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ORIGINAL ARTICLE

Socioeconomic Burden of Total Joint Arthroplasty for Symptomatic Hip and Knee Osteoarthritis in the Italian Population: A 5-Year Analysis Based on Hospitalization Records

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Objective. **To assess the burden of total joint arthroplasties (TJAs) performed for symptomatic hip and knee osteoarthritis (OA) in the Italian population.**

Methods. **We analyzed national hospitalizations and diagnosis-related group databases to compute incidence, annual percent change (APC), direct costs, and working days lost between 2001 and 2005 following TJA due to OA.**

Results. **In 2005, we recorded a total of 41,816 (APC +5.4; 95% confidence interval [95% CI] 5.1–5.8) and 44,051 (APC +13.4; 95% CI 13.1–13.8) hip and knee arthroplasties, respectively. Women represented the majority of patients undergoing TJA procedures (female:male ratio 1.7:1 for hip arthroplasties and 2.9:1 for knee arthroplasties). When analyzing the data by age groups, most of the patients were in the age groups 65–74 years and ≥75 years, although the highest increases were observed in those ages <65 years. Revisions accounted for 6,387 (APC +4.9; 95% CI 4.0–5.7) and 2,295 (APC +17.4; 95% CI 15.7–19.2) procedures for the hip and knee, respectively. Loss of working days in patients ages <65 years was estimated between 805,000 and 1 million days. Hospital costs increased from 741 million to 1 billion euros over the 5-year period (from 412 to 538 million euros for hip arthroplasties and from 329 to 517 million euros for knee arthroplasties). Rehabilitation costs increased from 228 to 322 million euros. Postoperative complications were estimated between 3.1 and 4.4 million euros. The average costs per patient were 16,835 and 15,358 euros for hip and knee arthroplasties, respectively.**

Conclusion. **The socioeconomic burden of TJAs performed for symptomatic OA in Italy is remarkable and calls for the adoption of proper preventive measures.**

INTRODUCTION

Osteoarthritis (OA) is an evolving disease and a major cause of impaired mobility resulting in marked reduction of quality of life and relevant costs (1,2). The hip and knee are the joints most frequently affected by OA and are associated with moderate to severe disability even in younger adults (3). Furthermore, this condition may result in lower extremity disability and impair independence and psychological functioning of the affected patients, also leading to relevant socioeconomic consequences and financial loss (4). According to the World Health Organization, OA is the sixth-leading cause of disability in the world (5), being comparable to that of asthma (6). The

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Significance & Innovations

- The number of total hip and knee replacements due to osteoarthritis has increased during the study period (2001–2005).
- The number of knee arthroplasties has reached that of hip arthroplasties in 2004. The annual increase versus the previous year (annual percent increase [APC]) is substantial for hip arthroplasty (APC +5.4) and impressive for knee arthroplasty (APC +13.4).
- Despite accounting for a minor absolute number of prostheses implanted, the highest increase was observed in men for both hip and knee arthroplasties.
- The majority of revision interventions consist in hip prosthesis revisions (ratio of hip:knee revision 3:1), but knee revisions show a higher increase (APC +17.4) compared to that of the hip (APC +4.9).

prevalence of OA increases indefinitely with age because the condition is not spontaneously reversible (7). Almost 9.6% of men and 18.0% of women ages ≥60 years in the world are thought to have symptomatic OA (1). Men are affected more often than women ages <45 years, whereas women are affected more frequently after age 55 years (1). Limitations to job activities are relevant in people with OA if compared with a healthy age- and sex-matched population, thus causing a reduction of working hours, problems in applying for jobs, or early retirement due to the illness (8). Given the increasing incidence of OA with age, the extended life expectancy observed in Italy is expected to result in a progressively higher number of people with this condition. Currently, 20% of the Italian population is age >65 years (9); therefore, Italy may represent an interesting case study, anticipating possible scenarios occurring in other European countries concerning the burden of chronic degenerative diseases. The diagnosis of OA already accounts for 55% of patients admitted to rheumatology units (10), and the expected medical costs of OA patients are double those of subjects without OA (11). These costs are related to arthroplasty and nonsteroidal antiinflammatory drug (NSAID) consumption, as well as other drugs commonly used to prevent their gastrointestinal side effects. Rehabilitation is also a relevant and expensive part of the treatment. The incidence of total hip replacement in Europe varies between 50 and 140 procedures per 100,000 inhabitants (12), with OA being the main cause for intervention. According to UK data, the average cost of hip replacement exceeds £4,000 (€6,500), but there is a lack of specific data concerning Italy and other European Union countries (12).

The aim of this work was to evaluate the socioeconomic burden of total joint arthroplasties (TJAs) performed in Italy for symptomatic hip and knee OA through the analysis of national hospitalization records.

MATERIALS AND METHODS

Information concerning all hospital admissions at Italian hospitals is maintained by the Italian Ministry of Health (national hospitalization database; SDO). This information is anonymous and includes patient age, diagnosis, procedures performed, and length of stay (LOS). Thanks to the availability of this huge database, we searched for the number of hip and knee arthroplasties performed in the Italian population due to the main diagnosis of OA. We also assessed costs concerning hospitalization, rehabilitation, and complications. For patients ages <65 years, loss of productivity in terms of working days lost was estimated. Hip replacements performed in patients ages <25 years were excluded from the analysis because they were considered as unlikely to be caused by OA. We selected the years 2001–2005 because it was the most recent time period available for our inquiry. Population data were obtained from the National Institute for Statistics for each of the considered years (9). Total hip arthroplasties (THAs) were defined by the following International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes for surgical procedures: 81.51 and 81.53 (revision surgery). Because not all of these interventions are carried out due to a main diagnosis of OA, given that hip fractures, osteonecrosis, and tumors often result in hip arthroplasties, we performed a specific analysis using the region of Tuscany database, a region with an aging index comparable to the national average value, in order to determine the rate of hip arthroplasties attributable to a major diagnosis of OA. A diagnosis of OA was defined by ICD-9-CM code 715. The analysis of the Tuscany regional health care system databases showed that approximately 75% of all THAs were due to a main diagnosis of OA. Based on this analysis, 75% of hip arthroplasties performed all over Italy were considered as being associated with a main diagnosis of hip OA. Total knee replacements were performed mostly because of OA (this diagnosis accounted for more than 95% of interventions in the regional databases), and they were defined by the ICD-9-CM codes 81.54 and 81.55 (revision surgery) for surgical procedures. Data were stratified by sex and by age into 4 age groups (25–44, 45–64, 65–74, and ≥75 years). Using results from the analysis of the Tuscany databases, the mean incidence of postoperative complications was assumed not to exceed 0.5%. This assumption was consistent with the lowest rates reported in the current medical literature for each considered variable: postoperative infections (13–19), pulmonary embolism (19–23), deep vein thrombosis (24–27), and mortality (19,28–35). We estimated the loss of productivity among patients ages <65 years in terms of working days lost by analyzing the average hospitalization LOS and rehabilitation period, which resulted from the analysis of the national hospitalization database.

Analyses of direct costs were based on the costs ascribed to diagnosis-related groups (DRGs), according to Ministerial Decree 549 (June 30, 1997). This law defined the national DRGs rate list adopted during the 6 years examined in our study, the values of which have been revised after 2005. The DRG considered for the cost analysis of both hip and knee TJA procedures performed because of OA

Table 1. Number of hip arthroplasties performed in Italy between 2001 and 2005 and APC shown by sex and age groups*

	2001	2002	2003	2004	2005	APC (95% CI)
Age group, years						
25–44						
Men	583	638	658	791	832	9.8 (7.2–12.4)
Women	614	682	676	746	777	5.7 (3.3–8.3)
45–64						
Men	3,988	4,157	4,415	5,031	5,066	6.9 (5.9–7.9)
Women	5,112	5,339	5,397	5,916	5,841	3.8 (2.9–4.6)
65–74						
Men	5,004	5,348	5,761	6,088	6,311	6.1 (5.2–6.9)
Women	8,642	8,961	9,089	9,650	9,637	3.0 (2.3–3.6)
≥75						
Men	2,754	3,009	3,478	3,577	3,735	8.0 (6.8–9.1)
Women	7,309	8,189	9,047	9,116	9,617	6.6 (5.9–7.3)
Subtotal						
Men	12,329	13,152	14,312	15,487	15,944	7.0 (6.4–7.5)
Women	21,677	23,171	24,209	25,428	25,872	4.5 (4.1–4.9)
Incidence per 100,000						
Men	61.2	65.2	70.1	74.7	75.9	5.8 (5.2–6.3)
Women	97.0	103.7	107.3	111.3	112.0	3.6 (3.2–4.0)
Total	34,006	36,323	38,521	40,915	41,816	+5.4 (5.1–5.8)
Incidence per 100,000	80.0	85.4	89.6	94.0	94.8	+4.4 (4.1–4.7)

* APC = annual percentage change; 95% CI = 95% confidence interval.

was DRG 209, defined as "surgical procedures on major joints and hip replacement," which corresponded to a fixed value of 7,979.78 euros per patient. On the basis of Tuscan databases, we computed that 75% of DRG 209 was attributable to TJA procedures (including hip and knee arthroplasties) performed because of OA, with the remaining 25% of DRG 209 being associated with the main diagnosis of hip fracture. Within DRG 209, the specific weight of hip and knee arthroplasties was computed based on the number of procedures performed each year. Cost analysis for the evaluation of complications following surgical interventions was based on the following DRGs: DRG 418 (postoperative infections), DRG 128 (deep vein thrombosis), and DRG 78 (pulmonary embolism), corresponding to costs of €2,776, €2,630, and €4,297, respectively. Based on specific estimations provided by the Italian Society for Physical and Rehabilitative Medicine, we assumed that 20% of patients undergo in-hospital rehabilitation in order to assess the burden of rehabilitation following TJA. The official Italian rate list for in-hospital rehabilitation has fixed a cost of 256 euros per day over a period of 20 days. Therefore, each patient undergoing in-hospital rehabilitation generates a cost of 5,120 euros. Furthermore, we had to consider that in Italy all patients are treated at home by physiotherapists on behalf of the local health authorities. According to Italian national rate lists, rehabilitation carried out in patients' homes has an average cost of 80 euros per day and is continued for a minimum period of 30 days, resulting in a cost of 2,400 euros per patient, although some patients may carry on up to 60 and even 90 days.

RESULTS

In 2005 we recorded a total of 41,816 hip arthroplasties (Table 1) and 44,051 knee arthroplasties (Table 2) due to OA. For hip arthroplasties, we computed an overall annual percent change (APC) across the 5 examined years of +5.4 (95% confidence interval [95% CI] 5.1–5.8), with the APC for men being +7.0 (95% CI 6.4–7.5) and the APC for women being +4.5 (95% CI 4.1–4.9). For knee arthroplasties, we computed an overall APC across the 5 years examined of +13.4 (95% CI 13.1–13.8), with the APC for men being +16.6 (95% CI 15.8–17.3) and the APC for women being +12.4 (95% CI 12.0–12.8).

Women represented the majority of patients undergoing TJA procedures (average female:male ratio 1.7:1 for hip arthroplasties and 2.9:1 for knee arthroplasties). When analyzing data by age groups, most of the patients were comprised in the age groups 65–74 and ≥75 years, although the highest increases were observed in younger patients ages <65 years both for hip and knee arthroplasties (Tables 1 and 2). In 2005, we also recorded a total of 6,387 prosthesis revisions following hip arthroplasties (APC +4.9; 95% CI 4.0–5.7) and 2,295 revisions of knee arthroplasties (APC +17.4; 95% CI 15.7–19.2), as shown in Tables 3 and 4.

The incidence per 100,000 inhabitants increased from 80 to 94.8 for hip arthroplasties (APC +4.4; 95% CI 4.1–4.7) and from 62.9 to 99.9 for knee arthroplasties (APC +12.3; 95% CI 11.9–12.7), with the highest increases being observed in men for both TJAs (APC +5.8; 95% CI 5.2–6.3 and APC +15.2; 95% CI 14.5–16.0, respectively). An increase in the incidence per 100,000 inhabitants was also shown for TJA revisions, from 12.0 to 14.0 per 100,000 (APC +3.8; 95% CI 3.0–4.7) and from 2.7 to 4.6 per 100,000 (APC +16.2; 95% CI 14.5–18.0) for hip and knee arthroplasties, respectively. Notably, the incidence per 100,000 hip prosthesis revisions showed higher increases in women (APC +17.1; 95% CI 15.1–19.2).

Table 2. Number of knee arthroplasties performed in Italy between 2001 and 2005 and APC shown by sex and age groups*

	2001	2002	2003	2004	2005	APC (95% CI)
Age group, years						
25–44						
Men	85	95	153	171	160	18.8 (12.5–25.5)
Women	74	85	112	124	120	13.7 (6.9–20.9)
45–64						
Men	1,207	1,489	1,738	2,251	2,426	19.5 (17.7–21.3)
Women	3,147	3,639	4,411	5,388	5,656	16.6 (15.5–17.7)
65–74						
Men	3,379	3,793	4,571	5,204	5,800	14.9 (13.8–15.9)
Women	10,560	11,931	13,203	15,373	15,755	11.0 (10.4–11.6)
≥75						
Men	1,782	2,173	2,623	2,888	3,480	17.4 (16.0–18.9)
Women	6,517	7,736	9,099	9,674	10,654	12.5 (11.7–13.2)
Subtotal						
Men	6,453	7,550	9,085	10,514	11,866	16.6 (15.8–17.3)
Women	20,298	23,391	26,825	30,559	32,185	12.4 (12.0–12.8)
Incidence per 100,000						
Men	32.0	37.4	44.5	50.7	56.5	15.2 (14.5–16.0)
Women	90.8	104.6	118.9	133.8	139.3	11.4 (11.0–11.8)
Total	26,751	30,941	35,910	41,073	44,051	+13.4 (13.1–13.8)
Incidence per 100,000	62.9	72.7	83.5	94.3	99.9	+12.3 (11.9–12.7)

* APC = annual percentage change; 95% CI = 95% confidence interval.

As shown in Tables 1 and 2, approximately 30% of hip arthroplasties and 20% of knee arthroplasties were performed annually in patients ages <65 years, thus affecting the working population. The mean LOS for hip arthroplasty without complications progressively decreased, from 14.6 days in 2001 to 12 days in 2005 (13.6 days in 2002, 13 days in 2003, and 12.5 days in 2004). The mean LOS for knee arthroplasty without complications decreased, from 14 days in 2001 to 11 days in 2005 (13.5 days in 2002, 12.1 days in 2003, and 11.5 days in 2004). The LOS observed for private hospitals is lower than that reported for public hospitals, although the latter hospitalizes

Table 3. Number of hip prosthesis revisions performed in Italy between 2001 and 2005 shown by sex and age groups (due to small numbers of cases, APC is shown for the total)*

	2001	2002	2003	2004	2005	APC (95% CI)
Age group, years						
25–44						
Men	52	86	70	95	94	
Women	69	73	81	82	89	
45–64						
Men	263	416	450	447	499	
Women	682	713	658	765	756	
65–74						
Men	517	758	751	772	799	
Women	1,452	1,539	1,544	1,483	1,616	
≥75						
Men	430	595	647	689	754	
Women	1,623	1,734	1,738	1,779	1,780	
Subtotal						
Men	1,262	1,855	1,918	2,003	2,146	
Women	3,826	4,059	4,021	4,109	4,241	
Incidence per 100,000						
Men	6.3	9.2	9.4	9.7	10.2	+9.8 (8.3–11.4)
Women	17.1	18.2	17.8	18.0	18.4	+17.1 (15.1–19.2)
Total	5,088	5,914	5,939	6,112	6,387	+4.9 (4.0–5.7)
Incidence per 100,000	12.0	13.9	13.8	14.0	14.5	+3.8 (3.0–4.7)

* APC = annual percentage change; 95% CI = 95% confidence interval.

Table 4. Number of knee prosthesis revisions performed in Italy between 2001 and 2005 shown by sex and age groups (due to small numbers of cases, APC is shown for the total)*

	2001	2002	2003	2004	2005	APC (95% CI)
Age group, years						
25–44						
Men	14	26	27	31	26	
Women	16	17	18	8	17	
45–64						
Men	60	131	102	82	131	
Women	126	271	188	281	271	
65–74						
Men	131	260	221	228	260	
Women	417	838	593	777	838	
≥75						
Men	79	0	132	155	142	
Women	303	0	434	453	610	
Subtotal						
Men	284	417	482	496	559	
Women	862	1,126	1,233	1,519	1,736	
Incidence per 100,000						
Men	1.4	2.1	2.4	2.4	2.7	+13.9 (10.6–17.4)
Women	3.9	5.0	5.5	6.6	7.5	+1.3 (0.3–2.3)
Total	1,146	1,543	1,715	2,015	2,295	+17.4 (15.7–19.2)
Incidence per 100,000	2.7	3.6	4.0	4.6	5.2	+16.2 (14.5–18.0)

* APC = annual percentage change; 95% CI = 95% confidence interval.

the majority of patients. The average LOS was 15 days for hip prosthesis revision and 14.5 days for knee prosthesis revision. The mean LOS was 10 days in the case of postoperative infection, 15 days for deep vein thrombosis, 14 days for pulmonary embolism, and 20 days for in-hospital rehabilitation. Rehabilitation carried out at a patient's home was computed in 30 days, although it can be extended up to 60 or 90 days in some cases. As shown in Table 5, the total loss of working days following hip and knee arthroplasty has been estimated as approximately 805,000 days (2001) and 1 million days (2005). Most working days were lost because of hip arthroplasty. The computation of working days lost was limited to patients ages <65 years and included hospitalization, complications, and rehabilitation. Despite a notable reduction in the average hospital LOS for both hip and knee arthroplasties across the 5 examined years, the number of working days lost increased from 2001 to 2005, as a consequence of the increase in the number of TJA procedures.

Hospital costs sustained by the national health care system for TJA procedures increased from 741 million euros to 1 billion euros between 2001 and 2005 (Table 6). Among those costs, hip arthroplasty hospital costs increased from 412 to 538 million euros and knee arthroplasty costs increased from 329 to 517 million euros over the 5-year period. Rehabilitation costs were assessed as 228 and 322 million euros in 2001 and 2005, respectively (Table 6). Overall estimated costs of postoperative complications (including deep vein thrombosis, pulmonary embolism, and infections) were computed between 3.1 (2001) and 4.4 million euros (2005), assuming a 0.5% incidence rate per each type of complication (Table 6). Based on 2005 data, the average cost per patient (including hospital, rehabilitation, and complication costs) was assessed as 16,835 and 15,358 euros for hip and knee arthroplasty, respectively. Considering the overall 8-year study period, total costs increased up to 6 billion euros, going from 973 million euros in 2001 to 1.4 billion euros in 2008. Mortality following TJA resulted in 335 deaths in 2001, 373 deaths in 2002, 410 deaths in 2003, 450 deaths in 2004, and 473 deaths in 2005, thus representing a cause of death comparable with other diseases characterized by low mortality such as tuberculosis (almost 400 deaths per year in Italy) (9).

Table 5. Estimated working days lost by patients ages <65 years and related APC*

Total joint arthroplasties	2001	2002	2003	2004	2005	APC (95% CI)
Hip arthroplasties	545,437	566,146	570,319	631,409	631,351	+4.1 (4.0–4.2)
Knee arthroplasties	259,910	262,801	300,761	367,413	386,586	+12.0 (11.9–12.2)
Total days lost	805,347	828,947	871,080	998,822	1,017,937	+6.8 (6.7–6.9)

* APC = annual percentage change; 95% CI = 95% confidence interval.

Table 6. Estimated costs (million euros) of hip/knee arthroplasties in Italy between 2001 and 2005

	2001	2002	2003	2004	2005	Total 2001–2005
Hospital costs						
Hip	412	489	481	500	538	2,420
Knee	329	378	410	510	517	2,144
Total	741	867	891	1,010	1,055	4,564
Rehabilitation						
In hospital						
Hip	40	43	45	48	49	225
Knee	28	33	38	44	47	190
Home based						
Hip	93	101	106	113	115	528
Knee	67	78	90	103	111	449
Total	228	255	279	308	322	1,392
Deep vein thrombosis						
Hip	0.5	0.5	0.5	0.6	0.6	2.7
Knee	0.3	0.4	0.5	0.5	0.6	2.3
Total	0.8	0.9	1	1.1	1.2	5
Pulmonary embolism						
Hip	0.8	0.9	0.9	1	1	3.6
Knee	0.6	0.7	0.8	0.9	0.9	3.9
Total	1.4	1.6	1.7	1.9	1.9	8.5
Postoperative infections						
Hip	0.5	0.5	0.6	0.6	0.7	2.9
Knee	0.4	0.4	0.5	0.6	0.6	2.1
Total	0.9	0.9	1.1	1.2	1.3	5.4
Overall costs						
Hip	547	635	634	663	704	3,182
Knee	425	490	540	659	677	2,791
Total	972	1,126	1,174	1,322	1,381	5,973

DISCUSSION

This is the first Italian study addressing the issue of TJAs performed because of symptomatic OA. We considered these surgical procedures to closely reflect the incidence of severe OA, although a proportion of affected patients do not undergo surgery. Other limitations of this study are mostly attributable to the estimation rates concerning prosthesis revision postoperative infections, deep vein thrombosis, pulmonary embolism, and mortality (based on the Tuscany regional database and international literature). However, these complications and mortality rates after TJA are known to be rare in developed countries, where high hospital standards are adopted (13–35). Therefore, our analyses are thought to be only minimally influenced by a possible variability of complications and mortality rates. A prospective observational study of unselected operations carried out in the UK by Williams et al in 2002 reported a 3-month mortality rate between 0.4% and 0.7% (28). Zhan and colleagues reported that approximately 200,000 total hip replacements, 100,000 partial hip replacements, and 36,000 prosthesis revisions were performed in the US in 2003, with intrahospital mortality rates of 0.33%, 3.04%, and 0.84%, respectively (29). In 2006, Doro et al reported mortality following these surgical procedures to be 0.16–0.29% (30). Mahomed et al showed that the rates of complications occurring within 90 days after primary total hip replacement were likely to be 1.0% for mortality, 0.9% for pulmonary embolism, and 0.2% for wound infection (19). Blom and colleagues assessed early postoperative mortality in an unselected consecutive series of 1,727 primary THAs where patients had not routinely received chemothromboprophylaxis, reporting a 3-month mortality rate of 1% (31). More recently, Liu et al have analyzed trends in characteristics of THA in the US through the National Hospital Discharge Survey from 1990 to 2004 for trends concerning in-hospital mortality and hospital LOS (32). According to this study, the number of THAs performed increased by 158%, while mortality rates remained low and decreased slightly (from 0.32% to 0.29%) (32). The prevalence of procedure-related complications decreased over time and the LOS decreased from an average of 8.7 to 4.5 days (32). Similarly, Aynardi et al assessed the 90-day mortality rate after THA by retrospectively reviewing 7,478 consecutive patients undergoing primary or revision THA between January 2000 and July 2006, reporting overall 30- and 90-day mortality rates of 0.24% and 0.55%, respectively (33). In Italy, Sperati and colleagues analyzed regional hospital discharge database and mortality data in public and private Italian hospitals in Lazio, reporting a global mortality rate after THA of 1.4% (30-day mortality 1.3% and 90-day mortality 2.2%) (34).

Our results showed a remarkable increase in the number of TJAs performed from 2001 through 2005 because of OA. This finding seems to be consistent with a long-term US survey that observed a progressive rise in the number of arthroplasties between 1990 and 2002 (35). According to these data, the rate of primary total arthroplasties per 100,000 inhabitants in the US increased by approximately

50% over 13 years (35). The number of procedures increased much more in people ages 45–64 years. The analysis of the US Nationwide Inpatient Survey from 1997 to 2004 revealed that approximately 225,900 hip arthroplasties were performed during 2004, corresponding to a 37% increase compared with the year 2000, but it is estimated that nearly 600,000 hip arthroplasties will be performed in the US by the year 2015 (36). Another Spanish study has documented the increase in the rate of hip arthroplasties per 10,000 inhabitants, which increased from 4.1 to 6.6 in Barcelona and Catalonia between 1994 and 2000 (37).

We believe that the analysis of the cost of DRGs for TJAs, complications, and rehabilitation can be considered as a reliable proxy of general costs sustained by the national health care system. We have estimated that total costs sustained for TJAs increased from 973 million to 1.4 billion euros, with the average cost per patient being 16,835 and 15,358 euros for hip and knee arthroplasties, respectively. Stargardt assessed the costs of primary hip arthroplasties performed in 42 hospitals of 9 European Union countries, finding that the total cost for THAs ranged from 1,290 euros (Hungary) to 8,739 euros (The Netherlands), with a mean cost of 5,043 euros (38). In that study, Italy was situated among the countries with the highest costs, as confirmed by our results. In a similar French study, it was found that 73,150 hospital admissions in the year 2001 resulted in total hospital costs of 591 million euros, thus being comparable with our Italian results (39). The loss of working days by people ages <65 years has been estimated at approximately 1 million days in 2008. Although surgery is the gold standard treatment in the case of severe symptomatic hip OA, other treatment options may also be considered in less severe cases, when medical therapy or conservative strategies allow an acceptable quality of life for the patients. The World Health Organization recommendations on OA (40) focus on primary prevention and foster the adoption of all possible conservative treatments before undergoing surgery, unless quality of life and function impairment become unacceptable. The availability of effective conservative treatment (such as eco-guided infiltration of the hip and knee joints) could prolong the survival of the patient's joint, thus possibly reducing loss of productivity, NSAID expenditures, and also the need for revision surgery (given that the life of a prosthesis does not currently exceed 20 years). The number of revisions is progressively increasing after both hip and knee arthroplasties.

Concerning the prosthesis revision rate, the study performed by Williams et al in 2002 showed that 2.6% of patients underwent another operation on the same hip within 1 year (28). Dixon et al reported, between 1991 and 2000, an increasing incidence of primary THA (+18%), while the incidence of THA revisions was almost double. Over the 10 years, the proportion of THA procedures requiring revision rose from 8% to 20% (41). Moreover, Lübbeke and colleagues showed that unadjusted quality of life and satisfaction were significantly lower after revision (42). Adjustment for patient characteristics revealed that this difference was only partially explained by the greater morbidity and older age of the patients undergoing revision (42). A study conducted by Ong et al reported that the average economic burden of prosthesis revision reached 18.8% (range 17.4–20.2%) of THAs (43). Recent data from the New Zealand Joint Registry of THAs performed between 1999 and December 2006 reported 920 revisions (2.16%) of 42,665 primary THAs (44). Bozic et al evaluated the mechanisms of surgical failure and the types of revision generally needed after THA procedures performed in the US (45). This analysis was carried out by using the US ICD-9-CM databases concerning codes specifically related to revision after THA in a large sample representative of the US population until 2006. The study found that the most common type of revision after a THA procedure was the all-component revision (41.1%), while the most common causes of revision were instability/dislocation (22.5%), mechanical loosening (19.7%), and infection (14.8%) (45). Revision procedures following THA were most commonly performed in large, urban, nonteaching hospitals for Medicare patients in people ages 75–84 years. The average hospital LOS for all types of revision arthroplasties was 6.2 days, and the average total charges were found to be $54,553 (46).

Our study confirms that the socioeconomic burden of TJAs (including revision surgery) due to hip and knee OA is growing and heavily affecting the working population.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Piscitelli had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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