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ENVIRONMENTAL RISKS FACTORS FOR FALL-RELATED FRACTURE IN HOME AMONG COMMUNITY DWELLING ELDERLY PEOPLE

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INTRODUCTION

The majority of fractures among elderly people originate from two causes, the increased risk of fall, and bone fragility. Many individual-related risk factors for fall-related fractures have been identified (e.g. female sex, advanced age, low bone mass density, presence of chronic medical conditions, gait and balance problems, overweight, smoking, living alone). Further studies have investigated environmental risk factors associated with occurrence of fall-related fractures among elderly people. Identification of the latter is important for development of cost-effective environmental-oriented risk-reduction strategies (i). We performed a study to identify which factors in physical environmental appear associated with occurrence of fall-related fractures in home among the community dwelling elderly people.

The aim of this study was to screen the environmental factors involved in the occurrence of fall-related home injury among elderly people. This information is important for designing studies to identify alterable environmental factors associated with the risk of these injuries.

METHODS

Study population

The study population consists of people aged 65 years and more residing in Stavanger, Norway from 1992 to 1995. Stavanger is a coastal town located in the southwestern part of the country. Approximately 14,500 people aged 65 years or more were residing in the town during the study period. Due to its location, Stavanger enjoys a mild climate compared to the rest of the country.

Cases

We identified cases for this study through a prospective ongoing registration system operated by the Central Hospital and the Emergency Clinic in Stavanger, which operates as a part of the Norwegian Injury Registration System. These two institutions provide inpatient and outpatient medical care to the total population in Stavanger. No other medical facilities exist in the town that routinely treat fractures. The registration, described in detail elsewhere (ii-iii), includes all inpatients and outpatients treated for injuries and is performed according to the common classification (iv) and protocol for registration of injuries in the

Nordic countries. It includes extensive structured information about the circumstances in which the injury occurred.

Cases of fractures at home occurring during the four-year period January 1, 1992 through December 31, 1995 were selected for study. All injuries that occurred in private residences or on the premises of private residences, regardless of whether the actual place of injury was the individual's own home or someone else's home (e.g. injuries during visits to friends), were included as cases. We selected only the cases resulting from falls. Cases due to other causes were excluded. Injuries resulting from occupational services provided in the home (e.g., plumber repairing water pipes) were excluded from the study. Also excluded were injuries that occurred among institutionalized elderly people (nursing homes and homes for elderly). The case selection included only unintentional injuries; cases stemming from domestic or other violence, and cases of intentionally self-inflicted injuries, were excluded. The following information was obtained for all cases: age and sex of the injured, mechanism of the accident, if the hospitalization occurred, place of the event, products involved in the injury occurrence, and Maximum Abbreviated Injury Severity Score (MAIS) (v). If an injured person had multiple visits to the hospital or clinic for the same injury, only the first visit was included in the analysis.

RESULTS

All together, 1,706 cases of fractures have been selected. Of these, 79% represented women and 44% represented people aged 80 years and more. 75% of fractures among people aged 65-79 years occurred in the home and 25% occurred on home premises. Among people aged 80 years and more, 87% of the fractures occurred in the home and 13% on home premises. Of all cases, 71% were due to a fall on the same level and 29% due to a fall from the higher level. Falls to the same level caused 65% of the cases among people aged 65-79 years, compared with 76% of the cases among people aged 80 years and more.

Table 1 shows distribution of cases according to the age, sex and place of occurrence. Fractures occurred at all places in the home. Places that are usually considered as potential hazard locations for injuries (e.g. kitchen, bathroom) accounted for a moderate number of cases.

Table 1 Fall-related fractures by age, sex, and place of occurrence

	65-79 years			80 years and more		
Place of the occurrence	Females	Males	Total	Females	Males	Total
HOME						
Kitchen	10%	5%	9%	10%	9%	9%
Living room	21%	19%	21%	29%	29%	29%
Bathroom	9%	6%	9%	5%	8%	6%
Staircase	11%	9%	11%	7%	5%	7%
Indoor, other	22%	24%	22%	26%	19%	25%
External staircase, balcony	13%	21%	14%	7%	9%	7%
Indoor, unspecified	15%	16%	15%	17%	19%	17%
Home, total	100%	100%	100%	100%	100%	100%
Number of injuries	557	155	712	535	119	654
PREMISES						
Premises, specified	86%	93%	87%	85%	77%	83%
Premises, unspecified	14%	7%	13%	15%	23%	17%
Premises, total	100%	100%	100%	100%	100%	100%
Number of injuries	185	54	239	75	26	101

Table 2 shows product listed as associated with the occurrence of the event leading to the fracture. The most represented product was floor. Other products representing a larger number of cases were staircases. Furniture represented moderate, but still significant portion of injuries. Items commonly assumed to pose hazards, like electrical wires, loose carpets, and doorsteps have not accounted for a significant number of cases in our case series.

Table 2 Fall-related fractures by age, sex, and a product causing the event leading to injury

	65-79 years				80 years and more			
	Females		Males		Females		Males	
	n	%	n	%	n	%	n	%
None	33	6%	10	6%	51	10%	5	4%
Raw material		0%		0%	1	0%		0%
Construction material	1	0%		0%		0%	1	1%
Fixed equipment	1	0%		0%	1	0%		0%
Artificial surface outdoors	13	2%	2	1%	14	3%	4	3%
Staircase	108	19%	24	15%	60	11%	17	14%
Floor	206	37%	47	30%	259	48%	63	53%
Doorstep	15	3%	6	4%	21	4%	2	2%
Part of the building	18	3%	8	5%	8	1%	2	2%
Electrical cables	4	1%	1	1%	6	1%		0%
Warm water equipment	4	1%		0%	2	0%	2	2%
Appliances	3	1%	1	1%	3	1%		0%
Furniture	44	8%	20	13%	31	6%	6	5%
Textile	25	4%	5	3%	21	4%	2	2%
Shoes	8	1%	1	1%	4	1%		0%
Toy	1	0%		0%		0%		0%
Bicycle		0%		0%	1	0%		0%
Clothes	4	1%		0%	2	0%	1	1%
Other	40	7%	23	15%	24	4%	6	5%
Unknown	29	5%	7	5%	26	5%	8	7%
Total	557	100%	155	100%	535	100%	119	100%

DISCUSSION

This study is a descriptive representative case series of cases of fall-related fractures among elderly people. The study has identified that potential alterable risk factors for these injuries might be floor surface, staircases and furniture. Contrary to common believes, loose carpets, loose electrical wires, bathroom and doorsteps have not accounted for a significant portion of cases, suggesting a limited preventable potential in interventions targeting these products.

As an additional interesting finding, this study has not identified major differences between men and women in the relative distribution of the cases according to the place or the product involved.

There are several limitations to this study. This study has a descriptive design and it only indicates what factors may represent the potential alterable environmental risk factors. Analytic epidemiologic studies and those evaluating interventions are required to clarify if environmental factors identified in this study truly represent risk factors for which alternation may appear to decrease a risk of fall-related fracture among the elderly. A further limitation is the data source. Data are based on a self-reporting by the patients, which

may be subject to significant bias. Prospective and targeted data collection might be required to rule out this possible bias.

Environmental hazards represent attractive area for possible intervention to reduce risk of serious injuries among the elderly people. However, future studies are required to clarify which environmental modifications truly represent cost-effective strategies to reduce risk of injury among elderly people.

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