

The initiative on hip fractures of the Veneto Region

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Summary

Objective: to assess the prevalence of the most relevant environmental and individual risk factors in subjects with a recent hip fracture was the aim of this observational study promoted by the Health Authorities of the Regione Veneto (Italy).

Methods: patients aged > 60 years of both genders with a recent hip fracture not associated with malignancies, were administered questionnaires on dietary habits, sun exposure, disability score. A complete family, pharmacological and pathology history was collected together with previous falls, details of the fracture index, anthropometric data. In a subgroup of patients blood was taken for the measurements of serum 25 hydroxy-vitamin D (25OHD).

Results: the study includes 704 patients (573 women and 131 men). Mean age was 81±8 years (range 60-102). Severe pre-fracture disability was a common feature (58%) associated with multiple co-morbidities (84%), more frequently cardiovascular and neurological diseases, and specific medications. In a large proportion (86%) of the patients environmental or individual risk factors for falling were found. Vitamin D insufficiency was quite common, particularly in the regional Health Districts were strategies for preventing vitamin D deficiency were not implemented. Only a small proportion (17%) of the study population had been evaluate and treated for osteoporosis.

Conclusions: in senile patients with a recent hip fracture pre-existing disability, multiple co-morbidities, high risk of falling and inadequate intake of calcium and vitamin D was quite common. Community and case-finding interventions are highly warranted.

KEY WORDS: hip fracture; fall; co-morbidities; disability; vitamin D.

Introduction

Hip fracture have an important role in health policy both for number of people affected and for social cost (1), and will worsen in next years due to the continuous ageing of the population (2). In 2002 in Italy there were more or less 80.000 hospitalization of patients aged more than 65 years old, 68% of whom were women aged more than 75 years old (3); in 2005 there were more than 94.000 hospitalization (4).

Cost deriving from hip fracture have been estimated in 1.000.000 euro/years, that is higher than costs deriving from myocardial infarction (5).

Especially in elderly people, hip fracture is an important cause of death, disability and institutionalization (6-11). Approximately 5% of them dies because of complications during the first phase of disease and 15-25% dies within the first year (1). 20% of patients became unable to walk permanently after hip fracture, and only 30-40% maintained the same degree of autonomy present before the fracture (1).

There are two main causes of hip fracture: osteoporosis and falling. Cross-sectional (12-14) and prospective (15, 16) densitometric studies have shown significantly lower values of mineral bone density of the hip in patients with hip fracture. Such studies have also shown doubling of risk of fracture every 10% reduction in bone mass. Some authors, although, believes that the power of densitometry to predict hip fracture is overestimated, compared with the role of age and other conditions (17).

Clinical and skeletal factors not related with BMD may determine hip fracture's risk as far as BMD. Such factors may also modify predictive value of BMD (18).

Some of them increase fracture's risk both directly and indirectly, i.e. by reducing BMD; others increase risk of falling, and then fracture. Unlike vertebral fracture, hip fracture are usually caused by a trauma, especially falling (19), that are more frequent and with specific characteristics in older people (20).

Neurological, visual, cardiovascular or muscular pathologies, and some drugs such as antihypertensive medications or benzodiazepine may facilitate falling (21-26).

Recently, by using data from the National Osteoporosis Risk Assessment (NORA) (27) study that involved 66.143 women in postmenopause, have been identified 18 independent risk factors for falling, that, when combined, increase this risk.

The strongest predictor of falling was a previous event (OR=2,7). Other risk factors were age, education level, hypoacusia, diabetes, BMI > 30, family or personal history of fracture, hypothyroidism, weight loss, muscle's weakness, equilibrium disorders, usage of walking devices, visual deficits, osteoarthritis or arthritis, disability in common daily activities, depression, low cognitive level and fear of falling.

Hypovitaminosis D, that is particularly frequent in Italian elderly population (28-30), increases the risk of muscular weakness and sarcopenia (31-34), that are also involved in falling. In addition treating hypovitaminosis D may reduce equilibrium disorders and falls (35, 36).

The incidence of falls and than fracture, particularly hip fracture, depends also on ambient factors, such as hurdles or insufficient lighting or support at home (20, 26).

The presence of risk factors for falling, and their prevalence, not yet known may explain why some preventive interventions have had limited success. In particular it's clear that risk factors and consequences of falling depend on multiple factors not yet completely known and that their knowledge is important for adequate preventive strategies.

The aim of this study was to evaluate the prevalence of ambient and individual risk factors for hip fracture in elderly people.

Material and methods

This is an observational study approved by Ethics Committee and is part of a specific regional preventive project for fracture in elderly people, named RIFRAT. Patients enrolled were aged > 60 years old, both males and females, that lives in Veneto and admitted in an hospital of Veneto region for a first hip fracture not caused by an efficient trauma (i.e. falls from more than 2 meters, car crash...) or a neoplastic disease.

Every patient was asked for family, pathological and pharmacological history and health operators submitted validated questionnaires to evaluate nutrition (MNA; specific questionnaire for calcium introt), disability score (ADL; HAQ), cognitive state (SPM-SQ) and daily sun exposure. In a subgroup of patients blood was taken for the measurements of serum 25 hydroxy-vitamin D (25OHD). Information about circumstances of the fall, ambient factors involved and osteoporosis risk factors, together with anthropometric and anagraphic data, were also collected.

Statistical analysis

Statistical analysis was performed using SPSS software. Most of the analysis is descriptive and its aim is to evaluate characteristics of patients and of the event that brought to the fracture, together with ambient factors. Differences between groups were tested by t-Student test for continuous variables and with chi-square test for categorical variables. A p value<0.05 was considered significant.

Results

Between march 2009 and march 2010 we enrolled 704 patients (573 women and 131 men) of 848 patients aged >65 years old and admitted in Veneto's hospital for hip fracture. Most of the patients not enrolled had severe cognitive impairment.

Mean age of patients was 81±8 years old (range 60-102). Table 1 summarizes principals anthropometric characteristics of our population, in both sexes.

Most of enrolled patients was admitted in Verona's hospital; 64 in Vicenza's hospitals and 77 in other hospitals.

Before fracture 39% of patients were able to stay upstanding less than 4 h per day, 78% walks less than 1 h per day, 60% for less than 1 km per day, 28% needs help to stand up and 29% needs some kind of assistance to walk. ADL score was higher than 8 in 58% of patients and HAQ was higher than 1.25 in 38%.

Common co-morbidities were: systemic hypertension (66%), ischemic cardiopathy or heart failure (28%), diabetes (17%), rheumatological diseases (16%) and hypoacusia (15%). A severe visual

Table 1 - Principal anthropometric characteristics.

a) female patients

	Minimum	Maximum	Mean	Standard deviation
Age	60	102	81	8
Age of menopause	25	60	49	5
Weight (kg)	30	110	61	12
Height (cm)	140	181	161	7
BMI (kg/m ²)	13.3	38.1	23.6	4.2

b) male patients

	Minimum	Maximum	Mean	Standard deviation
Age	60	96	80	8
Weight (kg)	39	96	70	12
Height (cm)	152	193	171	7
BMI (kg/m ²)	14.3	32.1	24.0	3.6

deficit, although glass, was present in 38% of patients. 85% of patients were able to answer to questionnaire, 25% of whom had a moderate to severe cognitive impairment as indicated by Short portable mental status questionnaire.

Only 16% of patients with co-morbidities take no drugs and 40% take at least 4 drugs. Most common medications were: diuretics (20% loops diuretics and 20% thiazides), beta-blockers (15%), other anti-hypertensive drugs (54%), anti-platelets (29%), anti-coagulant (11%), hypnotics (21%), PPI (20%), anti-arrhythmics (15%), statins (11%), antidepressives (11%), anti-diabetes (9%), and NSAIDs (8%).

98% of hip fractures were caused by a falling, of whom 12% happened during the night-time. 69% of patients have fallen at home, in particular 28% in bedroom and 21% in the kitchen. 79% have fallen while they were standing up and in 37% it was due to some objects, such as carpets (8%), or irregular way (11%) or insufficient lighting (12%). 35% reported a previous falling during the last year.

MNA revealed a poor nutritional state in 15% of patients and a condition at risk of malnutrition in 30%. 10% of patients was underweight according to BMI value. 79% of patients had inadequate intake of calcium (less than 800 g/die). 7% of patients were smokers, 13% ex-smokers and only 4% referred to drink more than 3 units of alcohol/die. 7% of patients had a familiar history of hip fracture and 32% had previous hip fracture.

42% had a sun exposure shorter than 10 minutes per day. 12% of patients that lived in regional Health Districts were strategies for preventing vitamin D deficiency were not implemented, assumed vitamin D supplementation compared with 52% of patients that lived in Verona (Figure 1), where all elderly people were proposed to assume vitamin D supplementation during winter's months (37). Patients that didn't take vitamin D supplementation had medium serum 25OHD concentration of 23±21 nmol/l (Figure 2). Mean serum 25OHD concentration were significantly higher in patients that lived in Verona (69±60 nmol/l) than those that didn't live in Verona (42±28 nmol/l). In patients without vitamin D supplementation, hypovitaminosis D (38) (25OHD lower than 75 nmol/l or than 50 nmol/l) was present in 85% and 100% of patients, respectively (Figure 3). A densitometric exam was performed in 18% of patients during last 5 years (medium neck T-score = -2.4±0.8; Z-score = -0.4±0.9; Table 2) and 17% of patients were taking drugs for osteoporosis at the time of fracture.

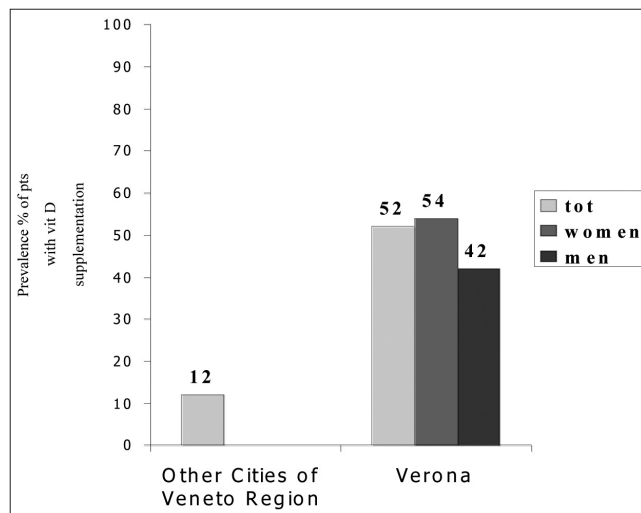


Figure 1 - Prevalence of patients with vitamin D supplementation in Veneto Region.

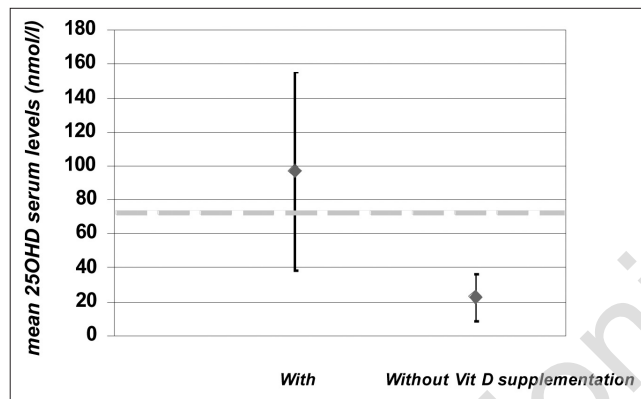


Figure 2 - Mean 25OHD serum levels in patients with or without supplementation.

Discussion

The population enrolled in this study is one of the biggest present in literature and shows the characteristics of patients with recent hip fracture, and how this event occurs.

Median age of this population is comparable with what present in literature, and confirms that extra-skeletal risk factors play an important role, and that generally this population is not involved in densitometric screening and preventive approaches.

Despite overweight patients (35% of our population) have an higher risk of falling, those underweight have an higher risk of hip fracture, maybe because of a reduced adipose panniculus.

More than 50% of these patients has severe disability before the fracture. In particular there were an insufficiency in staying upstanding and in walking with a significant deficit in daily activities. It was recently demonstrated that even subclinical disability is a risk factor for falling (39). These defects usually worsen after fracture leading to irreversible effects especially in disability. In this study we found frequent coexistence of a visual (more than 33% of patients) and hearing (1 patient out 7 patients) deficit and that may increase risk of falling and than fracture.

25% of patients had an important cognitive deficit. This value is underestimated because of the exclusion of patients (15% in this study) with severe cognitive impairment that were not able to perform questionnaires. It must be considered that cognitive im-

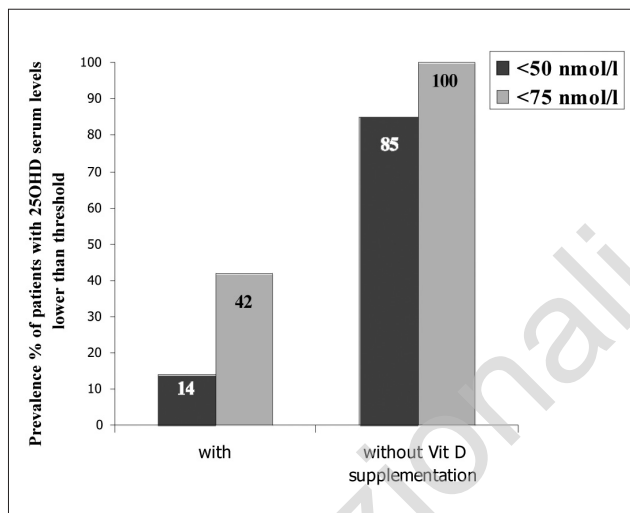


Figure 3 - Prevalence of hypovitaminosis D in patient with or without supplementation.

Table 2 - Densitometric evaluation.

	N	Minimum	Maximum	Mean	Standard deviation
T SCORE NECK	41	-4.5	-0.7	-2.4	0.8
Z SCORE NECK	32	-2.7	1.3	-0.4	0.9
T SCORE TOTAL HIP	41	-4.2	0.3	-2.2	1.0
Z SCORE TOTAL HIP	32	-2.6	2.2	-0.3	1.0

pairment, even not severe, may reduce patient's collaboration for diagnostic exams and therapeutic compliance.

Co-morbidities are another important characteristic of patients with hip fracture: 90% of patients had one pathology and 50% at least two. These values are in line with data recently published in BMJ (40) and confirm frailty of elderly patients with hip fracture and high mortality risk. Most frequent co-morbidity is cardiovascular disease. This may be explained by the reported association between cardiovascular disease, osteoporosis and hip fracture (41), that may have a genetic or pathogenic common background.

Only 16% of patients was taking no drugs, while 40% was taking at least 4 drugs. Most frequent medications were anti-hypertensive drugs. Recent studies demonstrated higher risk of falling in patients taking anti-hypertensive drugs (OR 1.24; CI 1.01-1.5) and diuretics (OR 1.07; IC 1.01-1.14), but not beta-blockers (42). In this population proton pump inhibitors are frequently taken, and their use has recently been correlated with increased risks of fracture (43), maybe caused by a reduced intestinal absorption of calcium, although this problem seems to decrease with chronic use. In our population more than one elderly patients with hip fracture out three takes hypnotics or anti-depressant drugs, and these drugs have been recently proved to increase risk of falling (42, 44). These effects may be caused by sedation, insomnia or sleep problems, nycturia, decreased postural reflex or increased reaction time, orthostatic hypotension, equilibrium disorders, heart rhythm and conduction disorders and altered motility, all of whom caused by anti-depressant drugs.

Daytime sleepiness is an important risk factor for falling, both in not-treated depression and in patients suffering from depression and treated with anti-depressant drugs (44); risk of falling is the same in patients suffering from depression treated with anti-depressant and those not treated with such drugs (44).

Anti-depressants are also used, for long time and without periodic reevaluation, in patients suffering from other pathologies than depression (urinary incontinence, chronic and neuropathic pain, anxiety disorders, irritable bowel syndrome, sedation).

In our opinion it's noteworthy that patients with hip fracture often assume non-steroidal anti-inflammatory drugs (NSAIDs) twice a week, or more; some studies have demonstrated an increased risk of falling in patients with chronic pain or that chronically use NSAIDs (45). Few reports have investigated the correlation between chronic pain and risk of falling in elderly people. Pain is involved in functional defects and muscular weakness and is associated with mobility limitations that may facilitate falling. In addition there are similar neurocognitive defects in patients with frequent falling and in those suffering from chronic back pain, supporting the role of neuropathic pain in falling. Chronic pain may be an important risk factor for falling in elderly patients, and this may be explained by the high prevalence of chronic pain, often under-treated, in such patients.

Our study confirms that hip fractures are often caused by falling, and this highlights the importance of preventing falling in order to reduce hip fracture. It's important to note that 1 patient out of 3 has a positive history of falling in the last year and this is the most relevant risk factor for falling (27) and fracture (46), although most relatives and general practitioners underestimate this factor. In our opinion it's noteworthy that more than 1 fracture out of 10 happens during the night-time, often in bedroom, and this demonstrates the role of insufficient lighting or problems in standing up from the bed, in falling. Those factors were present in more than 10% of our patients.

Frequently (more than 1 case out of 3) some objects played a role in causing falling. Most dangerous were carpets. In more than 10% of our patients, loose flooring were involved in falling.

Our patients were often at risk of malnutrition, and this increases the risk of osteoporosis and sarcopenia, and than of falling. 4 patients out of 5 have had an insufficient calcium intake (lower than 800 mg/die) that may cause secondary hyperparathyroidism. It's urgent to organize a program for nutritional education in elderly people.

Family history of hip fractures and smoking are less important risk factors for osteoporosis, falling and fractures than a previous fragility fracture that was present in 1 patient out of 3.

Only 18% of patients with recent hip fracture were previously screened by densitometry and only 17% were treated with drugs for osteoporosis.

Most of our patients had medium T-score of femoral neck of -2,4 and Z-score of -0,4 and this confirm that patients with hip fracture are often osteopenic (47) with bone mineral density comparable to people of the same age. This stresses that hip fractures have different causes, not only osteoporosis, and so we must use different approaches to prevent them.

Our study gives important informations both about the prevalence of hypovitaminosis D, that have known negative effects on bone and muscle, and about preventive strategies thus applied. We found that in patients without vitamin D supplementation mean serum levels of 25OHD were very low, and that in cities of our region, except Verona, only 12% takes vitamin D supplementation.

In Verona the prevalence of patients with hypovitaminosis D is lower thanks to preventive strategies applied during the last years and based on the use of vitamin D bolus during winter months (37). Moreover vitamin D has been recently correlated with time for functional recovery from hip fracture (48). All those data support preventive strategies with vitamin D supplementation in elderly people and in patients with hip fracture.

In conclusion, elderly people with hip fracture have often pre-existing disability, comorbidities with polypharmacy, individual and ambient risk factors for falling, and low calcium and vitamin D intake. Community and personalized preventive strategies are feasible and urgent.

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