Characteristics and Circumstances of Falls in the Community-Dwelling Older Adult Population

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Abstract

Objective: The study aimed to describe the characteristics and circumstances of falls in the community-dwelling older adult population. **Design:** This was a cross-sectional observational and descriptive study involving primary health care centers in Lleida and Castellón de la Plana, Spain. Randomized sampling was used to include 966 individuals aged 75 years or older residing in single-family homes and in possession of a health care card. Data were obtained using the Survey on Fragility in Older People in Lleida (FRALLE survey). Study variables included the occurrence of falls in the past year and fall characteristics such as whether it was a first or successive fall, cause, season, and time of the day the fall occurred, whether the respondent fell flat on the ground, and time the participant remained on the floor. Other variables involved the circumstances of the fall, including the general location of the fall and specific location within the home if applicable, lighting/weather conditions, objects which may have precipitated the fall, floor conditions, and type of footwear. **Results:** The prevalence of falls was 25.9% with regard to the previous year, with 70% of these participants reporting having fallen previously. Falls most often occurred by accident, during the daytime, and in the winter. Variables that showed statistical significance with regard to age group were: falling flat on the ground ($P = .031$), fall location ($P = .000$), presence of an object favoring the fall ($P = .039$), floor conditions ($P = .011$), and type of footwear ($P = .029$). By sex, variables that showed statistical significance included the need for assistance to get up ($P = .045$) and type of footwear ($P = .028$). **Conclusions:** The prevalence of falls was found to be similar in the studied cities. The results show the most common characteristics and circumstances of falls in older adults in the community, making it possible to guide future preventive strategies.

Keywords

falls, characteristics, elderly, community

Introduction

Aging in older people entails biological, psychological, and social changes that can compromise functionality in the older person.[1] This loss of functionality results in a reduced ability to independently carry out activities of daily living, leading to dependency and frailty. Falls can be a marker of this fragility.[2]

According to the World Health Organization (WHO),[3] a fall is defined as "an event which results in a person coming to rest inadvertently on the ground or floor or other lower level." Falls are considered to be a geriatric syndrome; although they are not specific to older people they tend to occur more often in this population, and at this stage of life are more likely to result in injury, disability, and death.[4] In this sense, it is essential to carry out a multidimensional assessment of the risk factors that may influence the occurrence of falls.

We know that risk factors can be intrinsic or extrinsic,[5,6] with the latter being mostly avoidable and modifiable. Effective action focused on such extrinsic factors can thus aid in the prevention of falls. Extrinsic factors can pose difficulties for the elderly population and are responsible for

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22% of falls. They are of even greater interest when we consider that one of the objectives of active aging is to promote a safe environment for movement.[7] Most of the reviewed studies coincide in that the relative contribution of each risk factor differs according to the health status of the individual, underlying conditions, the functional situation, and the characteristics of the setting.[8] Falls occur with greater frequency as elderly persons age and when they are widowed, live alone, have a lower level of education, and/or have a lower income.[8] Women represent the most vulnerable risk group. In turn, associated factors include the presence of comorbidity, depressive symptoms, hearing and vision problems, polypharmacy, and risk of malnutrition,[8] as well as poor quality of life[8] and sleep disorders linked to pharmacological treatment.[9] Other factors include fear of falling and disabilities in relation to basic activities.[10]

Despite our increasing understanding of falls and fall risk, the rate of falls in older adults continues to rise. This fact demonstrates the need to bring scientific knowledge into homes and the community. Currently, there are evidence-based programs aimed at prevention, such as A Matter of Balance, Stepping On, Tai Chi for Arthritis, and Tai Ji Quan, among others.[11]

To date, various studies have focused on improving knowledge with regard to the epidemiology of falls.[10,12] However, it is also relevant to identify fall characteristics, understood as those descriptors surrounding the event of the fall, and the circumstances in which they occur (especially where little evidence is available), in order to develop and implement new preventive strategies that consider the most prevalent characteristics and circumstances to reduce their incidence and thus increase quality of life in older people.[13] Thus, the main objective of the current study is to describe the characteristics and circumstances of falls in community-dwelling older adults.

Material and Methods

Study Design

This was a cross-sectional observational and descriptive study involving individuals aged 75 years and older from the cities of Lleida and Castellón de la Plana, Spain. Data were obtained using the Survey on Fragility in Older People in Lleida (FRALLE survey).[14]

Study Population

This study was focused on older people residing in family homes in the cities of Lleida and Castellón de la Plana. The inclusion criteria for all the men and women who gave their consent to participate in the study were as follows: age 75 years or older at the time of the interview, residence in family homes in the community, and possession of a health care card. Those who were under institutional care during the study period, were terminally ill, or showed cognitive impairment (Pfeiffer $\geq$3)[15] without caregivers or family members to respond on their behalf were excluded.

Type of Sampling and Sample Size

Sample size calculation was performed to estimate a proportion, with a 95% confidence level and 5% precision. A position of maximum indeterminacy was chosen ($P = .5$) and a 10% loss was estimated, obtaining a minimum sample size of n = 422.

In Lleida, stratified random sampling was performed in the 7 primary health care centers using health care card records, with a resulting sample of 640 subjects. A random number was selected and starting from the first random 2-digit number, random selection was performed until the established sample size was reached. When a randomly selected individual could not be located, was inaccessible, or did not wish to form part of the study, he/she was replaced by the next individual on the list in order to maintain the established sample size. In Castellón de la Plana, intentional sampling was performed. Health care center nurses asked older adults who met the same criteria whether they wished to participate in the study. Those who accepted were summoned by telephone for a personal interview with the research team. The sample in Castellón de la Plana comprised 326 subjects. The total sample thus included 966 participants.

Variables and Research Instruments

Sociodemographic data included sex, age, marital status, educational level, living arrangement, monthly income, and city of reference.

Falls were measured based on the question: "Have you fallen in the past year?" The occurrence of a fall in the 12 months prior to data collection was considered. An affirmative response indicated a prior history of falls. If cognitive impairment was indicated (as shown by 3 or more errors in the Pfeiffer test), the answer was to be provided by a proxy respondent.

Those individuals who had fallen in the past 12 months were asked about the circumstances and characteristics of the fall. Questions were asked with reference to the most recent fall suffered by the individual in the 12 months prior to data collection. These questions are reflected in the WHO questionnaire.[16]

Table 1 indicates and describes the variables used to assess the characteristics and circumstances of falls.

Data Collection

For data collection, participants were contacted by telephone in order to schedule an interview at their primary

Table 1. Variables Used to Assess the Characteristics and Circumstances of Falls.

Fall characteristics	• First fall: Whether this was the first fall that the respondent had experienced
	• Season of the year
	• Time of the day the fall occurred
	• Cause of the fall
	• Falling flat on the ground: Defined as a fall onto a lower surface that resulted in the subject lying completely stretched out
	• Time on the floor: Time the respondent remained on the floor after the fall
	• Capacity to get up: Whether the subject was able to get up alone/with help, or on the contrary, whether he/she was unable to do so
Fall circumstances	• Fall location
	• Specific location within the home: Exactly where in the home the fall occurred (if applicable)
	• Familiarity with the location: Whether the area of the fall was well-known to the subject or not
	• Lighting: Lighting conditions at the time of the fall
	• Weather conditions
	• Presence of an object which favored the fall
	• Recentness of object placement: Whether the object had been placed/installed a short time prior to the fall
	• Floor conditions
	• Type of footwear

health care center. Those individuals who were unable to travel to the center were interviewed at their homes. Each assessment consisted of a personal interview conducted by nurses previously trained in the data collection procedure.

Statistical Analysis

To perform a descriptive analysis of the sample, measures of central tendency and dispersion were used for the quantitative data, and measures of distribution of absolute (n) and relative (%) frequency were used for qualitative data.

For the bivariate analysis of the possible characteristics associated with age and sex the chi-square test was used, as the variables were all qualitative.

Statistical significance was set at $P < .05$.

Ethical Considerations

Before initiation, the study was approved by the Clinical Research Ethics Committees of both the Arnau de Vilanova University Hospital and the Castellón de la Plana Health Department.

Informed consent was obtained from all participants at the beginning of the interview after they had been duly informed of the purposes and nature of the study.

Results

A total of 966 older adults were included in the study, of which 57.5% were women and 42.5% were men (Lleida: women 60.3, men 39.7; Castellón de la Plana: women 51.8, men 48.2). The mean age was 81.4 ± 4.8 years (Lleida $M \pm$ SD 81.5 ± 5.0; Castellón de la Plana $M \pm$ SD 81.3 ± 4.2). In terms of residence, 66.3% were from the city of Lleida,

and the remaining 33.7% were from the city of Castellón de la Plana.

As can be seen in Table 2, the prevalence of falls in the prior year was 25.9% (n = 249; 95% CI 20.5-31.3), with no significant differences shown between the populations (Lleida 25.7%; Castellón de la Plana 26.2%).

Of the 966 study participants, 249 (25.9%) reported having experienced a fall in the past year. For each individual, the characteristics of the most recent fall and the circumstances in which it occurred were explored, searching for possible associations by age and sex.

Regarding fall characteristics (Table 2), almost 70% of participants who had fallen in the past year reported having fallen on more than one occasion. Falls were more common during the colder seasons and occurred in the morning in over half of the sample. Accident was the most common cause of falls. In the majority of cases, the respondent was able to get up immediately or after being on the floor for just a few minutes. No significant differences in terms of age and sex were observed for any of the aforementioned variables. On the other hand, over 60% of the sample reported having fallen flat on the ground, with significant differences observed according to age. Statistically significant differences were also found in relation to the need for aid in getting up after the fall, with females more often requiring assistance ($P = .045$).

In Table 3, which presents the circumstances of falls, it can be observed that more than half of all falls occurred within the home, above all in those adults aged 85 years or older ($P < .001$), and most often in the bedroom. In most cases the location of the fall was identified as a familiar and well-lit area. In few cases were adverse conditions reported in falls occurring outside the home. It is of note that an object favored the fall in over 30% of the sample, with

Table 2. Characteristics of Falls by Sex and Age: Absolute (n) and Relative (%) Frequency.

		Total		Age <85 y		Age ≥85 y		
		n	%	n	%	n	%	P
First fall	Yes	73	29.3	51	28.7	22	31.9	.617
	No	173	69.5	127	71.3	47	68.1	
Season	Spring	49	19.7	34	23.8	15	32.6	.625
	Summer	35	14.1	26	18.2	9	19.6	
	Autumn	56	22.5	44	30.8	12	26.1	
	Winter	49	19.7	39	27.3	10	21.7	
Time of day	Morning	136	54.6	104	59.1	32	46.4	.067
	Afternoon	77	30.9	54	30.7	23	33.3	
	Night	32	12.9	18	10.2	14	20.3	
Cause of the fall	Dizziness	21	8.4	14	7.9	7	10.3	.443
	Accident	107	43.0	74	41.8	33	48.5	
	Third parties	9	3.6	8	4.5	1	1.5	
	Don't remember	27	10.8	18	10.2	9	13.2	
	Other	81	32.5	63	35.6	18	26.5	
Did you fall flat on the ground?	Yes	159	63.9	118	66.7	41	59.4	.031
	No	80	32.1	57	32.2	23	33.3	
	The fall was from bed	7	2.8	2	1.1	5	7.2	
For how long did you remain on the floor?	Got up immediately	98	39.4	79	44.1	19	27.55	.205
	A few minutes	115	46.2	78	43.6	37	53.6	
	Under 1 hour	23	9.2	14	7.8	9	13.0	
	Over 1 hour	4	1.6	3	1.7	1	1.4	
	Over 12 hours	1	0.4	1	0.6	0	0.0	
	Don't remember	7	2.8	4	2.2	3	4.3	
Were you able to get up?	Yes, without help	89	35.7	67	37.4	22	32.4	.311
	Yes, with help	136	54.6	99	55.3	37	54.4	
	No	22	8.8	13	7.3	9	13.2	

statistical significance found with respect to age. The vast majority of individuals reported having fallen on smooth or uneven ground. Finally, it can be seen that women and those aged ≥85 years fell more often while wearing slippers, and men and those aged less than 85 years fell more often while wearing shoes.

Discussion

The current study shows a prevalence of falls (25.9%) similar to those observed by other authors who also focused their research on older adults living in the community.[17] The prevalence of falls has not shown a downward trend, despite efforts aimed at their prevention. This is perhaps a result of an increasing aged population, but in any case, to date, few national and international studies have delved into the most predominant characteristics present before falls and the circumstances in which they occur.[5,6] This information could well guide new and more effective strategies.

Thus, when considering the characteristics of falls it is relevant to take into account how their occurrence varies according to the season of the year. While in the present study no significant differences were observed, other authors, for example, Timsina et al,[18] observed a higher frequency of falls during the winter season. Winter weather and its potential to make outdoor surfaces more slippery and dangerous are factors that are believed to be responsible for an increased incidence of falls. However, in other reviewed studies sunny weather was identified as the predominant meteorological phenomenon in almost half of the described falls.[19] While for the female population, almost half of all falls occurred in the winter months, in males falls were more likely to occur in the summer, as was also observed by Berg et al.[20] This is possibly related to differences in daily routine between the 2 sexes. According to some authors,[5,21] older adults tend to fall more frequently during the daytime, as reflected in the current study.[22] This coincides with the period of maximum activity and the time when relatives are not present in the family home.[5] In other studies in the community,[18] the majority of falls in the elderly population were found to occur accidentally; in the current research, 43.7% of falls were the result of an accident. Previously, males have been described as being more likely to fall due to slipping.[20]

Table 3. Circumstances of Falls by Sex and Age: Absolute (n) and Relative (%) Frequency.

		Total		Age <85 y		Age ≥85 y		
		n	%	n	%	n	%	P
Fall location	In the home	131	52.6	78	44.1	53	77.9	.000
	In a public place	20	8.0	19	10.7	1	1.5	
	In the street	94	37.8	80	45.2	14	20.6	
Specific location of the fall within the home (if applicable)	Kitchen	13	5.2	7	8.9	6	11.5	.727
	Bathroom	22	8.8	12	15.2	10	19.2	
	Terrace	4	1.6	3	3.8	1	1.9	
	Stairs	12	4.8	7	8.9	5	9.6	
	Bedroom	35	14.1	19	24.1	16	30.8	
	Other	45	18.1	31	39.2	14	26.9	
Familiarity with the location	Familiar	200	20.7	135	94.4	65	97.0	.641
	Unfamiliar	9	0.9	7	4.9	2	3.0	
	Don't remember	1	0.1	1	0.7	0	0.0	
Lighting	Good lighting	220	88.4	160	89.9	60	87.0	.750
	Inadequate lighting	22	8.8	15	8.4	7	10.1	
	Don't remember	5	2.0	3	1.7	2	2.9	
Weather conditions	Rain	13	5.2	12	7.9	1	1.7	.166
	Snow	1	0.4	1	0.7	0	0.0	
	Wind	6	2.4	5	3.3	1	1.7	
	Ice	1	0.4	1	0.7	0	0.0	
	Very sunny	70	28.1	55	36.2	15	25.9	
	None of the above	119	47.8	78	51.3	41	70.7	
Was there an object present, which possibly favored the fall?	Yes	74	29.7	61	35.3	13	18.8	.039
	No	157	63.1	104	60.1	53	76.8	
	Don't know	11	4.4	8	4.6	3	4.3	
Had the object been placed recently?	Yes	11	1.1	9	14.5	2	12.5	.716
	No	61	6.3	49	79.0	12	75.0	
	Don't know	6	0.6	4	6.5	2	12.5	
Floor conditions	Smooth	97	10.0	54	42.9	43	72.9	.011
	Slippery	18	1.9	15	11.9	3	5.1	
	Irregular	22	2.3	18	14.3	4	6.8	
	Sloping	1	0.1	1	0.8	0	0.0	
	Stairs	13	1.3	10	7.9	3	5.1	
	None of the above	34	3.5	28	22.2	6	10.2	
Type of footwear	Barefoot	20	8.0	11	6.3	9	13.0	.029
	Slippers	100	40.2	65	37.1	35	50.7	
	Shoes	105	42.2	85	48.6	20	29.0	
	Other	15	6.0	12	6.9	3	4.3	
	Don't remember	4	1.6	2	1.1	2	2.9	

With regard to circumstances, it can be seen that over half of falls occurred inside the home, especially in those aged 85 years or older. The home is, quite possibly, the place where these individuals spend most of their time.[18,22] However, it is important to consider that a high percentage of falls also occur in the street, as has also been shown in other studies.[5,23,24] It should also be noted that most older adults described the place of the fall as known to them or familiar.[25] Furthermore, the published literature indicates that accidental falls inside the home occur more frequently in bathrooms, particularly in those with high bathtubs, no

handrails, low toilets, and slippery floors.[25,26] Falls are also common in kitchens where difficult access to furniture and utensils can force certain stances that favor falls.[25] The bedroom is also a high-risk location for falls,[25] as found in the present study, especially in those <85 years of age. This is perhaps due to an overconfidence of older adults with respect to their capacity to react to any obstacle. With regard to floor conditions, the present results reflect a greater percentage of falls in those aged 85 years and older while walking on smooth surfaces, because with advancing age these individuals do not lift their feet as

much to walk. Various authors have already reported how falls occur more frequently while older people are walking,[25] and that stumbling is triggered by obstacles encountered on the path during the swing phase.[27] In this sense, from the literature review it can be considered that the most common obstacles when walking include defects in the floor or pavement, carpet edges, electrical cables, door sills, and tree roots.[7,28,29] Depending on certain factors, including lighting, distractions, and attention, older people may not be aware of dangers that can cause falls.[30] Another factor to consider is the type of footwear, as few elderly people report being barefoot during falls. Most falls are produced while older adults are wearing slippers or shoes. Women and those aged >85 years more often suffer from falls while wearing slippers; in contrast, men and those aged <85 years tend to be wearing shoes. This leads us to believe that older people do not wear suitable shoes or do not wear them properly, with closed-toe or rubber-soled shoes being recommended.[24,31] It is interesting to note how most older people who fall repeatedly tend to do so under similar circumstances, a fact to take into account when planning preventive measures. The monitoring of the older adult population affected by this geriatric syndrome is essential in this regard.

Study Limitations

One of the first limitations of the study is that sampling was carried out differently in the 2 populations, in one group by means of randomized sampling (using health care cards) and in the other by intentional sampling, thus not allowing the entire population to be covered. However, the resulting sample size allows for a representativeness of the sample. Another possible limitation is that at the age of inclusion in the study the appearance of cognitive problems is relatively frequent, which could make responding to the questionnaire more difficult. However, the presence of cognitive impairment was established as an exclusion criterion whereby a proxy respondent was used instead, thus avoiding loss of information. Finally, some individuals may have had difficulties remembering falls (and thus their characteristics and circumstances) in the 12 months prior to data collection.

Implications for Practice and Future Lines of Research

The development of this study using a validated survey used previously in a setting similar to ours has allowed for reliable results on fragility and the nutritional status of the elderly to be obtained. These results may be useful to nurses with regard to care and social health and provide valid information for related research. New lines of research are being explored to implement actions for fall prevention in the elderly, in addition to research aiming to improve diagnosis of fall risk using new technologies.

Conclusions

The prevalence of falls was found to be similar in both cities, following the trend observed by other authors. The current study identified the characteristics and surrounding circumstances of falls in community-dwelling older adults, finding that they occur most commonly in the winter season and during the daytime, with accidents being the predominant cause. For those aged 85 years or older, a significant association was found with type of footwear, ground conditions, and location (home), while other characteristics such as falling flat on the ground and need for assistance in getting up were significantly associated with the female sex. Better knowledge of the most prevalent characteristics will allow for future preventative strategies to be oriented toward promoting safer environments for active and healthy aging.

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