Incidence of hip fractures in Malmö, Sweden, 1992–1995

A trend-break

Cecilia Rogmark[1], Ingemar Sernbo[1], Olof Johnell[1] and Jan-Åke Nilsson[2]

The incidence of hip fractures in Malmö, Sweden, has been studied since 1924. Predictions based on material from the 1950s to the 1980s have shown an almost exponential increase in incidence.

During 1992–1995, 2,268 patients aged 50 and older, with hip fractures, were admitted to Malmö University Hospital, the only hospital in the city treating hip fractures. 76% were women with a mean age of 81 (SD 8) years, and the mean age of men was 78 (SD 9) years. 47% of the fractures were cervical. The annual incidences per 10,000 inhabitants were 36 in men and 85 in women. The corresponding numbers of subjects over 80 years were 170 men and 297 women. These findings show that the incidence is no longer increasing.

The causes of such a trend-break could be successful osteoporosis prevention, an increasing proportion of non-Scandinavian immigrants with a lower genetic risk of osteoporotic fractures, or a healthier elderly population. Increasing number of the population at risk already have two operated hips, due to previous fractures or arthrosis. Other causes may be fewer prescriptions of sedatives and higher winter temperatures.

Departments of [1]Orthopedics and [2]Statistics, Malmö University Hospital, SE-205 02 Malmö, Sweden. Tel +46 40-33 10 00. Fax -33 62 00
Submitted 98-02-14. Accepted 98-11-02

Scandinavia has the highest reported incidence of hip fractures in the world (Falch et al. 1985, Bacon et al. 1996), but some countries in the southern hemisphere, e.g., Argentina and New Zealand, also have a high incidence (Bagur et al. 1994, Barber et al. 1995).

The incidence of hip fractures in Malmö has been studied since 1924 (Löfberg 1924, Alffram 1964, Johnell et al. 1984, Nilsson and Obrant 1978, Obrant et al. 1989, Gullberg et al. 1993). A steady increase was seen from the beginning of the century until the end of the 1980s; the absolute number of hip fractures increased 6-fold from 1950 to 1991.

We have now analyzed the incidence of hip fractures in Malmö, Sweden during 1992–1995.

Patients and methods

Malmö, with about 240,000 inhabitants, is the third largest city in Sweden. Data concerning the Malmö population are drawn from the yearbook of Local Statistics (Statistikbyrån, Stadskontoret, Malmö Stad). All patients with hip fractures are referred to Malmö University Hospital.

The number of fractures was obtained from computer-based clinical registers, and from operating room reports. Inhabitants of Malmö, who sustained their fracture elsewhere and were operated on in another hospital, were included and non-residents operated on in Malmö were excluded.

The data were examined with time analysis using binary logistic regression, and a confidence interval of 95%.

Results

During 1992–1995, 2,268 patients aged 50 or more with hip fractures were admitted to Malmö University Hospital. 76% were women having a mean age of 81 (SD 8) years, and the mean age of men was 78 (SD 9) years. 47% of the fractures were cervical. The annual incidences of hip fractures per 10,000 inhabitants in men over 50 years and women over 50 were 36 and 85, respectively. The corresponding numbers of men over 80 years were 170 and of women over 80 years 297 (Tables 1 and 2).

Predictions based on previous studies from the city of Malmö have shown an almost exponential increase in hip fracture incidence. When comparing the results from the 1990s with this prediction, we find that the incidence is no longer increasing (time analysis with

Copyright © Scandinavian University Press *1999. ISSN 0001–6470. Printed in Sweden – all rights reserved.*

Table 1. Incidence of hip fractures per 10,000 inhabitants in Malmö, 1992–95

Age, years	Women	Men
50–54	3.8	3.9
55–59	11	6
60–64	19	14
65–69	24	23
70–74	52	29
75–79	115	67
80–84	216	118
85–89	339	253
90–	503	370

logistic regression, confidence interval 95%) (Table 3 and Figure). The results differ significantly from the extrapolated trend in 7 of 8 groups, leaving only men aged 50 and more with trochanteric fractures as a still increasing group.

47% of the fractures were cervical, the quota being the same for both sexes. This is a decrease compared with earlier studies, in the 1980s, 55% of the female fractures and 56% of the male fractures were cervical ($p < 0.001$ and $p = 0.008$) (Sernbo and Johnell 1989). The increasing rate of trochanteric fractures in Malmö has been seen from the 1950s and onwards.

Discussion

The mean age of persons sustaining a hip fracture is still increasing in both sexes (Table 4). However, the mean life expectancy in the population shows a gender difference. The average length of life for women in Malmö, 80 years, has been unchanged since 1981, whereas the men in Malmö have had an increase from 72 to 74 years during the same period. This, and the increasing proportion of very old inhabitants in Malmö, could explain the increasing proportion of trochanteric fractures, as previous studies have shown that these are associated with lower bone mass than cervical fractures (Lips et al. 1987, Karlsson 1995).

Our study is one of the first reporting a trend-break in hip fracture incidence and suggesting that the course of osteoporosis could be altered. Melton et al. (1996) reported a decline in incidence during the 1980s in Rochester, Minnesota. Nungu et al. (1993) reported a decreasing incidence of cervical fractures in women under 85 years in Uppsala. Levi (1997) noted an unchanged incidence in Copenhagen, Denmark. Otherwise, the world-wide trend is an increasing incidence (Kannus et al. 1996). Surely such a trend-break is multi-factorial. It could be due to successful information to the public concerning osteoporosis prevention and increased use of medical treatment for established osteoporosis.

It could also be a cohort effect with a healthier elderly population or simply the fact that a growing part of the population at risk already has two operated hips, due to previous fractures or arthrosis. In Malmö, approximately 4% of hips in persons over 80 have now been replaced with an artificial hip joint. In addition, the combination of increasing length of life and the increasing hip fracture incidence up to the 1980s, should result in fewer "breakable" hips.

An increasing immigration to Sweden took place in the late 1980s and early 1990s. About 20% of the Malmö population is now of non-Scandinavian origin with a lower genetic risk of osteoporotic fractures, which is a contributory cause of the decline in incidence. If the entire population had been Scandinavian, we could expect to have 4% more hip fractures.

The winter months (January, February and December) of 1992–1995 were, on average, 1.6 °C warmer than normal. Holmberg and Thorngren (1987) have found that a lower outdoor temperature results in more falls outdoors and indoors, but more recent studies show that temperature, especially in the Scandinavian countries, does not affect the incidence of

Table 2. Incidence of hip fractures per 10,000 inhabitants in Malmö

	Age	Fracture	1950–61	67–68	74–75	83–84	85	92–95
Men	>50	cervical	8	9	11	17	21	17
		trochanteric	7	9	10	16	18	19
		total	*15*	*18*	*21*	*33*	*39*	36
	>80	cervical	37	42	68	109	110	83
		trochanteric	28	41	62	85	80	87
		total	*65*	*83*	*130*	*194*	*190*	170
Women	>50	cervical	19	24	25	39	42	41
		trochanteric	11	16	17	35	41	44
		total	*30*	*40*	*42*	*74*	*83*	85
	>80	cervical	90	109	142	151	142	134
		trochanteric	70	98	94	189	209	163
		total	*160*	*207*	*236*	*340*	*351*	*297*

Table 3. Time-trend analysis based on earlier studies in Malmö compared to current observed incidence (per 10,000 inhabitants)

Sex, age and fracture type	Year	Population	Observed incidence	Estimated probability	95%CI
Men >50 yrs					
cervical	1950–61	25,200	8	8	7–9
	1967–68	34,900	9	11	10–12
	1974–75	39,300	11	13	12–14
	1983–84	39,100	17	17	15–19
	1985	38,700	21	18	15–20
	1992–95	37,100	17	23	19–27
trochanteric	1950–61	25,200	7	7	6–8
	1967–68	34,900	9	10	9–10
	1974–75	39,300	10	12	11–13
	1983–84	39,100	16	15	14–18
	1985	38,700	18	16	14–18
	1992–95	37,100	19	21	18–25
Women >50 yrs					
cervical	1950–61	32,800	19	18	17–20
	1967–68	44,100	24	25	24–26
	1974–75	49,900	25	30	28–31
	1983–84	52,400	39	37	35–40
	1985	52,100	42	39	36–42
	1992–95	50,500	41	49	44–54
trochanteric	1950–61	32,800	11	10	9–11
	1967–68	44,100	16	17	16–18
	1974–75	49,900	17	23	22–24
	1983–84	52,400	35	34	31–36
	1985	52,100	41	36	33–39
	1992–95	50,500	44	52	47–58
Men >80 yrs					
cervical	19850–61	1,250	37	35	27–45
	1967–68	1,700	42	56	47–65
	1974–75	2,100	68	73	63–84
	1983–84	2,700	109	103	85–125
	1985	2,800	110	109	89–134
	1992–95	4,000	83	155	116–206
trochanteric	1950–61	1,250	28	28	21–37
	1967–68	1,700	41	44	37–53
	1974–75	2,100	62	58	50–68
	1983–84	2,700	85	82	66–102
	1985	2,800	80	87	69–109
	1992–95	4,000	87	123	89–169
Women >80 yrs					
cervical	1950–61	2,100	90	91	81–103
	1967–68	3,600	109	113	105–122
	1974–75	4,900	142	128	119–138
	1983–84	6,000	151	150	136–166
	1985	7,100	142	154	138–172
	1992–95	9,500	134	181	155–210
trochanteric	1950–61	2,100	70	65	56–74
	1967–68	3,600	98	101	92–109
	1974–75	4,900	94	130	121–140
	1983–84	6,000	189	180	164–198
	1985	7,100	209	190	172–210
	1992–95	9,500	163	263	228–304

Table 4. Mean age of hip fracture patients in Malmö, 1992–95

Fracture type	1949–60	1967–68	1974–75	1982–83	19 85	1992–95
Men						
Cervical	68	71	72	73	75	78
Trochanteric	69	69	71	71	72	78
Women						
Cervical	72	73	77	77	78	80
Trochanteric	75	77	78	79	82	83

hip fractures (Jacobsen et al. 1995, Luukinen et al. 1996).

The prescription of sedative-hypnotic drugs in Malmö has been reduced by 20% from 1983 to 1993, while prescription of estrogen has doubled during the same period (Statistics from Apoteksbolaget, Sweden 1996). In addition, fewer doses of sedatives with "hang-over effect" were consumed, but more short-acting sedatives. The use of long half-life benzodiazepines increases the risk of falling and sustaining a hip fracture (Ray et al. 1989). Current use of estrogens is known to reduce fracture incidence in women (Cauley et al. 1995). Future studies will tell whether our findings are the beginning of a decreasing trend in hip fracture incidence in Malmö or merely fluctuation on a much larger, and pessimistic, curve.

Alffram P A. An epidemiologic study of cervical and trochanteric fractures of the femur in an urban population. Acta Orthop Scand (Suppl 65) 1964.

Bacon W E, Maggi S, Looker A, Harris T, Nair C R, Giaconi J, Honkanen R, Ho S C, Peffers K A, Torring O, Gass R, Gonzalez N. International comparison of hip fracture rates in 1988-89. Osteoporos Int 1996; 6: 69-75.

Bagur A, Mautalen C, Rubin Z. Epidemiology of hip fractures in an urban population of central Argentina. Osteoporos Int 1994; 4: 332-5.

Barber J, Mills H, Horne G, Purdie G, Devane P. The incidence of hip fractures in Maori and non-Maori in New Zealand. N Z Med J 1995; 108: 367-8.

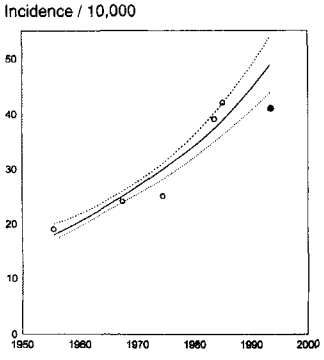
Cauley J A, Seeley D G, Ensrud K, Ettinger B, Black D, Cummings S R. Estrogen replacement therapy and fractures in older women. Ann Intern Med 1995; 122: 9-16.

Falch J A, Hebeck A, Slungaard U. Epidemiology of hip fractures in Norway. Acta Orthop Scand 1985; 56: 12-6.

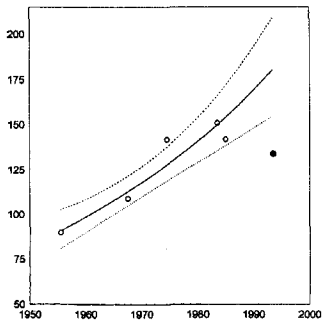
Gullberg B, Düppe H, Nilsson B E, Redlund-Johnell I, Sernbo I, Obrant K J, Johnell O. Incidence of hip fractures in Malmö, Sweden (1950-1991). Bone 1993; 14: S23-9.

Holmberg S, Thorngren K G. Statistical analysis of femoral neck fractures based on 3,053 cases. Clin Orthop 1987; 218: 32-41.

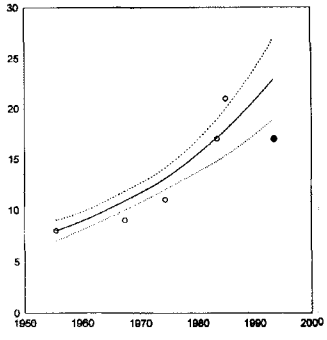
Jacobsen S J, Sargent D J, Atkinson E J, O'Fallon W M, Melton L J. Population-based study of the contribution of weather to hip fracture seasonality. Am J Epidemiol 1995; 141: 79-83.



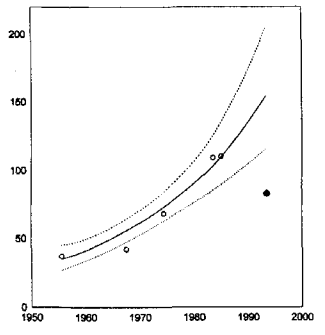
Cervical fractures,women, >50 yrs.



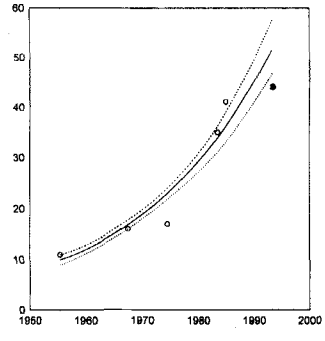
Cervical fractures, women, >80 yrs.



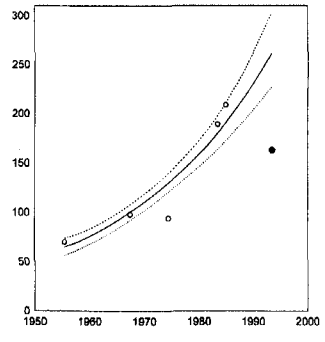
Cervical fractures, men, >50 yrs.



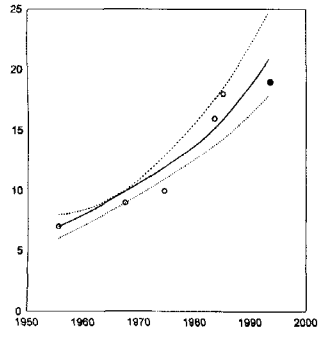
Cervical fractures, men, >80 yrs.



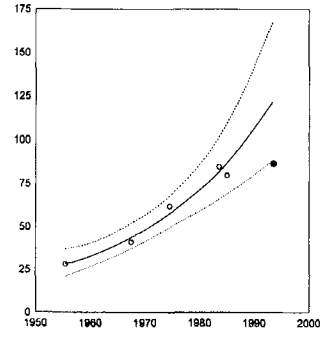
Trochanteric fractures, women, >50 yrs.



Trochanteric fract., women, >80 yrs.



Trochanteric fractures, men, >50 yrs.



Trochanteric fractures, men, >80 yrs.

Johnell O, Nilsson B E, Obrant K J, Sernbo I. Age and sex pattern of hip fracture–changes in 30 years. Acta Orthop Scand 1984; 55: 290-2.

Kannus P, Parkkari J, Sievanen H, Heinonen A, Vuori I, Jarvinen M. Epidemiology of hip fractures. Bone 1996: 18: S57-63.

Karlsson M. Bone mass, fracture and physical activity. Thesis, Lund University, Malmö, Sweden 1995.

Levi N. Incidence of hip fractures–At least a steady state in the Nordic countries? Eur J Orthop Surg Traumatol 1997; 7: 251-3.

Lips P, Uitenwall P, Taconis W K, Netelnbos J C. Are hip fractures caused by osteoporosis? In: Osteoporosis (Eds. Christiansen C, Johansen S S, Riis B S). Osteopress Aps., Copenhagen 1987; 362-3.

Luukinen H, Koski K, Kivelä S-L. The relationship between outdoor temperature and the frequency of falls among the elderly in Finland. J Epidemiol Community Health 1996; 50: 107.

Löfberg O. The treatment of fractures of the neck of the femur. Acta Chir Scand 1924; 57: 504-34.

Melton L J III, Atkinson E J, Madhok R. Downturn in hip fracture incidence. Public Health Rep 1996; 111: 146-50.

Nilsson B E, Obrant K J. Secular tendencies of the incidence of fracture of the upper end of the femur. Acta Orthop Scand 1978; 49: 389-91.

Nungu S, Olerud C, Rehnberg L. The incidence of hip fracture in Uppsala County. Acta Orthop Scand 1993; 64: 75-8.

Obrant K J, Bengnér U, Johnell O, Nilsson B E, Sernbo I. Increasing age-adjusted risk of fragility fractures: a sign of increasing osteoporosis in successive generations. Calcif Tissue Int 1989; 44: 157-67.

Ray W A, Griffin M R, Downey W. Benzodiazepines of long and short elimination half-life and the risk of hip fracture. JAMA 1989; 262: 3303-7.

Sernbo I, Johnell O. Changes in bone mass and fracture type in patients with hip fracture. Clin Orthop 1989; 238: 139-47.

Statistics from Apoteksbolaget, Sweden.

Time trend analysis based on earlier studies in Malmö compared to current observed incidence (per 10,000 inhabitants). o observed incidence, • present incidence, — incidence trend, --- 5% confidence limit, and ···· 95% confidence limit.