



## Standardized incidence and trend of osteoporotic hip fracture in Polish women and men: A nine year observation



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### ABSTRACT

**Background:** Osteoporosis and its consequence of low trauma fracture represent a major health burden in aging population, because it results in increased morbidity, mortality and high health care costs. The number of hip fractures worldwide will approximately double by the year 2025 and more than triple by 2050.

The aim of the study was to assess the incidence and trends of osteoporotic hip fracture in women and men aged over 50 years in Polish population.

**Materials and methods:** Hospital records in population of 32,100 men and 39,984 women between January 1st, 2002 and December 31, 2010 with ICD-10 codes S72.0, S72.1 and S72.2 (femoral neck, intertrochanteric, subtrochanteric, inter and subtrochanteric fracture) were included in analysis.

**Results:** The study revealed 937 low energy hip fractures (240 in men 697 and in women). Systematic increase in rate over the study period, with the 44% in last year compared to 2002 year can be noticed. The increase was lowest in female (20.7%) than in male population (57.6%), and similarly was lowest in urban (27%) than in rural (67.7%) inhabitants.

**Conclusion:** Concluding, the incidence of osteoporotic hip fracture in Polish men and women aged over 50 years is low, but the epidemiological picture is likely to change due to apparent aging of the population. Increasing trend of hip fracture incidence together with changes in age structure will result in an increased need for specialized care including several medical branches (GP, orthopedics, geriatrics, rehabilitation).

Levels of evidence – IV.

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### 1. Introduction

Osteoporosis and its consequence of low trauma fracture represent a major health burden in aging population, because it results in increased morbidity, mortality and high health care costs [1]. A widely adopted approach is to consider fractures from low energy trauma as being osteoporotic. The most common osteoporotic fractures are those at the hip, spine, forearm and humerus, and are called *major* osteoporotic fractures. The number of hip fractures

worldwide will approximately double by the year 2025 and more than triple by 2050 [2]. Hip fractures together with spine fractures are the most serious consequence of osteoporosis, and up to 20% of patients die in the first year following hip fracture, mostly as a result of serious underlying medical conditions [3]. Less than half of subjects with hip fracture regain functional level that they had prior to the hip fracture [4]. The incidence of hip fracture has been characterized in just over 30 countries, and remaining lifetime hip fracture probability at the age of 50 differs significantly and the highest risk present women and men from Scandinavian [5].

The incidence of hip fracture in Poland seems to be one of the lowest in Europe [6]. However, recent data on hip fracture incidence in Poland was based on data given by National Insurance System and it cannot be excluded that not all subjects with past hip fracture were included because hip fracture was not present

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**Table 1**  
Annual number of inhabitants aged over 50 years in the district Tarnowskie Góry and city Piekary Śląskie.

Gender	Year									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	
Total	60,457	61,921	63,345	65,016	66,462	68,001	69,438	70,715	72,084	
Men	26,666	27,342	27,984	28,851	29,481	30,162	30,906	31,468	32,100	
Women	33,791	34,579	35,361	36,165	36,981	37,839	38,532	39,247	39,984	

in patients' hospital charts as a first diagnosis. We assumed that in order to establish hip fracture incidence in Polish female and male populations data ought to be collected directly in hospital charts. We have chosen one of the greatest Polish orthopedic hospital in district Tarnowskie Góry and city Piekary Śląskie, located in Silesian voivodeship. In this region of the country is only one orthopedic hospital and all subjects living in this area with hip fracture are under treatment in this hospital.

The aim of this study was to estimate the incidence and trend of a hip fracture in female and male populations in the district Tarnowskie Góry and city Piekary Śląskie in a period of 2002–2010.

## 2. Materials and methods

Study was performed in the district Tarnowskie Góry and city Piekary Śląskie, both located in Upper Silesia (Southern Poland; regional capital city: Katowice). The population is 100% Caucasian and composed of urban and rural dwellers in the ratio similar to the one of the total population of Poland. Life expectancy in the study area is 71.6 years for men and 79.7 years for women [7].

The size of population aged above 50 years in the study area in years 2002–2010 is shown in Table 1 [7]. Over the study period the size of population aged 50 or more years increased by 19.2% (20.3% for men and 18% for women) which confirms the aging process characteristic of the Polish population [7].

All the patients (men and women) who had sustained a hip fracture were treated in Dr J. Daab Regional Hospital of Trauma Surgery in Piekary Śląskie. This hospital is the only one orthopedic hospital in whole district so one may assume that merely all hip fractures noted in a population were managed in this hospital. All case records of patients aged 50 or above between January 1, 2002 and December 31, 2010 with code of the International Classification of Diseases ICD-10: S72,0; S72,1; S72,2 (femoral neck, intertrochanteric, subtrochanteric, inter and subtrochanteric fracture) were analyzed. Only osteoporotic, low energy fractures caused by the falls from a standing height or less were included. The circumstances of the hip fracture occurrence were obtained from personal interview and based on the code ICD-10 (V01-Y98) of external causes of morbidity and mortality. Patients with hip fracture living outside of the district Tarnowskie Góry and city Piekary Śląskie, and those with non low – energy fractures (e.g. automobile accidents, violent trauma or falls from more than standing height) were not included in analysis. Each fracture was confirmed by X-ray. Cases of readmission, transfers to another hospital were identified, and every duplicate record or data was checked and excluded from the final data set.

To realize the goal of presented study first we calculated crude rates for hip fracture per 100,000 total population of the district Tarnowskie Góry and city Piekary Śląskie. Similarly, crude specific rates were calculated for studied events in male and female population or separately in urban and rural population.

### 2.1. Statistics

The number of people by gender, age and place of residence was obtained from the local database available in the Central Statistical Office in Warsaw [7]. Then we used the directly standardized

procedure to calculate standardized rates for hip fracture based on the principles adopted in epidemiology [8]. We used the Segi 'world' population as the standard population [9]. Direct standardization yields, a standardized rate, which is a weighted average of the age-specific rates, for each of the populations to be compared.

The 95% confidence intervals (CIs) were also calculated, assuming Poisson distribution [10] and gamma distribution when the number of incidences was small [11].

The trend for fracture incidences was analyzed by the means of multiple Poisson regression model incorporating age and gender as confounders. Incidence rate ratios (IRR) to first year of registration (2002) were calculated with adjustment for over dispersion. We have also computed 95% CIs of IRR using the profile likelihood function. Interpretation of statistical significance was based on  $\alpha = 0.05$  criterion. All analyses were performed by means of SAS 9.2 (SAS Institute Inc., Cary, NC).

## 3. Results

Data analysis consisted of 937 patients with hip osteoporotic fracture aged from 50 to 101 years and registered in the study period 2002–2010, in district Tarnowskie Góry and city Piekary Śląskie. Mean age of subjects was  $77.6 \pm 10.2$  years, median of age was 79 years. Most of the study group were women ( $n = 697$ , 74.4% of subjects), with the mean value of age  $79.1 \pm 9.3$  years. Studied male population was a bit younger than female ( $73.2 \pm 11.5$  years) and observed difference was statistically significant ( $p < 0.01$ ).

Most patients resided in urban area ( $n = 722$ , 77.1%). The proportion of women living in urban area (77.8%) was slightly higher compared to the same percentage of men (75%), but the difference was not statistically significant ( $p = 0.3$ ). The average age of people living in urban area was slightly higher ( $77.8 \pm 10.3$  years) compared with the average age of people living in rural area ( $76.9 \pm 10.1$  years), but the observed difference was not statistically significant ( $p = 0.3$ ).

Table 2 shows values of number of cases and crude rates for hip fracture with their 95% CI in particulars years of the study period, separately for total, male and female population living in district Tarnowskie Góry and city Piekary Śląskie. The number of fractures were two–three times higher in female than in male population, similarly the incidence of events was significantly higher in urban than in rural inhabitants in each study years. Systematic increase in rate over the study period, with the 44% in last year compared to 2002 year can be observed. The increase was lowest in female (20.7%) than in male population (57.6%), and similarly was lowest in urban (27%) than in rural (67.7%) inhabitants. Table 3 shows values of standardized rates for hip fracture. It is worth noting that standardized coefficients are lower than crude.

Fig. 1 shows trend for Incidence Rate Ratio relative to year 2002 and its 95% Confidence Interval for hip fracture in district Tarnowskie Góry and city Piekary Śląskie, in the period 2003–2010. It should be noted a systematic increase in IRR compared to the first year of registration (2002). The highest values were obtained for the last two years, the IRR was respectively: 1.44 (95% CI: 1.03–2.0) for 2009 and 1.32 (95% CI: 0.95–1.85) for 2010 year.

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