

Updated incidence rates of fragility fractures in Italy: extension study 2002-2008

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Summary

Objectives. We aimed to update the incidence rates of major fragility fractures in Italy, including those which do not result systematically in hospital admissions, on the basis of hospitalization rates provided in our previous researches.

Methods. We analyzed Italian national hospital discharge data from year 2002 to 2008 in order to determine age- and sex-specific incidence rates of hip, vertebral, humeral, and forearm fractures occurred in people aged 40 to 100 years of age. Re-hospitalizations of the same patients have been excluded from the analysis. Hospital discharge data have been adjusted taking into account recently published information concerning fracture-specific hospitalization rates.

Results. We estimated a total of 91,494 hip fractures in year 2008 among people aged 40 to 100 years old, with a +18.1% increase across the seven-year period. Women aged >75 years old (n=55,950) accounted for about 60% of total fractures observed both in males and females. Concerning males, the highest incidence was observed between 80 and 84 years old (about 5,000 hip fractures). Overall incidence

rate per 100,000 inhabitants computed for hip fractures was 283.5, with marked age- and sex-specific differences. Clinical vertebral fractures were estimated to be almost 61,000 in 2008, with a +6.3% increase over seven years. Overall incidence rate per 100,000 inhabitants computed for clinical vertebral fractures was 189.0, but this value doubled between 75 and 95 years of age. For the same year 2008, we estimated a total of 57,400 humeral and 94,000 forearm/wrist fractures, with a +13.2% and +0.7% increase over the seven-year period, respectively. Overall humeral fractures incidence per 100,000 was estimated in 178.0, with highest rates (up to 600 and over) observed in women between 75 and 95 years of age, while incidence per 100,000 for wrist fractures was computed in 298.0, with top values observed in women aged 55 years old and over.

Conclusion. The burden of major osteoporotic fractures in Italy is still increasing. Preventive strategies aimed to reduce fractures incidence should be carried out at regional level.

KEY WORDS: incidence; fractures; hip; vertebra; wrist; humerus.

Introduction

Italy has one of the highest life expectancies in the world: according to the Italian National Institute for Statistics (ISTAT), life expectancy at birth increased at a rate of 4 months per year from 1950 to 2005, reaching 78.4 years for men and 87.4 years for women, respectively (1, 2). Twenty percent of the Italian population (namely 12,085,058 people) is actually over 65 years of age (1), but 5.6% of these people is already ≥80 years of age (1). The national ageing index has been recently computed in 143.1, with southern Italian regions remaining younger than northern areas of the country (1). Increased life expectancy is associated with a greater frailty of elderly people and a higher prevalence of chronic and degenerative diseases, including osteoporosis. The World Health Organization (WHO) considers osteoporosis to be second only to cardiovascular diseases as a critical health problem (3), and previous analyses have shown that incidence and costs of hip fractures in Italy are already comparable to those of acute myocardial infarction (4). The main Epidemiological Study on the Prevalence of Osteoporosis in Italy (ESOPO) reported a high prevalence of osteoporosis: 23% among all women, with age-specific rates ranging from 9% (40 to 49 year olds) up to 45% (70 to 79 or older), and almost 15% in men aged ≥60 years (5, 6). According to these data, about 4 million of Italian women and 800 thousand men are thought to be affected by osteoporosis (2), although the ESOPO study was conducted by using QUS (Quantitative Ultra-Sounds) measurements and not DEXA (Dual Energy X-rays Absorbiometry), the gold standard tool in the diagnosis of osteoporosis (6-8). It is known that osteoporosis is a condition that enhances the risk of fractures (9), and osteoporotic fractures represent a challenge for health professionals and decision makers in the 21st century. Some data are already available about the incidence of fragility fractures in the Italian population (10-12), and we have recently published a specific study addressing also the issue of fractures occurred in skeletal sites other than hip (13). Vertebral fractures or deformities are the most common osteoporotic

tic fractures (14) and the European Vertebral Osteoporosis Study (EVOS) found that about 12% of both men and women aged 50-80 years old there are vertebral deformities radiologically detectable (15). These deformities are associated with negative outcomes (including back pain and physical impairment) even when they are asymptomatic (16, 17). Furthermore, vertebral deformities are associated to a higher risk of subsequent osteoporotic fractures (18-20) and an increased risk of mortality (19, 21). It is estimated that two-thirds of vertebral fractures never come to clinical attention (22), so that it is very difficult to assess their incidence among general population. Wrist or forearm fractures represent the most common fractures in women just before and immediately after menopause (typically between 40 and 50 years old), probably as a consequence of a hormone-related fast bone loss (14). Wrist fractures are also frequent in men aged <70, with female-to-male ratio being four to one (14). Wrist fractures increase almost two folds the risk of subsequent hip or vertebral fractures, but also the risk of new forearm and other skeletal fractures is increased by 3.3 times and 2.4 respectively (23). Humeral fractures represent the third most common fracture in people aged >65 years old and have been associated to a five times increase in the risk of subsequent hip fractures (24), thus confirming that all osteoporotic fractures should be considered as the first signal of an evolving disease. This work represent an extension study of our previous paper (25), in which we have computed the incidence of major fragility fractures in Italy, including those which do not result systematically in hospital admissions, on the basis of hospitalization rates provided in our recent researches (13).

Materials and methods

The national hospitalization database (SDO), maintained at the Italian Ministry of Health, contains information concerning all hospitalizations occurring in all Italian public and private hospitals. These information are anonymous and include patient's age, diagnosis, procedures performed, and length of the hospitalization. Based on those databases, we have recently published a paper addressing the issue of the incidence of major osteoporotic fractures in Italy (hip, humeral, forearm, and vertebral fractures), resulting both from hospitalization database analyses, and from a 3-years multicentric survey carried out at 10 major Italian Emergency departments, where a specific assessment of the fragility origin of the fracture events was performed by orthopedic surgeons (13). Actually, it is known that most of hip fractures systematically result in hospitalization, thus allowing researchers to perform epidemiological analyses by using hospital discharge records. On the other hand, only a small part of osteoporotic fractures occurred at other different skeletal sites are hospitalized, so that hospital discharge records cannot be simply used to investigate the burden of most osteoporotic fractures. In our previous study (13), we have estimated hospitalization rates for humeral, forearm, hip and vertebral fractures in a sample of about 30,000 patients, so that it has been possible to evaluate the number of fractured patients discharged all over the country from Emergency departments without being hospitalized (13). Overall hospitalization rates were the following: 93.0% for hip fractures, 36.3% for humeral fractures, 22.6% for forearm/wrist fractures, and 27.6% for clinical vertebral fractures, with some differences according to the age of the patients (13). On the contrary, Emergency departments directly discharged 7.0% of hip fractured patients, 63.7% of humeral fractures, 77.4% of forearm/wrist fractures, and 72.4% of vertebral fractures were immediately discharged from Emergency department and did not require hospital admission (13). In our analyses we have applied age-specific hospitalization rates, as resulted from the study (13). Additional corrective factors have been used for vertebral fractures when performing comparative analyses between the hospitalization rates and data coming from the Na-

tional Hospitalization Database (SDO), as the majority of vertebral deformities (from 78% to 67%) are asymptomatic and do not require admission at Emergency departments (14, 23). For the purpose of this study, only clinical vertebral fractures (defined as those fractures which come to medical attention) were considered and analyzed. The analysis of hospital discharge records (SDO) were extended to the whole period 2002-2008, while our previous paper was limited to the years 2004-2006 (25). Analyses hospital discharge records were performed by searching for ICD-9CM diagnosis codes (major diagnosis) of hip, humeral, forearm and vertebral fractures. Hip fractures were defined by the following ICD-9CM diagnosis codes (major diagnosis): 820.0-820.1 (femoral neck fractures), 820.2-820.3 (per-trochanteric femoral fractures) and 820.8, 820.9 and 821.1 (other femoral fractures). Other fractures were defined by the following ICD-9CM diagnosis codes (major diagnosis): 812 (humeral fractures), 813 (forearm/wrist fractures) and 805 (vertebral fractures). Re-hospitalizations of the same patients (mostly due to admissions at rehabilitative divisions) were excluded thanks to a specific analysis carried out at central level directly by the Italian Ministry of Health. After the correction for hospitalization rates, data were stratified by gender into 5-year age groups (40-44; 45-49; 50-54; 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95-100 years old) and stratified per 100,000 inhabitants. Population data concerning each year were obtained from the National Institute for Statistics (ISTAT) (1).

Results

The total number of estimated hip fragility fractures occurred in Italy in year 2008 among people aged 40 to 100 years of age was 91,494 (22,693 men and 68,801 women), as resulted by the analysis of hospitalization records (excluding re-admissions of the same patients), with a +18.1% increase across the seven-year period (data presented according to gender and five years intervals in Table 1). Women aged >75 years old (n=55,950) accounted for 60% of total fractures observed both in males and females from 40 to 100 years of age. Concerning males, the highest incidence was observed between 80 and 84 years old (about 5,000 hip fractures). Overall incidence rate per 100,000 inhabitants computed for hip fractures was 283.49, with marked age- and sex-specific differences (Table 2). The total number of estimated clinical vertebral fragility fractures occurred in Italy in year 2008 among people aged 40 to 100 years of age was 61,009 (25,616 men and 35,393 women), with a +6.3% increase across seven years (data presented according to gender and five years intervals in Table 3). Overall incidence rate per 100,000 inhabitants computed for clinical vertebral fractures was 189.03, but this value doubled between 75 and 95 years of age (Table 4). The total number of estimated humeral fragility fractures occurred in Italy in year 2008 among people aged 40 to 100 years of age was 57,401 (14,198 men and 43,204 women), with a +13.2% increase across the seven years (data presented according to gender and five years intervals in Table 5). Overall incidence rate per 100,000 inhabitants computed for humeral fractures was 178.0, with highest values (up to 600 and over) observed in women between 75 and 95 years of age (Table 6). The total number of estimated forearm/wrist fragility fractures occurred in Italy in year 2008 among people aged 40 to 100 years of age was 94,045 (28,797 men and 65,246 women), with a +0.7% increase over the seven-year period and a +3.8% increase from 2002 to 2008 (data presented according to gender and five years intervals in Table 7). Overall incidence rate per 100,000 inhabitants computed for wrist fractures was 291, with highest values observed in women between aged 55-85 years old (Table 8). However, only for this kind of fractures, a decreasing trend in the last two years examined – mostly attributable to a minor number of fractures suffered by women – might be identified.

Table 1 - Estimated overall number of hip fractures (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	<i>Men</i>	597	558	604	694	915	1,267	2,164	3,173	3,319	3,092	1,951	415	77,768
	<i>Women</i>	184	304	534	934	1,630	2,973	5,889	10,396	12,695	12,728	8,454	2,298	
2003	<i>Men</i>	623	561	571	747	939	1,305	2,140	3,349	4,020	2,916	2,302	521	81,545
	<i>Women</i>	213	322	532	974	1,579	3,073	5,925	10,684	14,740	11,751	9,307	2,451	
2004	<i>Men</i>	586	588	653	787	951	1,462	2,351	3,266	4,439	2,670	2,128	455	83,415
	<i>Women</i>	250	325	617	1,089	1,779	3,155	6,275	11,202	16,368	10,878	8,978	2,163	
2005	<i>Men</i>	575	609	609	812	931	1,423	2,237	3,580	4,696	2,856	2,302	503	86,395
	<i>Women</i>	227	328	590	1,060	1,654	3,087	6,265	11,375	17,029	11,634	9,528	2,485	
2006	<i>Men</i>	672	566	633	842	961	1,487	2,278	3,657	4,929	3,243	2,158	606	88,647
	<i>Women</i>	230	340	664	1,163	1,637	3,214	6,108	11,444	17,278	12,576	9,278	2,683	
2007	<i>Men</i>	641	597	710	771	856	1,386	2,153	3,538	4,873	3,595	2,013	620	88,499
	<i>Women</i>	211	298	624	1,087	1,686	3,108	5,711	11,237	16,963	14,571	8,479	2,771	
2008	<i>Men</i>	628	666	678	788	937	1,358	2,177	3,636	4,944	4,302	1,942	637	91,494
	<i>Women</i>	213	316	605	1,056	1,666	3,096	5,897	11,158	17,398	16,405	7,939	3,052	

Table 2 - Estimated overall number of hip fractures per 100,000 (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	<i>Men</i>	29.18	30.06	32.05	42.61	55.51	89.17	176.12	349.79	732.02	1,181.65	2,239.18	2,956.68	267.01
	<i>Women</i>	8.97	16.10	27.46	54.33	90.33	179.90	373.29	759.16	1,560.09	2,237.43	3,456.66	4,185.33	
2003	<i>Men</i>	29.53	29.63	30.83	44.12	57.22	90.34	172.16	359.23	780.02	1,218.10	2,387.97	3,342.96	275.46
	<i>Women</i>	10.08	16.76	27.86	54.84	88.14	184.49	373.93	770.84	1,588.70	2,244.88	3,495.04	4,017.37	
2004	<i>Men</i>	26.72	30.35	35.80	44.43	58.99	98.80	186.94	344.22	768.13	1,248.78	2,093.73	2,678.52	276.90
	<i>Women</i>	11.38	16.50	32.80	58.78	101.25	186.11	395.28	803.77	1,574.76	2,305.62	3,225.79	3,278.51	
2005	<i>Men</i>	25.10	30.63	33.31	44.27	59.20	93.73	175.62	370.39	751.15	1,376.35	2,156.64	2,623.34	281.34
	<i>Women</i>	9.93	16.27	31.26	55.27	96.86	178.69	392.94	812.17	1,524.36	2,546.42	3,259.64	3,389.95	
2006	<i>Men</i>	28.45	27.78	34.45	44.29	63.29	95.90	178.57	366.94	773.39	1,395.23	1,996.58	2,843.47	284.28
	<i>Women</i>	9.79	16.49	35.05	58.54	99.74	183.11	386.59	802.61	1,533.57	2,486.74	3,122.65	3,358.70	
2007	<i>Men</i>	26.47	28.48	37.92	41.21	53.95	88.50	167.70	346.23	743.50	1,350.93	1,940.84	2,639.42	278.75
	<i>Women</i>	8.78	14.08	32.39	55.57	98.86	176.12	362.28	780.31	1,487.22	2,528.22	2,954.80	3,182.53	
2008	<i>Men</i>	25.47	30.88	35.48	42.86	56.68	87.12	166.57	351.17	731.16	1,421.55	2,075.05	2,430.46	283.49
	<i>Women</i>	8.69	14.46	30.71	54.77	94.10	176.75	371.17	773.99	1,507.37	2,504.03	3,046.02	3,240.40	

Table 3 - Estimated overall number of clinical vertebral fractures (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	Men	2,153	2,160	2,513	2,507	2,917	3,229	3,204	2,942	1,954	869	350	42	57,366
	Women	1,190	1,080	1,810	2,487	3,037	4,104	4,700	5,427	4,523	2,862	1,088	219	
2003	Men	2,317	2,277	2,377	2,643	2,850	3,350	3,189	2,881	2,196	931	458	73	57,797
	Women	1,127	1,163	1,843	2,430	3,010	4,118	4,614	5,558	4,665	2,431	1,154	142	
2004	Men	2,380	2,407	2,523	2,603	2,730	3,150	3,046	2,969	2,112	754	450	38	58,987
	Women	1,093	1,250	1,857	2,633	3,187	4,125	5,018	5,838	5,231	2,292	1,119	181	
2005	Men	2,523	2,347	2,317	2,693	2,637	3,304	3,200	2,969	2,215	850	423	69	59,116
	Women	950	1,150	1,803	2,770	2,990	4,096	5,036	5,835	5,242	2,346	1,142	208	
2006	Men	2,710	2,293	2,363	2,763	2,650	3,579	3,175	3,196	2,388	954	458	50	60,880
	Women	1,023	1,280	1,920	2,660	3,030	4,379	4,846	5,642	5,635	2,654	1,042	188	
2007	Men	2,333	2,317	2,200	2,503	2,443	3,171	3,218	3,000	2,262	1,058	308	65	58,569
	Women	947	1,300	1,767	2,303	2,913	4,136	4,725	5,850	5,465	3,073	1,027	185	
2008	Men	2,203	2,153	2,337	2,340	2,750	3,171	3,454	2,992	2,454	1,327	354	81	61,009
	Women	987	1,147	2,043	2,630	2,983	4,168	4,996	5,896	5,835	3,485	965	258	

Table 4 - Estimated number of clinical vertebral fractures per 100,000 (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	Men	105.26	116.38	133.36	153.90	176.94	227.23	260.72	324.36	430.93	332.19	401.70	301.42	196.96
	Women	58.03	57.20	93.08	144.64	168.28	248.31	297.92	396.29	555.84	503.02	445.05	399.28	
2003	Men	109.80	120.25	128.34	156.12	173.66	231.91	256.57	309.00	426.13	388.81	474.78	468.89	195.24
	Women	53.31	60.56	96.52	136.81	168.02	247.22	291.21	400.98	502.84	464.37	433.30	233.25	
2004	Men	108.51	124.20	138.34	146.98	169.33	212.87	242.23	312.94	365.38	352.58	442.75	226.42	195.81
	Women	49.77	63.46	98.69	142.14	181.36	243.33	316.09	418.92	503.25	485.86	402.14	274.00	
2005	Men	110.15	118.02	126.73	146.82	167.67	217.59	251.22	307.20	354.36	409.63	396.36	361.07	192.51
	Women	41.55	57.05	95.54	144.44	175.09	237.12	315.84	416.59	469.27	513.52	390.80	283.33	
2006	Men	114.73	112.54	128.62	145.35	174.51	230.80	248.89	320.70	374.76	410.37	423.46	234.61	195.23
	Women	43.55	62.08	101.34	133.90	184.61	249.46	306.74	395.72	500.12	524.76	350.80	235.92	
2007	Men	96.35	110.53	117.51	133.79	153.98	202.49	250.64	293.58	345.06	397.46	296.66	278.35	184.48
	Women	39.40	61.41	91.70	117.76	170.82	234.36	299.73	406.23	479.17	533.21	357.87	212.03	
2008	Men	89.38	99.83	122.29	127.26	166.35	203.45	264.25	289.00	362.90	438.47	378.09	308.17	189.03
	Women	40.27	52.47	103.73	136.41	168.51	237.94	314.49	409.00	505.51	531.89	370.40	273.60	

Table 5 - Estimated number of humeral fractures (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	<i>Men</i>	1,203	1,132	1,125	1,086	1,159	1,307	1,481	1,596	1,069	566	326	69	50,733
	<i>Women</i>	616	853	1,348	2,177	3,087	4,556	5,996	7,933	6,184	3,744	1,728	389	
2003	<i>Men</i>	1,210	1,118	1,064	1,174	1,183	1,320	1,411	1,569	1,309	617	308	63	51,664
	<i>Women</i>	626	788	1,319	2,177	3,167	4,577	5,819	8,104	7,020	3,477	1,899	344	
2004	<i>Men</i>	1,275	1,222	1,283	1,176	1,154	1,302	1,364	1,785	1,345	614	305	54	53,036
	<i>Women</i>	647	815	1,450	2,396	2,999	4,834	6,204	7,933	7,649	3,094	1,791	344	
2005	<i>Men</i>	1,234	1,191	1,297	1,241	1,132	1,403	1,453	1,758	1,542	614	320	69	54,182
	<i>Women</i>	655	839	1,465	2,553	3,201	4,759	6,261	8,248	7,370	3,396	1,881	299	
2006	<i>Men</i>	1,401	1,275	1,324	1,368	1,181	1,453	1,505	1,659	1,557	686	294	72	56,129
	<i>Women</i>	698	834	1,433	2,633	3,235	4,974	6,230	8,365	7,871	3,854	1,839	389	
2007	<i>Men</i>	1,341	1,307	1,234	1,283	1,140	1,440	1,328	1,776	1,503	812	332	78	55,530
	<i>Women</i>	613	858	1,435	2,432	3,159	5,013	6,198	8,176	7,682	4,313	1,674	401	
2008	<i>Men</i>	1,438	1,314	1,271	1,239	1,285	1,500	1,505	1,842	1,611	857	267	69	57,401
	<i>Women</i>	718	805	1,469	2,505	3,429	4,992	6,271	8,275	7,969	4,843	1,491	437	

Table 6 - Estimated number of humeral fractures per 100,000 (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	<i>Men</i>	59	61	60	67	70	92	121	176	236	216	375	491	174
	<i>Women</i>	30	45	69	127	171	276	380	579	760	658	707	709	
2003	<i>Men</i>	57	59	57	69	72	91	114	168	254	258	320	404	175
	<i>Women</i>	30	41	69	123	177	275	367	585	757	664	713	565	
2004	<i>Men</i>	58	63	70	66	72	88	108	188	233	287	301	317	176
	<i>Women</i>	29	41	77	129	171	285	391	569	736	656	643	522	
2005	<i>Men</i>	54	60	71	68	72	92	114	182	247	296	300	359	176
	<i>Women</i>	29	42	78	133	187	275	393	589	660	743	643	409	
2006	<i>Men</i>	59	63	72	72	78	94	118	166	244	295	272	337	180
	<i>Women</i>	30	40	76	133	197	283	394	587	699	762	619	487	
2007	<i>Men</i>	55	62	66	69	72	92	103	174	229	305	321	331	175
	<i>Women</i>	26	41	75	124	185	284	393	568	674	748	583	461	
2008	<i>Men</i>	58	61	66	67	78	96	115	178	238	283	285	263	178
	<i>Women</i>	29	37	75	130	194	285	395	574	690	739	572	464	

Table 7 - Estimated number of forearm/wrist fractures (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	Men	5,111	4,282	4,392	3,639	3,337	2,123	1,859	1,769	985	485	260	34	93,438
	Women	2,431	3,198	5,183	7,212	8,967	7,643	8,474	9,785	6,459	3,811	1,672	327	
2003	Men	5,217	4,781	4,268	3,932	3,438	2,157	1,829	1,797	1,043	418	255	29	95,370
	Women	2,561	3,217	4,944	7,667	8,794	7,790	8,704	9,895	7,291	3,359	1,692	293	
2004	Men	5,658	4,507	4,167	3,903	3,045	2,048	1,847	1,600	1,182	399	211	19	93,260
	Women	2,455	3,217	5,063	7,811	8,334	7,711	8,281	9,761	7,545	2,744	1,509	240	
2005	Men	5,505	4,953	3,922	3,874	2,963	2,218	1,795	1,605	1,235	471	163	48	94,586
	Women	2,652	3,299	5,131	7,998	8,156	7,771	8,402	9,881	7,670	2,999	1,634	240	
2006	Men	5,907	5,241	4,397	4,167	2,685	2,199	1,628	1,677	1,163	437	183	43	97,038
	Women	2,608	3,275	5,471	8,286	8,756	7,749	8,092	10,366	7,617	3,503	1,360	226	
2007	Men	5,735	5,203	4,498	3,524	2,935	2,089	1,545	1,629	1,129	461	139	48	93,381
	Women	2,421	3,198	4,920	7,715	8,329	7,435	7,681	9,915	7,704	3,604	1,240	284	
2008	Men	5,744	5,255	4,287	3,707	3,102	1,900	1,530	1,485	1,057	524	139	67	94,045
	Women	2,330	3,169	5,111	7,624	8,554	7,303	7,798	10,049	7,853	3,965	1,149	341	

Table 8 - Estimated number of forearm/wrist fractures per 100,000 (Italy, 2002-2003-2004-2005-2006-2007-2008).

Age-group		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100	Total
2002	Men	250	231	233	223	202	149	151	195	217	186	298	240	321
	Women	119	169	267	419	497	462	537	715	794	670	684	595	
2003	Men	247	253	230	232	209	149	147	193	202	175	264	185	322
	Women	121	167	259	432	491	468	549	714	786	642	635	481	
2004	Men	258	233	228	220	189	138	147	169	205	187	208	113	310
	Women	112	163	269	422	474	455	522	700	726	582	542	364	
2005	Men	240	249	215	211	188	146	141	166	198	227	153	251	308
	Women	116	164	272	417	478	450	527	705	687	656	559	328	
2006	Men	250	257	239	219	177	142	128	168	182	188	169	203	311
	Women	111	159	289	417	533	441	512	727	676	693	458	283	
2007	Men	237	248	240	188	185	133	120	159	172	173	134	205	294
	Women	101	151	255	394	488	421	487	688	675	625	432	326	
2008	Men	233	244	224	202	188	122	117	143	156	173	149	257	291
	Women	95	145	259	395	483	417	491	697	680	605	441	362	

Discussion

While confirming the extremely high burden of hip fractures in the Italian population, at the same time this paper represents a full attempt to evaluate the incidence of "minor" fragility fractures among different age groups in the Italian population. Actually, fragility fractures occurring at skeletal sites other than hip are an underestimated issue which is difficult to analyze because they do not systematically result in hospital admissions and as a consequence of the lack of specific diagnostic codes for fragility fractures. In this paper we have continued the analyses on the national hospitalization database by using hospitalization rates coming from our previously published survey (13), which had involved orthopaedic surgeons and personnel from Emergency Department at 10 major Italian Hospitals: Milan (Orthopaedic Institute "Gaetano Pini"), Turin (Maria Vittoria Hospital), Brescia (Riuniti Hospital), Rome (Tor Vergata University Hospital, St. Camillo Hospital and St. Giovanni Addolorata Hospital), Cagliari (University Hospital), Palermo (University Hospital), Bari (University Hospital), and Catania (University Hospital). Some discrepancies in the number of estimated fractures compared to data presented in the previous paper (13) are exclusively due to the following methodological choices adopted in the present research: we have presented also data concerning people aged 40-44 years old and those regarding men aged 45-64 years of age, which were not included in the final analysis of our previous paper. Furthermore, patients in the age group 95-100 years old were poorly represented in the previously published work (13). Fractures occurred in people aged >65 years old and particularly over 75 years of age should be considered as fragility fractures, given the high prevalence of osteoporosis in these age groups. This assumption is confirmed by the finding that most of fractures are suffered by elderly women. Actually, women aged >75 accounted for 60% of total hip fractures observed in people between 40 and 100 years old both males and females. Having observed that wrist fractures show high rates also in women aged 55-64 years old is consistent with available incidence data concerning this kind of fracture even in early post-menopausal women (14). Furthermore, our analyses assumed as starting point the specific assessment concerning the fragility origin of the fracture events performed by orthopedic surgeons involved in the previous study (13). Our data show that the absence of ICD9-CM codes for fragility fractures results in a lack of perception of hip and "minor fractures" burden, thus leading to problems in the full evaluation of osteoporosis impact in elderly people. Under-diagnosis of osteoporosis in patients at higher risk (particularly postmenopausal women) may be a possible cause of the underestimation of fragility fractures and consequently results in under-treatment of this pathology. This ultimately leads to an additional increase of osteoporotic fractures among people affected by osteoporosis and not treated. Finally, the low compliance that usually characterize antifracture therapies in Italy could make ineffective also treatments correctly prescribed to high risk patients. The issue of identifying subjects at higher risk of future fractures has been already addressed by the IOF FRAX algorithm (which has been developed in order to estimate patients' individual risk of fragility fractures based on data obtained from Sweden), although an updated version of the Italian FRAX tool is still not available (26). The availability of updating incidence rates in the Italian version of the FRAX could possibly provide physicians with a reliable instrument for determining which patients are really at higher risk of future osteoporotic fractures. Our data call for specific preventive strategies based on actions (such as optimization of access to anti-fracture therapies and compliance to the treatments, proper dietary calcium intake during the whole life, vitamin D supplementations, physical activity programs) to be carried out at regional level all over the country, as stated in the conclusions of the official inquiry promoted by the Italian Senate in 2002, specifically addressing the burden of osteoporosis in Italy. Some experiences have just star-

ted, such as the TARGET project (27) carried out by Tuscany region in order to reduce the incidence of hip re-fractures in the elderly on the whole regional population. However, the problem needs to be addressed all over Italy.

Conclusion

These results confirm that the incidence of osteoporotic fractures in Italy is still increasing. Specific preventive strategies aimed to reduce the incidence of osteoporotic fractures should be carried out at regional level.

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