Secular increase in the incidence of hip fractures in Belgium between 1984 and 1996: need for a concerted public health strategy

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Objective To determine the incidence of hip fractures (at the proximal end of the femur) in Belgium from 1984 to 1996.

Methods Use was made of information from the national database on hospital bills, which fully covers the annual hospital stays in the whole of the country.

Findings The mean annual incidence of hip fractures increased from 107.8 to 140.5 per 100 000 inhabitants between 1984 and 1996. The incidence of fractures of the femoral shaft (diaphysis), taken as a control, remained stable. The female to male ratio of these hip fractures was 2.3:1. Although the incidence by age group was identical for males and females, the fractures occurred approximately seven years earlier in women than in men. The demographic changes observed in Belgium during this period accounted for only 10% of the observed increase in the number of hip fractures.

Conclusion If no comprehensive preventive policy is set up promptly, there will be a sevenfold increase in the incidence of hip fractures between now and the year 2050 in Belgium.

Keywords Hip fractures/epidemiology; Age factors; Longitudinal studies; Forecasting; Belgium (*source: MeSH*).

Mots clés Fracture hanche/épidémiologie; Facteur âge; Etude longitudinale; Prévision; Belgique (*source: INSERM*).

Palabras clave Fracturas de cadera/epidemiología; Factores de edad; Estudios longitudinales; Predicción; Belgica (*fuente: BIREME*).

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Introduction

Fractures of the proximal end of the femur (hip fractures) are considered to be the most serious consequence of osteoporosis, and the burden posed by this condition has consistently been increasing in most developed and developing countries (*1–3*). Prevention of osteoporosis is therefore a major public health concern. Wide variations in the incidence of hip fractures have been reported between and within countries (*3–5*), and have been attributed to genetic, environmental, and behavioural factors. Consequently, public health policies that are aimed at improving primary or secondary prevention procedures cannot simply be transferred from one country to another. Attempts to optimize the efficiency of these policies should be based on comprehensive epidemiological surveys carried out in the country or region where the prevention strategy is to be applied.

No recent data on the incidence of hip fractures are available for Belgium, but such data have been collected for some neighbouring countries (*1, 6, 7*). The only report ever published for Belgium (*8*) suggested that there was a dramatic increase (5.6% per year) in hip fractures between 1977 and 1982. We carried out the present survey to determine whether this trend is still continuing. We compared the incidence of hip fractures in both males and females and examined the respective roles of demographic and secular aspects and their contribution to changes in hip fracture incidence between 1984 and 1996. Finally, since there is currently no appropriate strategy for screening and preventing osteoporosis in Belgium, we projected these observed changes on population estimates for the next 50 years and calculated the future hip fracture incidence in Belgium.

Materials and methods

Using the national database of hospital bills, which fully covers the annual hospital stays in Belgium

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(population, ca.10 million), we determined the incidence of proximal femoral (hip) fractures for the whole country from 1984 to 1996 (Source: Institut National d'Assurance-Maladie-Invalidité, Avenue de Tervueren, Brussels, Belgium). The format of this registry excludes double-counting of one admission or of omissions since it is based on supervised reimbursement of the acute care costs of all medical and surgical procedures (*8*). In order to minimize any possible random errors or fluctuations linked to data acquisition, we calculated the annual incidence of hip fractures as the mean of the incidence observed over three consecutive years. The Belgian national database of hospital bills is coded according to the nature of the procedure performed. Three codes are related to surgical procedures (osteosynthesis) directly identified as linked to a fracture of the proximal femur, and two codes are related to hip arthroplasty (femoral prosthetic replacement and total hip prosthetic replacement). The same coding system for health-related procedures has been used in Belgium since 1963 and is one of the most detailed coding systems worldwide, including codes for 8300 different procedures. In order to distinguish hip arthroplasties linked to a femoral neck fracture from those related to other diagnoses (mainly osteoarthritis), we conducted a 6-month survey in nine major Belgian hospitals (representing 10% of the overall number of hospital stays) and identified the diagnosis for each of the hip surgical procedures. The nine hospitals included in this sample were selected since they were the largest hospitals in each of the major cities of the French-speaking part of Belgium. The incidence of fractures of the femoral diaphysis was used as the control.

The sex- and age-related incidences were obtained for 1993 (the selected reference-year) by accessing the database of one of the largest Belgian Social Security Agencies (Union Nationale des Mutualités Socialistes), which covers 27% of all Belgian citizens. Using demographic data obtained from the National Institute of Statistics, we calculated, on the basis of the age- and sex-standardized values for 1993, the demographic-based expected evolution from 1984 to 1993. Similarly, using the Belgian population projections made by the Demographic Projections Office (Bureau du Plan) for the next 50 years, we calculated the expected number of hip fractures in Belgium for each year until 2050.

Results

From our 6-month survey in the representative sample of hospitals, we observed that femoral prosthetic replacements and total hip prosthetic replacements were linked to a femoral neck fracture in, respectively, 67% and 22% of the cases.

The mean annual incidence of fracture of the proximal femur increased from 107.8 in 1984–86 to 140.5 (per 100 000 inhabitants) in 1994–96, while that of femoral diaphysis fractures remained stable at 14.5 in 1984–86 and 14.2 (per 100 000 inhabitants) in 1994–96 (Fig. 1). For 1993, the female:male ratio of hip fractures was 2.3:1. However, the incidences by age group were identical between males and females, with fractures occurring approximately seven years earlier in women than in men (Fig. 2 and Fig. 3).

While the demographic changes observed in Belgium from 1984 to 1996 would account for only a 3.2% increase in the number of hip fractures during this period, the observed increase was 30%. By taking into account only the demographic changes expected over the next 50 years, with no other increase in the age-specific incidence of hip fractures, the expected total number of hip fractures in Belgium for the year 2050 would be twice the present number. If in addition to the expected demographic effect, the incidence of hip fractures follows the pattern observed during the 1984–1996 period, the incidence of hip fractures in the Belgian population would rise from around 140 in 1994–96 to 860 (per 100 000 inhabitants) in 2050 (Fig. 4).

Discussion

In the present study, the incidence of hip fractures in Belgium was determined from information in the national database for hospitalized patients. We therefore did not take into account patients who were not hospitalized — these were, very likely, a small number related to immediate deaths after the fracture (*9*) and patients who were not treated surgically. The latter, even if rare, might nevertheless have been slightly more numerous in the earlier years of the period covered by this survey, creating an artifact for the important increase in incidence observed over the 12-year period of our study. However, it is unlikely that medical attitudes have changed sufficiently over this period to

Fig. 1. **Mean annual incidence of hip fractures, in Belgium, from 1984–96**

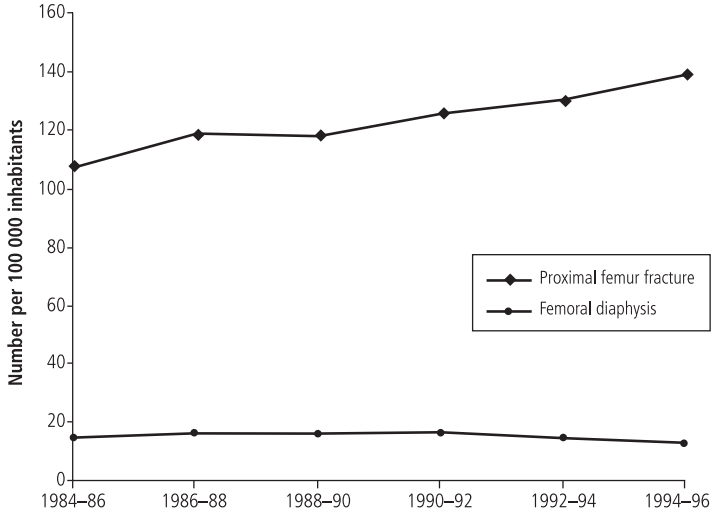

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Fig. 2. **Distribution of hip fractures in Belgium, by age group and sex, 1993**

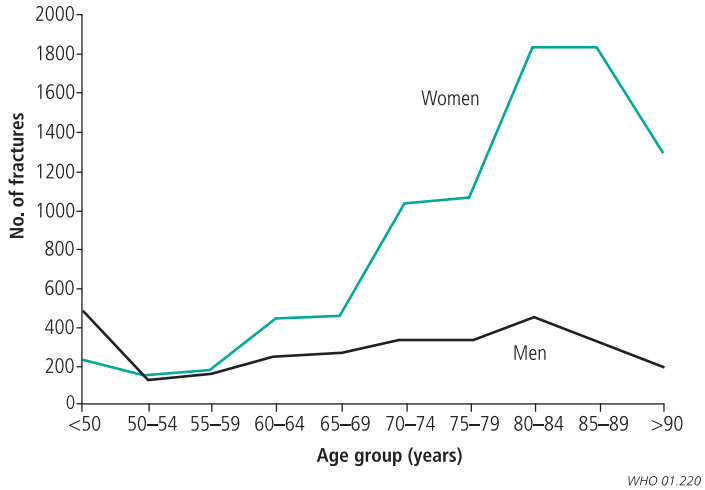


Fig. 3. **Incidence of hip fractures in Belgium, by age group and sex, 1993**

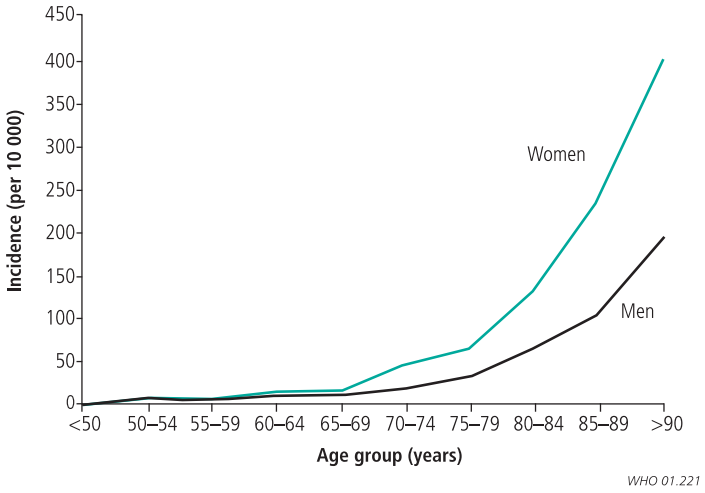
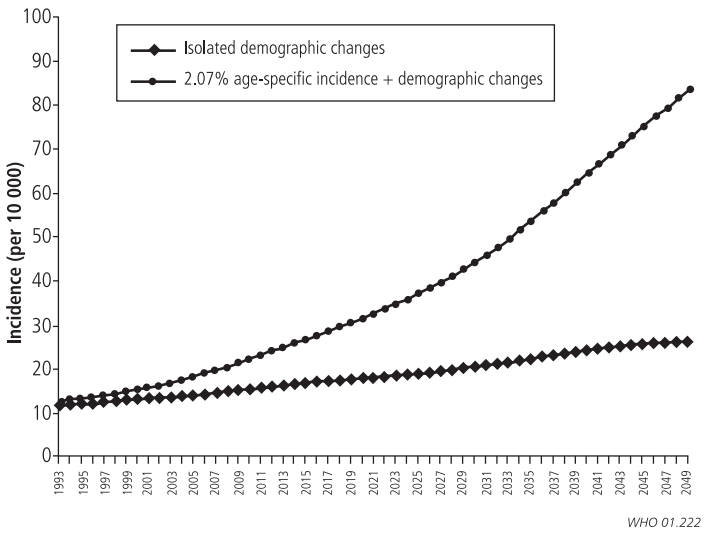


Fig. 4. **Expected number of hip fractures in Belgium until the year 2050**



explain a relevant part of this observed increase in hip fracture incidence. Changes, over time, in surgical attitudes towards osteoarthritis or hip fracture might have a more relevant impact on the percentage of hip arthroplasties attributable to osteoporosis. Our survey to assess this percentage was based on individual files of patients who were operated on in 1993. Even if our figures are very close to those reported from the neighbouring countries for 1988–89 (*4*), we cannot exclude a slight variability in these data between 1984 and 1996. This should not be neglected when evaluating the reported increase in hip fractures during this period.

Obviously we did not follow each individual clinical record, and therefore we cannot exclude the occurrence of fractures resulting from other pathological conditions, e.g. cancer metastases or severe trauma. Their contribution should, however, be relatively small and constant over time.

Our methodology, based on a state-driven health system, gives us reliable total figures for the number of hip fractures in the whole Belgian population, with no need for sampling or extrapolating from partial results. Similarly, the structure of the national database prevents double-counting of the same patient who might have been transferred either from one hospital to another or between different departments within the same hospital. Multiple surgical procedures on the same patient cannot, however, be totally ruled out.

The only previous survey of the Belgian population reported a rate of 97 hip fractures per 100 000 inhabitants for the year 1981 (*8*). Our finding for 1984 of 107.8 per 100 000 inhabitants is consistent with the 1981 figure if we apply the 2.07% per year increase in hip fractures that we observed in our study between 1984 and 1996. The incidence that we found is also in agreement with the published data from twelve European countries (*7*), as is our female to male sex ratio of 2.3:1 (*7*). Also our estimate is very close to the 104.4 hip fractures for 100 000 Swiss residents recorded from hospital discharge lists in 1992–93, although the crude female to male ratio was significantly higher at 4.7:1 (*10*). In Picardy, a region in France very close to the Belgian border, a female to male ratio of 2.6:1 was reported for hip fractures in 1987, with age- and sex-specific incidences almost identical to our figures (*6*).

The increase in the number of hip fractures, independently of the growing number of elderly people, has also been described in several other countries. In Europe, increases in age- and sex-specific incidences have been described in the United Kingdom (*11*), Finland (*12, 13*), Netherlands (*14*), Norway (*15*), and Sweden (*16, 17*) (see *16* for a review). In these countries, the change per annum in the sex-specific age-standardized incidence of hip fractures varied from 0.5% to 3.3% (*18*), and is of the same order of magnitude as the 2.07% per year increase that we observed in Belgium for the period 1984–96. However, some reports (*19*) suggest that

the age-adjusted rates of hip fractures might have levelled off in certain areas, including the USA (*20*), parts of Sweden (*21*), Australia (*22*), and the United Kingdom (*23*).

There are no definite explanations for this observed secular trend in the Belgian population. In Belgium, the following risk factors for hip fractures have been identified and should be considered: increase in the use of psychotropic drugs, alcohol or tobacco (*8, 24*); more extended use of drugs with potential skeletal adverse effects such as corticosteroids or thyroid hormones; fashion-driven changes in body shape towards a lower body mass index (*24*); decrease in physical activity and generalized use of motor vehicles instead of walking or cycling (*25*); and increase in body height and related changes in hip axis length, or femoral geometry (*26–29*).

Finally, our projected figure of 28 000 hip fractures in Belgium for the year 2050, based solely on demographic evolution, is in perfect accord with the estimate made for France, i.e. 143 140 new cases of hip fractures in 2050, taking into account the fivefold greater population of France compared with Belgium (*1*).

Conclusion

Hip fractures are currently a major health issue in Belgium. If no comprehensive preventive policy is set up promptly, there will be a sevenfold increase in these fractures between now and the year 2050. Hip fractures in males, even if they are less common than in women, should not be underestimated and are likely to become a major health problem in the coming years. ■

Conflicts of interest: none declared.

Résumé

Augmentation séculaire de l'incidence des fractures du col du fémur en Belgique entre 1984 et 1996 : nécessité d'une stratégie concertée de santé publique

Objectif Déterminer l'incidence des fractures du col du fémur en Belgique de 1984 à 1996.

Méthodes Nous avons utilisé les informations de la base de données nationale sur les factures d'hôpital, qui couvre la totalité des séjours hospitaliers annuels dans le pays.

Résultats L'incidence annuelle moyenne des fractures du col du fémur est passée de 107,8 à 140,5 pour 100 000 habitants entre 1984 et 1996. L'incidence des fractures de la diaphyse fémorale, prise comme témoin, est restée stable. Les fractures du col du fémur touchaient 2,3 femmes pour 1 homme. Si l'incidence par tranche d'âge était la même chez les hommes et les femmes, les fractures survenaient environ sept ans plus tôt chez les femmes. L'évolution démographique constatée en Belgique pendant cette période n'intervenait que pour 10 % dans l'augmentation du nombre de fractures du col du fémur.

Conclusion Si aucune politique globale de prévention n'est mise en œuvre rapidement, l'incidence des fractures du col du fémur sera multipliée par sept d'ici 2050 en Belgique.

Resumen

Aumento incesante de la incidencia de fracturas de cadera en Bélgica entre 1984 y 1996: necesidad de una estrategia concertada de salud pública

Objetivo Determinar la incidencia de fracturas de cadera (extremo proximal del fémur) en Bélgica entre 1984 y 1996.

Métodos Se utilizó información de la base de datos nacional sobre facturas hospitalarias, que refleja de manera exhaustiva las estancias hospitalarias anuales en todo el país.

Resultados La incidencia anual media de fracturas de cadera aumentó de 107,8 a 140,5 por 100 000 habitantes entre 1984 y 1996. La incidencia de fracturas de la diáfisis femoral, tomada como control, se mantuvo estable. La relación mujeres:hombres entre esos casos de fractura de cadera fue de 2,3:1. Aunque la incidencia por grupos de edad fue idéntica en hombres y mujeres, las fracturas se producían aproximadamente 7 años antes en las mujeres que en los hombres. Los cambios demográficos que han tenido lugar en Bélgica durante el periodo considerado explican sólo el 10% del aumento observado del número de fracturas de cadera.

Conclusión Si no se establece con prontitud una política preventiva amplia, de aquí a 2050 la incidencia de fracturas de cadera se multiplicará por 7 en Bélgica.

References

1. **Baudoin C et al.** Hip fractures in France: the magnitude and perspective of the problem. *Osteoporosis International*, 1996, **6** (suppl. 3): 1–10.
2. **Reginster JY.** *Ostéoporose postménopausique. Traitement prophylactique.* Paris-Milan-Barcelona, Masson, 1993.
3. **Cooper C, Campion G, Melton LJ.** Hip fractures in the elderly: a worldwide projection. *Osteoporosis International* , 1992, **2**: 285–289.
4. **Lyritis GP.** MEDOS Study Group — Epidemiology of hip fracture: the MEDOS Study. *Osteoporosis International*, 1996, **3**: 11–15.

5. **Maggi S et al.** Incidence of hip fractures in the elderly: a cross-national analysis. *Osteoporosis International*, 1991, **1**: 232–241.
6. **Baudoin C et al.** Fractures of the proximal femur in Picardy, France, in 1987. *Osteoporosis International*, 1993, **3**: 43–49.
7. **Johnell O et al.** MEDOS Study Group — The apparent incidence of hip fracture in Europe: a study of National Register Sources. *Osteoporosis International*, 1992, **2**: 298–302.
8. **Nagant de Deuxchaisnes C, Devogelaer JP.** Increase in the incidence of hip fractures and of the ratio of trochanteric to cervical hip fractures in Belgium. *Calcified Tissue International*, 1988, **4-2**: 201–203.
9. **Bacon WE et al.** International comparison of hip fracture rates in 1988–89. *Osteoporosis International*, 1996, **6**: 69–75.
10. **Schürch MA et al.** A prospective study on socioeconomic aspects of fracture of the proximal femur. *Journal of Bone and Mineral Research*, 1996, **11**: 1935–1942.
11. **Boyce WJ, Vessey MP.** Rising incidence of fracture of the proximal femur. *Lancet*, 1985, **1**: 150.
12. **Parkkari J et al.** Increasing age-adjusted incidence of hip fractures in Finland: the number and incidence of fractures in 1970–1991 and prediction for the future. *Calcified Tissue International*, 1994, **55**: 342–345.
13. **Kannus P et al.** Increasing number and incidence of osteoporotic fractures of the proximal humerus in elderly people. *British Medical Journal,* 1996, **313**: 1051–1052.
14. **Boereboom FTJ et al.** Epidemiology of hip fractures in the Netherlands: women compared with men. *Osteoporosis International*, 1992, **2**: 279–284.
15. **Falch JA et al.** Secular increase and geographical differences in hip fracture incidence in Norway. *Bone*, 1993, **14**: 643–645.
16. **Gullberg B et al.** Incidence of hip fractures in Malmö, Sweden (1950–1991). *Bone*, 1993, **14**: 23–29.
17. **Zetterberg C, Gunnar BJA.** Fractures of the proximal end of the femur in Göteborg, Sweden, 1940–1979. *Acta Orthopaedica Scandinavica*, 1982, **53**: 419–426.
18. **Gullberg B et al.** World-wide projections for hip fracture. *Osteoporosis International* , 1997, **7**: 407–413.
19. **Melton LJ.** Hip fractures: a worldwide problem today and tomorrow. *Bone*, 1993, **14**: 1–8.
20. **Melton LJ, O'Fallon WM, Riggs BL.** Secular trends in the incidence of hip fractures. *Calcified Tissue International*, 1987, **41**: 57–64.
21. **Rehnberg L, Nungu S, Olerud C.** The incidence of femoral neck fractures in women is decreasing. *Acta Orthopaedica Scandinavica*, 1992, **63**: 92–93.
22. **Lau E.** Admission rates for hip fracture in Australia in the last decade. *Medical Journal of Australia*, 1993, **158**: 604–606.
23. **Spector TD, Cooper C, Fenton Lewis A.** Trends in admissions for hip fracture in England and Wales, 1968–1985. *British Medical Journal*, 1990, **300**: 1173–1174.
24. **Meyer HE, Tverdal A, Falch JA.** Risk factors for hip fracture in middle-aged Norwegian women and men. *American Journal of Epidemiology*, 1993, **137**: 1203–1211.
25. **Porter RW et al.** Prediction of hip fracture in elderly women: a prospective study. *British Medical Journal*, 1990, **301**: 638–641.
26. **Meyer HE, Tverdal A, Falch JA.** Body height, body mass index, and fatal hip fractures: 16 years' follow-up of 674 000 Norwegian women and men. *Epidemiology*, 1995, **6**: 299–305.
27. **Cummings SR et al.** Racial differences in hip axis lengths might explain racial differences in rates of hip fracture. *Osteoporosis International*, 1994, **4**: 226–229.
28. **Boonen S et al.** Measurement of femoral geometry in type I and type II osteoporosis: differences in hip axis length consistent with heterogeneity in the pathogenesis of osteoporotic fractures. *Journal of Bone and Mineral Research*, 1995, **10**: 1908–1912.
29. **O'Neill TW et al.** Geometric measurements of the proximal femur in UK women: secular increase between the late 1950s and early 1990s. *Osteoporosis International,* 1996, **6**: 136–140.