

SHORT REPORT

Secular trend in the incidence of hip fracture in Catalonia, Spain, 2003–2014

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Abstract

Objectives: to describe the secular trend and seasonal variation in the incidence of hip fracture (HF) over 12 years (2003–2014) in Catalonia, the community with the highest incidence of HF in Spain.**Methods:** data about age, gender, type of fracture and month of hospitalisation among patients aged 65 years and older discharged with a diagnosis of HF were collected. Crude and age-standardised annual incidence rate were reckoned. To analyse HF trend, the age/sex-adjusted average annual change in incidence (incidence rate ratio, IRR) was calculated.**Results:** we identified 100,110 HF in the period, with an increase of 16.9% (women 13.4%; men 28.4%). Trochanteric fractures were the most frequent (55.8%). The crude incidence rate (per 100,000 population) decreased from 677.2 (95% confidence interval (95% CI) 662.0–692.7) to 657.6 (95% CI 644.0–671.5). The standardised incidence rate decreased from 754.0 (95% CI 738.6–769.3) to 641.5 (95% CI 627.7–655.3), with a sharp decrease in women (–16.8%) while it was stable in men. The incidence by type of fracture was stable. The trend throughout the period showed a slight decrease with IRR 0.99 (95% CI 0.98–0.99; $P = 0.025$). The incidence was stable in the oldest group (+85 years), while there was a downward trend in the younger groups. A significant seasonal pattern was observed, with more cases in winter and less in summer (spring as reference).**Conclusions:** the secular trend reveals a decreasing incidence of HF although the absolute number has increased in the last 12 years in Catalonia. Trochanteric fractures were the most prevalent and a seasonal pattern was observed, with more cases in winter.**Keywords:** epidemiology, secular trend, incidence rate ratio, seasonal presentation, hip fracture, older people

Introduction

Hip fracture (HF) is one of the most disabling healthcare problems affecting patients with osteoporosis. The incidence of HF is higher in older people, so the total number of these fractures is increasing due to the progressive ageing of the population. There is a wide variation between countries in the incidence of HF with the highest in the Scandinavian countries [1]. Despite the secular trends described between 1970s and 1990s showed an increase in

the incidence of HF [2], there has been observed a plateau [3] or even a decrease afterwards [4–9]. Also seasonality in the incidence of HF has been described regardless the latitude [10–12].

The incidence rate of HF varies between different regions within the same country, as is the case in Spain [13], where Catalonia is one of the communities with the highest incidence rate for unknown reasons. Previously, seasonality in the incidence of HF was described only for men in our country [14]. The aim of this study is to describe the secular

trend and seasonal variation in the incidence of HF over 12 years (2003–2014) in Catalonia (Spain), adjusted by sex and age.

Methods

Data about sex, age and type of fracture from people aged 65 years and older discharged between 1 January 2003 and 31 December 2014, whose main diagnostic were the codes 820.0× and 820.2× (ICD-9-CM), were collected from the Minimum Basic Data Set, a mandatory register of all hospital discharges. Patients with pathological and open fractures were excluded. The type of fracture was classified as neck or trochanteric fractures. Population data were obtained from the Insured's Central Register of Catalonia, a computer-based population register that includes all the people living in Catalonia. Months of admission, adjusted to 30 days, were grouped every 3 months beginning with spring (March, April and May).

Statistical methods

Annual crude (per 100,000 population) and standardised (2010 population based) incidence rate both with 95% confidence interval (95% CI) assuming Poisson distribution [15] were calculated for the whole population, by sex or age groups (65–74, 75–84 and 85 years and older) and for each type of fracture. To assess the changes during the period and seasonality, Poisson regression models were built including sex and age as a confounders and the log of population as an offset term (incidence rate ratio (IRR) with 95%CI). Calendar year was introduced as a predictor, to explore the linear trend, as well as a categorical variable, in a second model, to analyse the differences between years. All analyses were performed using Stata 13.1 (StataCorp LP, USA).

Results

The population increased from 6.9 to 7.6 million people (2003–2014). Over these 12 years, the proportion of people aged 65 years or older increased from 16.0% to 17.7%, and the oldest group (+85 years) increased from 1.8% to 2.7%. The total episodes of HF in people aged 65 years or older were 100,110 (75.8% of them in women). The female/male ratio changed from 3.35 (2003) to 2.96 (2014). The percentage corresponding to the oldest group increased from 42.5% to 53.8% ($P < 0.001$), so the mean age of men with HF has changed from 76.1 ± 15.9 years (2003) to 77.5 ± 15.5 years (2014) and in women from 81.9 ± 9.7 to 83.3 ± 9.7 . Trochanteric fractures were the most frequent (55.8%). The rate neck/trochanteric fracture remained stable around 0.77 in men but in women the rate changed from 1.17 neck fractures for each trochanteric one in the youngest group to 0.69 in the oldest group.

Crude and standardised incidence rates of HF

Annual crude incidence rate per 100,000 population, decreased from 677.2 (95% CI 662.0–692.7) in 2003 to 657.6 (95% CI 644.0–671.5) in 2014 representing a decrease of 2.9%. For women, the incidence decreased about 5.8%, while for men the incidence increased about 6.8% (Table 1). By age group, the incidence rate (crude and standardised) decreased significantly in all three groups. The direct standardised incidence rate decreased from 754.0 (95% CI 738.6–769.3) to 641.5 (95% CI 627.7–655.3) representing a decrease of 14.9%. The standardised incidence rate in women decreased about 16.8% while in men the incidence was stable. The incidence by type of fracture also remained stable (Supplementary data, Appendix S1, available in *Age and Ageing* online).

Trend of HF incidence

There was a downward trend in the incidence of standardised HF, nearly 1% annually since 2003, during the period (IRR = 0.99; 95% CI 0.98–0.99; $P = 0.025$) (Figure 1). By sex, the incidence of all fractures in both women (IRR = 0.989; 95% CI 0.984–0.993, $P < 0.001$) and men (IRR = 0.994; 95% CI 0.989–0.998; $P = 0.009$) decreased during the period. The analysis by group of age showed a significant downward trend for the younger groups for all fractures. In the 65–74 group, the decrease was about 3% (IRR = 0.974; 95% CI 0.968–0.980, $P < 0.001$), while in the 75–84 group the decrease was about 1.5% (IRR = 0.985; 95% CI 0.981–0.989, $P < 0.001$). No change was observed in the +85 years group over the period (IRR = 0.998; 95% CI 0.944–1.002, $P = 0.367$). By type of fracture, both decreased in women but only the trochanteric ones in men (Supplementary data, Appendix S1, available in *Age and Ageing* online).

Seasonal variation

Of the 100,110 HF, 26.9% were admitted in winter months. The IRR increased about 8.8% ($P < 0.001$) in winter months (spring as reference) and decreased about 7.1% ($P < 0.001$) in summer months without differences in the IRR between spring and autumn months. The same results were observed in men and women when analysed separately.

Discussion

In the last 12 years, there has been a downward trend of nearly 1% annually in the sex-age adjusted incidence of HF in Catalonia, although the absolute number of HF has increased (+17%) due to population ageing. The annually decrease is more remarkable in women (about -1.1%) than in men (-0.6%). A steepest downward trend is observed in the younger groups of age: -3% and -1.5% annually in patients between 65–74 years and 75–84 years, respectively. Meanwhile, the incidence has remained stable in the oldest group.

Our results are similar to those reported in some recent published studies with regard to the reduction in the HF

Table 1. Crude and standardised incidence rate (x100,000 inhabitants \geq 65 years) of HP in Catalonia, according to sex and age and the change (%) comparing 2003 and 2014.

Year	Crude incidence rate ($\times 100,000$)						Standardised incidence rate		
	Women	Men	65–74 years	75–84 years	≥ 85 years	Total	Women	Men	Both sexes
2003	907.2	366.0	172.5	845.6	2,525.1	677.2	1,002.8	412.2	754.0
95% CI	884.0–930.9	349.0–383.7	162.1–183.3	817.1–875.0	2,438.3–2614.1	662.0–692.7	976.1–1,027.8	392.8–431.7	738.6–769.3
2004	850.5	357.3	165.9	787.	2,275.0	646.3	909.4	390.2	691.0
95% CI	829.1–872.4	340.9–374.4	156.0–173.3	760.9–814.3	2,198.6–2,353.3	632.0–660.8	886.3–932.4	372.0–408.3	676.7–705.3
2005	885.2	385.8	167.5	810.0	2,403.9	678.2	939.2	415.4	718.9
95% CI	863.3–907.6	368.7–403.5	157.4–178.1	783.6–837.1	2,325.1–2,484.7	663.5–693.1	915.1–962.6	396.8–434.1	704.2–733.6
2006	854.8	366.2	151.1	757.7	2,366.0	651.3	900.2	392.3	686.6
95% CI	833.5–876.6	349.8–383.3	141.5–161.1	732.5–783.5	2,289.2–2,444.8	637.1–665.8	877.6–922.9	374.5–410.1	672.3–700.9
2007	880.9	392.3	148.6	802.7	2,357.9	677.3	913.2	411.7	702.3
95% CI	859.3–903.0	375.2–409.9	139.0–158.6	777.0–829.1	2,282.3–2,435.3	662.8–692.1	890.6–935.8	393.6–429.8	687.7–716.9
2008	877.5	381.8	151.9	747.7	2,353.0	670.5	894.4	392.3	683.2
95% CI	856.0–899.5	365.1–399.1	142.2–162.1	723.1–773.0	2,279.1–2,428.6	656.1–685.1	872.3–916.6	374.9–409.6	668.8–697.7
2009	849.8	389.7	145.7	726.0	2,264.5	656.8	855.2	393.4	660.9
95% CI	828.7–871.3	373.0–407.0	136.2–155.7	702.0–750.7	2,193.7–2,337.0	642.7–671.2	833.8–876.5	376.3–410.4	646.7–675.2
2010	911.9	419.8	143.7	769.1	2,464.7	704.9	911.9	419.8	704.9
95% CI	890.2–934.1	402.5–437.6	134.3–153.5	744.5–794.4	2,392.0–2,539.1	690.4–719.8	890.0–933.8	402.3–437.2	690.3–719.6
2011	889.3	395.8	128.1	730.6	2,380.3	681.0	877.4	389.0	672.0
95% CI	867.9–911.1	379.1–412.9	119.3–137.4	706.6–755.2	2,310.5–2,451.8	666.8–695.5	856.2–898.7	372.5–405.6	657.7–686.4
2012	889.7	391.8	127.4	714.7	2,335.2	678.9	865.3	377.9	660.3
95% CI	868.4–911.3	375.4–408.8	118.6–136.7	691.1–738.971	2,267.6–2,404.3	664.8–693.3	844.4–886.1	361.9–393.9	646.1–674.5
2013	888.9	401.3	133.6	4.9	2,327.9	682.0	863.7	386.0	662.8
95% CI	867.7–910.4	384.8–418.3	124.7–143.0	691.4–739.1	2,261.2–2,396.0	667.9–696.3	843.0–884.4	370.0–402.1	648.7–677.0
2014	854.9	390.8	132.6	667.7	2,304.7	657.6	833.3	377.2	641.5
95% CI	834.4–875.9	374.7–407.4	123.9–141.8	644.7–691.2	2,239.5–2,371.3	627.7–655.3	813.1–853.5	361.4–392.9	627.7–655.3
Change (%) between 2003 and 2014	–5.8	6.8	–23.1	–21.0	–8.7	–2.9	–16.8	–8.5	–14.9

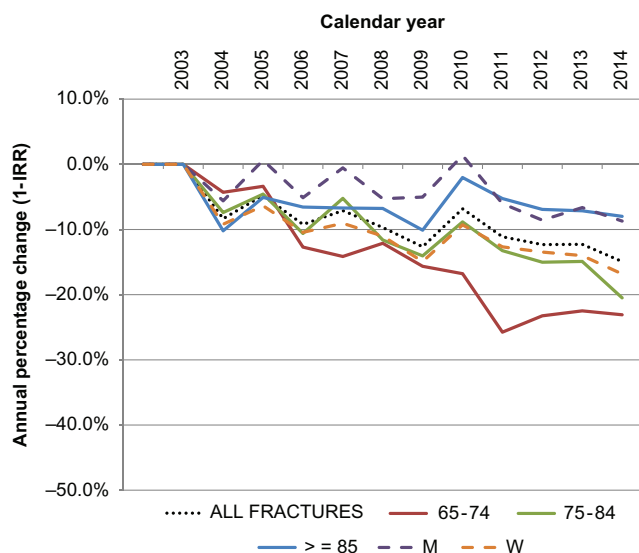


Figure 1. Annual change in the standardised incidence rate ratio of HP in people age 65 years and older in Catalonia 2003–2014 by sex and group of age (2003 as a reference year).

incidence rate [16–18]. Comparing to recent reports [19], we have observed a similar decrease by group of age in women, but unlike others [20], our study showed a decreasing trend for men in the last 12 years. One explanation could be the inclusion of the last years since 2011, each with a significant decreasing IRR.

Some lifestyle changes could have contributed to the observed downward trend in HF incidence. A better perinatal and childhood nutrition has been related to a later decreased risk of HF [21]. Smoking and low body mass index are two factors that increase the risk of osteoporosis. In our country, while tabaquism has continually decreased in the last 20 years [22], obesity has dramatically risen from 18.9% to 26.9% in the group older than 65 years between 2006 and 2014 [22]. Otherwise, while increasing physical activity lessens the risk of falls, sedentary lifestyle has remained stable. Finally, the higher pharmacological treatment of osteoporosis could have had a role [23, 24], although some studies have found no relationship [25].

Although the epidemiology of HF has been widely described, few studies have distinguished between cervical and trochanteric fractures [26]. In our study, unlike other series [27], trochanteric fractures were the most prevalent (55.7%) in all ages and both sexes except for youngest women. The different patterns of the two types of HF, suggest possible differences in risk factors [28]. Some of the risk factors for femoral neck fractures are a low calcaneal BMD, current steroid use and poor functional ability; while ageing, lower BMD and poor health status have been described as predictors of trochanteric fractures. Some authors hypothesise that the lower the bone mineral density, the higher the incidence of trochanteric fractures. The downward trend observed in the two younger groups of age for these fractures could support the hypothesis of an improving bone health of the elderly.

The higher incidence in winter months in our country [14] is unlikely to be explained by climatic factors directly related to falls like ice or snow [10–12]. Nevertheless, it seems to be a relationship between the increased risk of frailty fractures and the lower vitamin D serum levels [29] as a consequence of less sunlight exposure in winter [30].

The strength of this study is that it comprises a long and continuous period of years (more than a decade) with a high number of HF. We have selected fractures included in the 820.0 and 820.2 ICD-9 codes as most studies in our country [13, 14, 19, 20], although we excluded open fractures. The main limitations of the study are its observational design and the source of the data (Administrative Healthcare database), so there are some missing data, as the mechanism of fall or other important risk factors for fracture apart from sex and age.

As a conclusion, the incidence of HF has decreased for both sexes and for the population 65–84 years old, although the absolute number of HF has increased in the last 12 years in Catalonia. HF in Catalonia has a seasonal presentation with more cases in winter than in spring.

Key points

- The secular trend of HPs in Catalonia reveals a decreasing incidence, more marked in the 65–74 years old group.
- Trochanteric fractures were the most prevalent but the rate varied with sex and age.
- A seasonal pattern was observed with more cases in winter (+8.8%) having spring as reference.

Supplementary data

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

Conflicts of interest

None declared.

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