Background and Objectives: To evaluate the incidence of falls according to socio-demographic and health factors, and to determine their physical, psychological and social consequences.

Subjects and Method: Population-based prospective study, which included a representative cohort of 448 elderly community-dwellers, aged 65 or more living in the city of Mataró (Spain). We made a baseline evaluation, which was repeated after a one-year follow up, consisting of a standardized questionnaire on socio-demographic characteristics, physical activity, tests of physical and cognitive function, history of falls during the previous year, the Falls Efficacy Scale, and associated chronic conditions. Follow-up interviews at intervals of one month over 12 months, consisting of a standardized questionnaire aimed at detecting and describing any fall occurred during the previous month.

Results: 25.1% (95% CI, 18.8-31.4) of males and 37.0%, (95% CI, 31.2-42.8) of females fell. Multiple falls were observed in 3.8% of men and 10.9% of women. 203 falls were reported, providing a crude incidence rate of 30.9 falls per 100 men-years (95% CI, 23.3-41.8) and 56.5 falls per 100 women-years (95% CI, 46.5-68.8). A positive association with falls was found with age, reduced physical and cognitive function, associated chronic conditions and previous falls. 71.1% of falls had physical consequences, with 7.7% of fractures, and 21.7% needed medical aid. 64.4% of fallers feared of falling again.

Conclusions: Our study shows a pattern of high incidence of falls among the elderly living in the Spanish non-institutionalized community. Our data confirm that adverse consequences derived from the falls are frequent and often severe, which makes falls one of the major problems of elderly people.

Key words: Falls. Elderly. Incidence. Consequences.

Incidence and consequences of falls among elderly people living in the community

Antoni Salvà, Ignasi Bolíbar, Guillem Peray, César Arias


This study has been partially subsidized by the FIS of the Spanish Ministry of Health.

Subjects and method

We conducted a population-based prospective study with a representative cohort of community-dwelling elderly people who were followed up during one year in order to detect all incident cases of falls. The study population was defined by all the 1,341 non-institutionalized persons aged 65 years or more living in the three neighborhoods attended by the primary care centers of Centre-Mèdia in Mataró (Barcelona, Spain). This

Non-institutionalized elderly people aged 65 years old or more. We wanted to evaluate the incidence of falls according to the socio-demographic and health characteristics, and to determine the physical, psychological and social consequences of falls on the population studied.

Subjects and method

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TABLE 1
Baseline characteristics of participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>398 (88.6%)</td>
<td>265 (59.2%)</td>
<td>448 (100%)</td>
</tr>
<tr>
<td>Age (mean ± SD in years)</td>
<td>73.3 ± 6.1</td>
<td>75.6 ± 6.3</td>
<td>74.5 ± 6.0</td>
</tr>
<tr>
<td>Low vision</td>
<td>7.4%</td>
<td>21.1%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Low education*</td>
<td>45.1%</td>
<td>58.7%</td>
<td>53.1%</td>
</tr>
<tr>
<td>Maximum ADL (Katz) indexb</td>
<td>90.2%</td>
<td>83.2%</td>
<td>86.1%</td>
</tr>
<tr>
<td>Maximum IADL (Lawton) index</td>
<td>86.9%</td>
<td>60.4%</td>
<td>72.4%</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Sedentary</td>
<td>7.1%</td>
<td>24.9%</td>
</tr>
<tr>
<td></td>
<td>Light</td>
<td>72.7%</td>
<td>64.5%</td>
</tr>
<tr>
<td></td>
<td>Moderate/very vigorous</td>
<td>10.2%</td>
<td>10.6%</td>
</tr>
<tr>
<td></td>
<td>Vigorous</td>
<td>8.2%</td>
<td>45.8%</td>
</tr>
<tr>
<td>Vigor person</td>
<td>70.2%</td>
<td>43.8%</td>
<td>54.8%</td>
</tr>
<tr>
<td>Vigor measured: mean (SD)</td>
<td>3.1 (1.9)</td>
<td>4.1 (1.9)</td>
<td>4.2 (2.0)</td>
</tr>
<tr>
<td>Falls during the last year</td>
<td>25.4%</td>
<td>29.1%</td>
<td>26.6%</td>
</tr>
</tbody>
</table>

*Education, difficulty reading or writing or no scholarity; ADL, maximum index score 6 (1 point for each independent activity); IADL, maximum index score 8 in males, and 8 in females (1 point for each independent activity).

In accordance with Kellog International Work Group on the Prevention on Falls by the Elderly a fall was defined as an event which results in a person coming to rest inadvertently on the ground or other lower level and therefore the follow-up information was based on 448 persons. At the end, only 53 subjects did not complete the final evaluation one year after the baseline. 52 refused to continue the study, 13 died and 8 moved. Median follow-up time was 12 months (range 3.5-24 months) with a total of 2,892 person-months.

The statistical analysis of the study data was aimed at calculating the percentage of elderly with any fall, and the annual incidence rate of falls8. The annual incidence rate of falls expresses the number of falls per 100 person-years of follow-up. It includes those subjects who fell two or more times. Multiple falls were considered as one event. The incidence rate (IR) of falls was estimated using the Poisson distribution. The incidence rate was expressed as the number of falls per 100 person-years of follow-up. Incidence rate ratios (IRR) were used to compare the incidence rate of falls between the three groups (high, medium and low fallers).


table 2

Number and percentage of fallers during the 12 months follow-up by groups of age and sex

<table>
<thead>
<tr>
<th>Age (GROUP years)</th>
<th>45-69 (n = 79)</th>
<th>70-74 (n = 58)</th>
<th>&gt; 75 (n = 68)</th>
<th>Total (n = 185)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>No falls (%)</td>
<td>37.7%</td>
<td>42.0%</td>
<td>27.9%</td>
<td>36.0%</td>
</tr>
<tr>
<td>Any fall (%)</td>
<td>62.3%</td>
<td>58.0%</td>
<td>72.1%</td>
<td>64.0%</td>
</tr>
<tr>
<td>≥ 1 fall (%)</td>
<td>29.6%</td>
<td>29.6%</td>
<td>40.6%</td>
<td>34.0%</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No falls (%)</td>
<td>79.8%</td>
<td>87.9%</td>
<td>78.1%</td>
<td>83.0%</td>
</tr>
<tr>
<td>ANY fall (%)</td>
<td>20.2%</td>
<td>12.1%</td>
<td>21.9%</td>
<td>17.0%</td>
</tr>
<tr>
<td>≥ 1 fall (%)</td>
<td>9.1%</td>
<td>6.3%</td>
<td>11.8%</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

The total number of reported falls was 203 (table 3). The crude incidence rate for falls was 46.0 falls per 100 person-years (95% CI, 38.4-54.2) for males and 56.5 (95% CI, 46.5-68.8) for females. In the adjusted model, incidence rate of falls was 1.7 (95% CI, 1.2-2.4) for females compared to males. In this model, the independent variables were: age, sex, physical activity, physical function, basic activities of daily living (ADL), instrumental activities of daily living (IADL), IRR = 1.7 (95% CI, 1.2-2.4).

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The crude rate of falls was higher in winter and fall (56.8 and 57.8/100 person-years; p = 0.003) and spring (39.7/100 person-years; p = 0.066).

Significant differences were not found between the proportion of falls in people living alone (34.3%) or accompanied (31.7%), nor in relation to the level of education (30.8% among no education vs. 26.3% among primary or higher levels). Regarding physical activity, a U relation appeared to be observed with the percentage of falls, which was higher for sedentary activity (39.2%) and moderate/vigorous activity (36.9%) and lower for light activity (29.3%).

Likewise, a tendency towards a negative association was found with regard to the indexes of physical activity (maximum ADL 30.8% vs. the rest 40.3%; p = 0.14; and maximum IADL 27.2% vs. the rest 45.1%; p = 0.001) and cognitive function (normal Pfeiffer 29.7% vs. abnormal Pfeiffer 38.1%; p = 0.09). The percentage of falls was 27.0% in vigorous subjects and 38.2% in fragile subjects (p = 0.01).

Table 4 shows the IRR adjusted for age and sex, calculated using the binomial negative, for the above factors, with very similar results to the univariate analysis of the percentage of falls. The number of pathologies was also associated with the incidence of falls (IRR = 1.10; 95% CI, 1.05-1.15).

Finally, having fallen during the previous year was a clear risk factor for subsequent falls (IRR = 2.17; 95% CI, 1.58-2.98).

The most common pattern of the conditions of the falls was a familiar place (92.2%), which was well-illuminated (90.4%). Falls mainly occurred during the morning (57.9%), although they also happened in the afternoon (29.2%) and at night (12.8%). The climatic conditions were normal (45.4%), very sunny (47.9%) and raining or icy (6.7%). The floor surface was smooth (60.8%) and not slippery (39.2%), and in 82.0% of cases it was slipping. Subjects were wearing slippers in 52.6%, 28.4% wore shoes and 14.4% were barefoot. Subjects tripped over an object in 78.7% of falls. Most subjects (61.1%) got up immediately, 53.9% could get up with help and only 1.3% could not get up.

The falls had physical consequences in 71.1% of cases. 62.9% with a superficial wound or contusion, 7.7% with fractures, and there was one case of cranial trauma.

Of the 15 fractures found, 4 were in lower extremities, 2 of them being femoral fractures (1.4% of all fallen subjects).

As to the psychological consequences, 64.4% of people who had fallen said they were afraid of falling again (fig. 1) and 9.5% said that the fall had changed their life style (fig. 2). The decrease found in the FES score between the initial and the final evaluation was greater (p = 0.002) among people that had fallen (a decrease from 81.3 to 60.9 points) than among those that had not (decrease from 87.1 to 71.2 points). Older people had a greater statistically significant decrease in the FES, although the difference in the FES between those who fell and those who did not was not affected by age or sex (data not shown). All the FES items got worse by the end of the year, whether they fell or not, even though the deterioration was particularly greater among those who fell in «prepare simple meals», «go shopping» and «go up or down stairs».

From all of 203 falls, 44 (21.7%) needed primary care services, and 25 (12.3% of total falls and 56.8% of falls that needed medical attention) of them went to the hospital emergency department. Three people were admitted because of the fall in an acute care hospital. At the end of the study period, from those people who needed medical attention, 41 were at home (7 of them with home assistance), 2 were in an intermediate or long term care hospital and one person was in a nursing home (residential home).

Discussion

In this study a monthly follow-up was carried out on a population cohort of 448...
The incidence and consequences of falls among elderly people living in the community.

Faller (%)

<table>
<thead>
<tr>
<th>Faller (%)</th>
<th>Male</th>
<th>Female</th>
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<tbody>
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<td>0.0%</td>
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</table>

Age (years)

SALVÀ A, ET AL. INCIDENCE AND CONSEQUENCES OF FALLS AMONG ELDERLY PEOPLE LIVING IN THE COMMUNITY

The variables analyzed as determinants in the rate of incidence of falls include how the incidence of falls varies in the community. A more complete study of these determinants will form a major part of the work directed at identifying and quantifying the risk factors of falls. Physical activity stands out because of its possible non-linear behavior in determining a higher percentage of falls in those people less and more active. The reasons are opposed, as Vellas et al found: in the less active population it could be due to physical and functional deterioration, whereas in the active population it could be due to a greater exposure to situations with a risk of falling. Cognitive impairment and poor functional level as well as a greater number of pathologies appear to be important risk factors for falling as other authors have reported. These variables also showed a relationship with multiple falls.

The differences we found between fragile and vigorous people agreed with those of Speechley and Tinetti, although they were not so pronounced (38% vs. 27% and 52% vs. 17%, respectively). The higher frequency of falls among people who have fallen previously is consistent with other community studies. Previous falls indicate the existence of earlier risk factors but to these are added the consequences that, as in the case of reduction of mobility, can facilitate a new fall. The pattern observed in the circumstances described at the moment of the fall agrees with those of other authors. Aspects that stand out is the footwear worn at the time of the fall, mostly slippers, which are frequently used by elderly people in our country. Another aspect to be emphasized, which has been com-
mented in other studies, is the existence of an object that causes the fall26.28.29. Our re-
results also coincide with the majority of aut-
hors in that there are common conse-
quences from the falls that can be im-
portant and costly. Although in 62.9% of 
cases these consequences were light (superficial wounds or contusion), the fin-
ing of 7.7% of fractures stands out. In the 
literature, percentages published are 
between 2.5% and 6%23,24. Our percenta-
ge of 1.4% of femoral fractures is also 
close to the 24%-43% published2,10,25. 
jects who needed medical attention was 
about the circumstances as well as the 
with a history of falls it is important to ask 
synrome produces a loss of autonomy in 
quent among women of any age group; 
change in life-style after falling items, 
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RE: investigation sur la chute accidentelle re-
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