

EPIDEMIOLOGY OF FRACTURES OF THE DISTAL FOREARM IN OSLO, NORWAY

J. A. FALCH

Medical Department B, Aker Hospital, Oslo, Norway

In Oslo in 1979, 1604 fractures were recorded in persons over 20 years of age. Eighty-three per cent were women. In men, the age specific incidence increased only slightly with age. In women, however, the incidence increased in the years around and after menopause, declining again after 75. Even after correcting for falls occurring in winter, the incidence was significantly higher than reported from Sweden and the U.K.

Key words: forearm fracture; epidemiology

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The bone mineral mass of the skeleton decreases in both sexes after the age of 40 (Horsman 1976), rendering the bone less mechanically efficient as a supporting framework for the body. The regional bone mass of the distal forearm also decreases with age, and the incidence of fractures of the distal forearm increases concurrently, especially in women (Alffram & Bauer 1962, Knowelden et al. 1964, Matkovic et al. 1980). Women with forearm fractures have less bone mass than age-matched controls (Nilsson & Westlin 1974) and may represent an osteopenic subpopulation with a higher fracture liability when subjected to trauma.

The incidence of fractures of the upper end of the femur in Oslo has been shown to be the highest ever reported (Falch & Slungaard 1980). Since these fractures also are assumed to be a symptom of osteopenia, it would be of interest to investigate the occurrence of forearm fractures in the same population.

PATIENTS AND METHODS

In Oslo, patients with a fracture of the distal end of the forearm seek medical attention in one out of three out-patient clinics or are admitted to a surgical or orthopedic department. In the two largest out-patient clinics the records of patients with a selected diagnosis can be recalled from a diagnosis register. In the third clinic, the staff was asked to retain records from fracture patients. These records were studied retrospectively every second week. The roentgen films were not reviewed. The records of patients admitted to hospital were found by assistance of the hospital admission data system. Only patients over 20 who were Oslo residents and had a fracture of the distal end of the forearm were included. The following information was recorded: sex, date of birth, date of fracture and side of fracture. The period of observation was 1 January to 31 December 1979.

From the recorded numbers, the age- and sex-specific annual incidence was calculated. The population census data of Oslo 31 December 1978 were chosen to represent the population at risk (Central Bureau of Statistics of Norway, 1979).

Since slippery winter streets may contribute to many of the falls causing fracture, the annual incidence was also calculated using only fractures occurring in the 6 months from April to September. The number was multiplied by two, giving a hypothetical number of fractures for a hypothetical year without snow and ice in the streets.

The significance of the difference in the number of right and left sided fractures was tested using confidence limits for binomial distribution. To evaluate the significance of geographical variation, the difference between the observed number of fractures in Malmö (Alffram & Bauer 1962) and Oxford/Dundee (Knowelden et al. 1964) and the expected number in these cities calculated from the incidence in Oslo were tested using chi-square test.

RESULTS

A total of 1613 fractures were recorded. Eight women and one man who sustained bilateral fracture were recorded as one fracture episode each, leaving 1604 fractures, 1329 (83 per cent) of whom were women. In Table 1 the population at risk, number of fractures and incidence in age –

and sex-specific groups are listed. The annual incidence for the total year and for the “summer – corrected” year are plotted in Figure 1. Young women and men have the same incidence until it rises sharply in women at the time of and after the menopause, levels off around 60 and, finally, declines from 75 onwards. In men the incidence increases only slightly with age. Correcting for winter injuries does not change the basic shape of the incidence patterns, but the incidence decreases by as much as 50 per cent in some groups.

Figure 2 shows the seasonal variation. All age groups except the youngest men show a higher frequency in the beginning and the end of the year.

The incidences – total and “summer” fractures – are listed in Table 2 together with the incidences reported from Sweden and the U.K. Even

Table 1. Population at risk, number of fractures of the distal forearm from 1 January to 31 December 1979 and from 1 April to 30 September 1979. The annual incidence has been calculated in age and sex groups for the total year and for the summer months

Sex	Age group	Population 31/12 1978	January to December		April to September	
			No. of fractures	Annual incidence per 10 000	No. of fractures	Annual incidence per 10 000
W o m e n	20–29	40 422	39	9.7	16	7.9
	30–39	29 611	34	11.5	4	2.7
	40–49	21 814	55	25.2	17	15.6
	50–54	14 023	108	77.0	24	34.2
	55–59	17 477	213	121.9	59	67.5
	60–64	17 205	235	136.6	79	91.8
	65–69	16 994	209	123.0	72	84.7
	70–74	15 043	202	134.3	66	87.8
	75–79	12 753	144	112.9	52	81.6
	80–84	7 738	67	86.6	27	69.8
85–89	3 296	20	60.7	7	42.5	
≥90	1 065	3	28.2	2	37.6	
M e n	20–29	36 879	34	9.2	16	8.7
	30–39	32 060	36	11.2	17	10.6
	40–49	21 108	35	16.6	12	11.4
	50–54	12 856	15	11.7	5	7.8
	55–59	14 889	36	24.2	13	17.5
	60–64	13 513	30	22.2	7	10.4
	65–69	11 742	30	25.6	7	6.0
	70–74	8 791	26	29.6	6	13.7
	75–79	6 112	18	29.5	6	19.6
	80–84	3 181	10	31.4	2	12.6
85–89	1 219	3	24.6	1	16.4	
≥90	356	2	56.2	0	0	

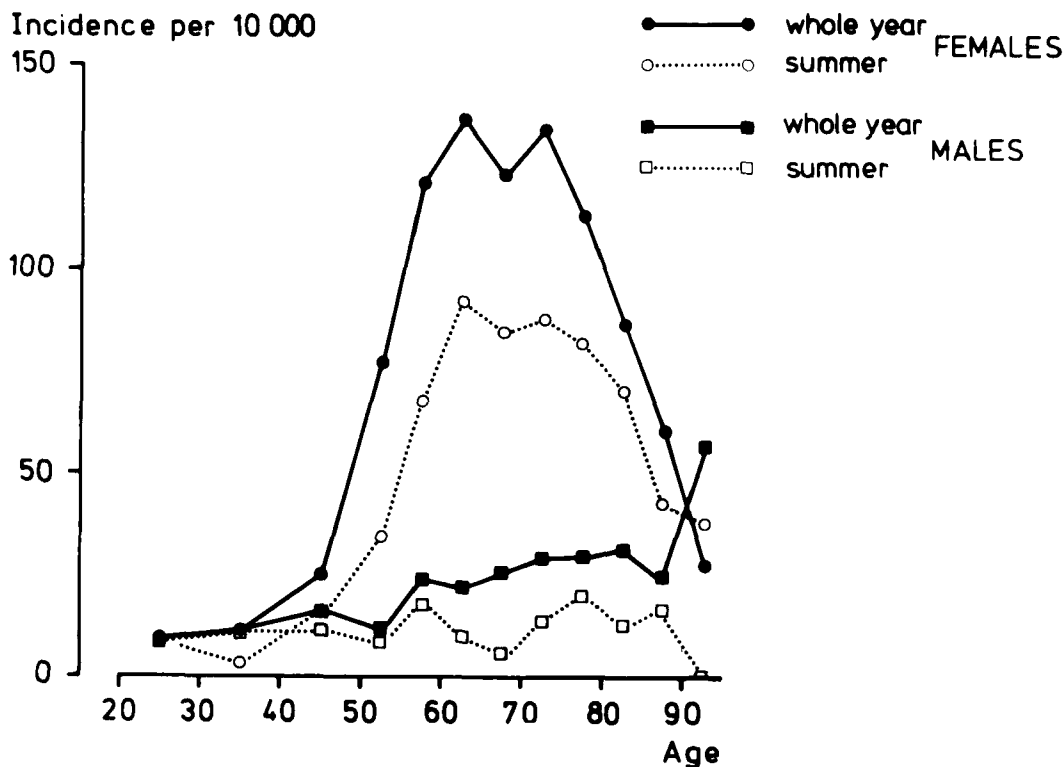


Figure 1. The annual sex- and age-specific incidence of fractures of the distal forearm in Oslo. Whole year: annual incidence calculated from all fractures occurring from 1 January to 31 December 1979. Summer: annual incidence calculated from all fractures occurring from 1 April to 30 September 1979.

Table 2. The age- and sex-specific annual incidence of fractures of the distal forearm in Oslo, Malmø and Oxford/Dundee. Oslo total: Incidence calculated from fractures recorded from 1 January to 31 December 1979. Oslo "summer": Incidence calculated from fractures recorded 1 April to 30 September 1979

Age group	Annual incidence per 10000					
	Women			Men		
	Oslo total	Oslo "summer"	Malmø	Oslo total	Oslo "summer"	Malmø
20-29	9.7	7.9	2.9	9.2	8.7	3.2
30-39	11.5	2.7	3.6	11.2	10.6	3.3
40-49	25.2	15.6	9.6	16.6	11.4	5.0
50-59	101.9	52.7	42.7	18.4	13.0	4.1
60-69	129.8	88.3	60.4	23.8	11.1	6.5
70-79	124.5	84.9	52.1	29.5	16.1	5.8
≥80	74.4	59.5	57.7	31.5	12.6	6.8
			Oxford/ Dundee			Oxford/ Dundee
55-64	129.2	79.6	43.8	23.2	14.1	9.0
65-74	128.3	86.2	50.6	27.3	12.7	7.2
75-84	103.0	77.1	51.4	30.1	17.2	11.4
≥85	52.7	41.3	74.2	-	-	-

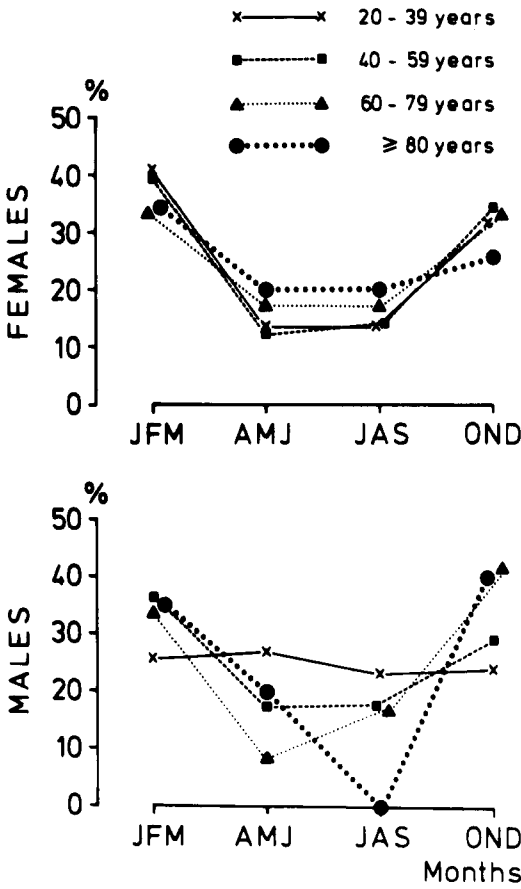


Figure 2. Seasonal variation in frequency of fractures of the distal forearm in Oslo. Number of fractures in each period of 3 months is given as the percentage of all fractures in the age- and sex group.

after correcting for the winter months, the incidence is significantly higher in Oslo ($P < 0.01$) except in the oldest age group in both sexes and for women age 30-39.

The fracture side is shown in Table 3. Over 40 years, left-sided fractures dominate in both sexes, but the dominance is significant only in the age group 60-79.

DISCUSSION

This study demonstrates that fracture of the distal forearm is predominately a woman's fracture, and that the incidence in women increases sharply in the years around and after the menopause. Although the incidence among men also increases with age, the increase is almost negligible when compared with women.

There are more fractures in the winter. By calculating the annual incidence from the number of fractures during the summer, the incidence is markedly reduced, but the shape of the incidence pattern is unchanged. Even by calculating a "summer" incidence, the incidence for post-menopausal women in Oslo is higher than the incidence reported from Sweden and the U.K. This geographical difference has also been found for fractures of the upper end of the femur, where the incidence in Oslo is the highest reported (Falch & Slungaard 1980). No definite explanation for the high incidence of fractures in Oslo

Table 3. Side of fracture in sex- and age groups

Sex	Age group	No. of fractures				
		Right	Left	Bilateral	Unknown	
W o m e n	20-39	40	33	0	0	NS
	40-59	171	201	4	0	NS
	60-79	330	455	4	1	$P < 0.01$
	≥80	43	47	0	0	NS
M e n	20-39	36	34	0	0	NS
	40-59	39	46	1	0	NS
	60-79	41	63	0	0	$P = 0.05$
	≥80	7	8	0	0	NS

can be offered. Another difference between women in Oslo as compared to Sweden and the U.K. is the decrease in incidence after 75 found in Oslo, which may indicate some difference in behavior.

Left forearm fractures are more frequent than right – sided. This difference could be caused by a tendency to protect oneself with the left arm when falling due to the right arm being used to carry goods etc. A higher bone mass has been reported for tubular bones from the right side of the skeleton (Horsman 1976), but others using photon absorptiometry have not found any difference between the left and right side of the distal radius (Christiansen & Rødbro 1975, Nilsson & Westlin 1974).

In conclusion, the incidence of forearm fractures in Oslo shows a similar pattern to that found elsewhere, but the incidence is higher than reported from other countries. This might be caused by a higher frequency of falls in Oslo, but could also indicate a high prevalence of bone fragility.

REFERENCES

- Alffram, P.-A. & Bauer, G. (1962) Epidemiology of fractures of the forearm. *J. Bone Joint Surg.* **44-A**, 105–114.
- Christiansen, C. & Rødbro, P. (1975) Bone mineral content and estimated total body calcium in normal adults. *Scand. J. Clin. Lab. Invest.* **35**, 433–439.
- Falch, J. A. & Slungaard, U. (1980) Fractures of the upper end of the femur in Oslo: an epidemiological study. *Acta Orthop. Scand.* **51**, 858.
- Horsman, A. (1976) Bone mass. In: *Calcium, phosphate and magnesium metabolism* (Ed. Nordin, B. E. C.) 1st edn. pp. 357–404. Churchill Livingstone, Edinburgh.
- Knowelden, J., Buhr, A. J. & Dunbar, O. (1964) Incidence of fractures in persons over 35 years of age. *Br. J. Prev. Soc. Med.* **18**, 130–141.
- Matkovic, V., Ciganovic, M., Tominac, C. & Kostial, K. (1980) Osteoporosis and epidemiology of fractures in Croatia. *Henry Ford Hosp. Med. J.* **28**, 116–126.
- Nilsson, B. E. & Westlin, N. E. (1974) The bone mineral content in the forearm of women with Colles' fracture. *Acta Orthop. Scand.* **45**, 836–844.

Correspondence to: Dr. J. Falch, Med. Dep. B, Aker sykehus, Oslo 5, Norway.