	0	0	0	0	1	0	2	0
6th fall	0	0	0	0	0	0	1	0
Total N	18	2	2	5	7	5	26	5
Total %	25.7	2.8	2.8	7.2	10	7.2	37.1	7.2

Regarding the presence of workers at the time of the falls, we found that most (66.7%) happened in their absence. In most cases, 58.7% of falls did not result in injuries, light injuries were 24.2%, moderate 14.3% and heavy 2.8%. From the total number of falls, 8.8% of older adults were taken to the hospital for observation and performance of complementary diagnostic exams.

After the first occurrence, 86.7% of older adults report fearing new falls, 45.2% restricted or had their activities restricted and 32.3% were physically restricted from mobility (rails, immobilization belt). We applied the Mann-Whitney test to find out if there is a relation among those who fell and did not fall with age, total number of medications, degree of dependency assessed through Modified Barthel Index and the risk of falling assessed through the Morse fall scale for $p<0.05$.

We found no associations among falls and the degree of dependency (p=0.133), age (p=0.297) and the total number of medications (p=0.388). The number of falls is higher among those at a risk of falling (p = 0.034), assessed through the Morse fall scale, according to the next Table (Table 4).

Table 4: Results of the Mann-Whitney U test for the occurrence of falls and age, number of medications, degree of dependency and risk of falling (Morse fall scale). Lisbon, Portugal, 2014.

	Occurrence of fall	N	Average of orders	Mann Whitney U	Z	P
Age	Yes	39	56.47	1112.500	-1.043	0.297
	No	65	50.12			
Number of medications	Yes	39	55.78	1139.500	0-.863	0.388
	No	65	50.53			
Degree of dependency (Barthel)	Yes	39	58.23	1044.000	-1.502	0.133
	No	65	49.06			
Risk of falling (Morse)	Yes	39	60.31	963.000	-2.123	0.034
	No	65	47.82			

The chi-squared (χ2) test did not reveal a statistical difference among those who fall and do not fall and the type and number of diagnoses (p = 0.513).

Regarding the use of medications, we conclude that sedative use increases the risk of falling (p=0.007) (Table 5).

Table 5: Results of the Chi-Squared test between the occurrence of falls in older adults and the pharmacological group used by them. Lisbon, Portugal, 2014.

Pharmacological group	Fall	χ2	P	Pharmacological group	Fall	χ2	P
antihypertensive	Yes 21	0.595	0.285	Antidepressants	Yes 17	1.33	0.172
	No 40				No 21		
Vasodilators	Yes 6	0.594	0.308	Thyroid Hormones	Yes 2	*	
	No 14				No 2		
antiarrhythmics	Yes 4	*		Antihistamines	Yes 2	*	
	No5				No 3		
Antilipids	Yes 12	2.713	0.081	Corticosteroids	Yes 1	*	
	No11				No 7		
anticoagulants/antithrombotic	Yes 19	0.313	0.360	Diuretics	Yes 16	3.75	0.44
	No 28				No 15		
antacids/antiulcer	Yes 20	0.165	0.419	Anti-inflamatories	Yes 7	0.117	0.467
	No 36				No 10		
laxatives	Yes 20	0.435	0.324	Muscle relaxants	Yes 1	*	
	No 29				No 1		
Antiemetics/antinauseants	Yes 6	0.904	0.260	Anti-asthmatics	Yes 3	*	
	No6			Broncodilatators	No 5		
Antiparkinsonics	Yes 7	0.628	0.303	Antiepileptic	Yes 6	0.904	0.260
	No 8				No 6		
Cognitive changes treatment	Yes 4	*		Antineoplastics	Yes 1	*	
	No 3				No 2		
Anxiolytic benzodiazepines	Yes 15	0.025	0.519	Oral Antidiabetics	Yes 2	*	
	No 24				No 12		
Sedatives	Yes 16	7.36	0.007	Insulin	Yes 0	*	
	No 11				No 1		
Antipyretic analgesic	Yes 4	*		Antibiotics	Yes 1	*	
	No 6				No 0		
Narcotic analgesic	Yes 3	*		Alzheimer Treatment	Yes 7	1.69	0.160
	No 5				No 6		
Psychotropics	Yes 5	0.567	0.321	Analeptic	Yes 0	*	
	No 12				No 1		
Antipsychotics	Yes 0	*		Others	Yes 1	*	
	No 1				No 2		

* we did not apply the statistical test due to the fact that many groups had n lower than 5

Using the chi-squared test, we found that, for this population, there is no relation between occurrences of falls and gender (p=0.584)

Data discussion

The prevalence of falls found in this investigation is similar to that of other studies with institutionalized older adults, namely: 32.5%[12], 33.5%[17] and 38.9%[11].

Some studies showed higher values, with 48.8%[18] and 68%[19] of institutionalized older adults who suffered, at least, one fall in a one year period. Another study presents lower values, of the order of 12% of falls in 30 days[20].

These disparities in research results can be attributed to differences in age, the degree of dependency, the physical environment of the various institutions, in conjunction with legislation for their construction and accessibility and even cultural factors[3,12].

Data show a high number of recurring falls. Results from a research in Brazil revealed that among the 32.5%

of older adults who suffered falls, 42.3% fell only once, 22.5% twice and 35.2% suffered three or more falls[12]. A study in Portugal revealed that 40% fell once, 8% twice and 20% suffered three or more falls[19]. Most older adults who fell suffered a new fall. 68%, 21% and 12% had, respectively, 1, 2, ≥3 falls[20].

Falls usually occurred in the morning period, which agrees with previous study results, which reveal a high incidence between 10 and 12 in the morning period and, in the night, between 2 and 8[21]. In another study, the highest frequency of falls was in the afternoon period (50.7%), followed by the morning (35.2%) and the night had the fewest episodes of falls (14.1%)[12]. During the afternoon, most falls happened between 18 and 21 o'clock, with an increase between 18 and 21[8]. Studies show that the night period presents the highest predisposition for falls[19,22].

These differences can be linked to the organization of care in various periods and the number of workers in relation to that of older adults. These aspects call for further studies to better understand the phenomenon.

As in other investigations[8,12-17,22-23], results show that falls happen essentially inside the LTCFs. There are studies that present a lower incidence, 72.5%[24], 70.8%[17] and 69.1%[12].

The geographical area where the falls occur does not vary in the various investigations, which point to the bedroom as the main area for falls[8,21-23] and the bathroom[21]. These two places are, frequently, contiguous, since legislation requires the bathroom to be contiguous to the bedroom[25].

Regarding the mechanism of fall, data are similar to other studies that say that individuals fall when they are walking[8,23] and during transferences[8].

Transferences and walking are responsible, respectively, for 41% and 36% of falls[21]. The mechanism that leads to the fall during walking is "slipping" and "tripping"[24], namely on the crutches/walkers of other residents[8].

The most visible consequences of falls are the physical injuries. The data we found are similar to the ones in other studies, where injuries were light in 80.6% of cases, with small fissures and excoriations and 19.4% of cases resulted in serious injuries[24]. However, the frequency of fractures is lower than that of other studies, which reveal that 16.9%[17] and 19.2%[11] of older adults who fell suffered fractures.

Regarding the presence and supervision of workers at the time of the fall, we find that most accidents happened in their absence, which agrees with another study[25]. Our data show that the first fall has a higher probability of being witnessed than recurring falls. However, few studies[25] investigate if the fall was witnessed by workers, which is important to better understand how prevention programs should be designed.

Regarding gender and age, data values do not differ from other studies, where most of the population that falls is also female[22-23] with an average age of 83.75 years[23].

This piece of data is not consensual and there are results that show a slightly higher incidence of falls among males[21,25] and others found no statistically significant association between gender and the occurrence of falls[11,18]. Investigators justify this by the fact that institutionalized older females were not involved in domestic activities[18].

Assessment of the risk of falling must be done with all older adults. Classification of those who are at risk of falling and those who are not must be the first step of any prevention program. This is because there is an association between risk assessment and the occurrence of falls[22]. Older adults with functional incapacity in one to five ADL present a 46% higher probability of falling. Those with functional disabilities in all ADL presented a lower probability of falls (RP = 0.57; IC95%: 0.34 − 0.96)[11].

Although we found no association between falls and comorbidities, we highlight the results from a meta-analysis that point to a relationship between cognitive alterations and Parkinson[3]. One research reveals that

residents with Alzheimer (OR=0.23) and Cardiac Stroke (OR=0.42) have lower incidence of falls with severe injuries[20].

Polymedication is a risk factor for falls that is well reported in literature[20]. Although various investigations agree that there is a relationship between falls and types of medication, they arrive at different conclusions. Studies confirmed that the highest risk of falling was in individuals who used anxiolytics[20], sedatives[3], antipsychotics[3], antidepressants[3,20] and antiaginals[25].

Because of what has been written, it is important to invest in studies that associate falls to different types of medication, since available evidence does not clearly define the direct association between medication and falls. It is worth noting that the multifactorial nature of falls may interfere with this association.

CONCLUSION

Study results show that that the prevalence of falls is high, as well as their recurrence, with a statistically significant difference between the occurrence of falls, the risk of falling and use of sedatives.

These results justify the pertinence of going deeper into this complex and multifactorial phenomenon, in the sense of understanding practices and behaviors in risk assessment.

For future investigations, we suggest the study of recognized and/or implemented preventive measures, as well as observing how follow-up is performed with older adults who suffer one fall in order to avoid the second fall and to prevent fear and loss of functionality. Moreover, studying the organization of care in different periods of the day and of the size of the staff can help to understand what would be more adequate in programs for prevention of falls in LTCFs.

The results of these studies should be used in the training of workers in order to show the relevance and the need for implementing preventive programs. For clinical practice, we advise the adoption of programs for the prevention of falls, with risk assessment and an increase in supervision for older patients by the workers, without them interfering with the older adults' autonomy and independence.

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