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Research Article

Gender Difference for Hip Replacement Surgery

Epidemiological Situation of Hip Replacement Surgery: Gender Difference Responding

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Abstract: In some papers, differences in gender regarding the total hip arthroplasty (THA) replacement surgery response are reported. This study evaluated gender differences in response to patients undergoing total hip arthroplasty replacement surgery in our country. It is a cross-sectional and descriptive study that analyzed 401 patients admitted and undergoing THA at the University Trauma Center, Tirana, for five years. SPSS software 20.0 is used to analyze patient outcome measures. The logistic regression compared outcomes between genders. A p-value less than 0.05 was considered significant. The average age in this study was 67.1 +/- 5.4 years, with the range of min to max ranging from 22 to 89 years old.Women were the most predominant Gender, at 51.6% (207/401), compared to men, at 48.4% (194/401). The age group 60–70 years old had the most patients, accounting for 29.7% (119/401). In addition, women were more likely than men to be older, to have arthritis, and to have metabolic syndrome (P=0.001). The preoperative health of men was weaker despite being younger than women. Based on the logistic regression of the data, the length of hospital stay was significantly higher in women versus men. Still, on the other side, mobility after the replacement was much slower in men. Also, the men were less likely to return to their homes or mobilize independently during the 90-day follow-up. The findings of this study show a significant association between the gender effect and the outcomes of the replacement response. The total amount of arthroplasty used is more than four times as great in women as in men. We recommend future studies to clear up the underlying causes of gender differences in joint arthroplasty.

Keywords: total hip arthroplasty, gender difference, outcomes, trauma hospital, surgery, epidemiological data

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1. INTRODUCTION

A major concern and challenge clinicians have, is maintaining or improving the quality of care. The appropriateness of the medical procedures used by them is one of the important elements of quality care. Clinicians must have the ability to determine the appropriateness of care. A procedure is considered appropriate if its health benefit exceeds its health risk and is worth performing [1]. This study aims to assess the epidemiological situation of hip replacement and to shed light on whether gender differences influence surgical response in the hip replacement procedure. Our present study's objectives are to understand better the epidemiological situation of hip replacement surgery among Albanian patients and to determine the relationship between sex and THA arthroplasty. Total hip arthroplasty (THA) is one of the most common orthopedic surgical procedures. This kind of operative intervention is one of the most successful and improves the quality of life for patients today. The short- and long-term success rates are very high [2]. Modern techniques and implants aim to improve the results of interventions. An appropriate indication for orthopedic surgery usually offers a good patient outcome [1,3]. Most experts consider that the severity of pain and disability in hip articulation is important and objective indications for THA [1]. However, the severity of symptoms is a topic of disagreement about the patient's need for surgery [4]. Many things could explain sex and gender disparities in TJA, including underrepresentation in clinical trials, variations in commitment to perform the surgery, pain reactions to underpinning illnesses and treatments, patient-physician relationship issues, treatment desires, provider-level factors like health care professional style of communication, and additional condition like access to specialist treatment[5]. These are just a few examples of the reasons for the gender disparity. Furthermore, it is well known that women are more likely than men to experience arthritis and degenerative joint diseases, which will further increase the need for these procedures [6]. Pain is a subjective complaint, and gender differences in response to painful stimuli are well documented. Observation has shown that women have a lower pain threshold (greater sensitivity to experimentally induced pain) than men [7,8]. It may be influenced by sociocultural factors (like age, family history, and gender roles), psychological factors (for example, anxiety, depression, cognition, and behavior), or biological factors (like genetics, sex hormones, and endogenous pain inhibition). All these factors, alone or interacting, can contribute in complex ways [4,8]. Some studies suggest that women may be more disabled than men before THA intervention. It is still unknown if a worse disability at the time of THA will affect outcomes after surgery [9]. Men seemed to benefit more from the intervention than women. The role of comorbidities was highlighted when improvement was modest [10]. Certain studies have shown that pain and satisfaction after THA is affected by patients' comorbidities before surgery [11]. The main outcomes measured after surgery are pain and functional status.

2. METHODS

2.1. Study design and study population

This observational study involved the data of patients ≥18 years of age who were admitted to the University Trauma Hospital Center to perform the surgical intervention related to replacing the damaged joint component with a prosthesis from March 2015 to December 2019.

Table 1. Selection of patients (inclusion and exclusion criteria)

Inclusion criteria	Exclusion criteria
All patients aged 50 years and older, regardless of Gender, have subjected to THA arthroplasty during the 5 years of the study. Patients who were accepted to be part of this study.	Patients younger than 50 years old, Patients who had received a primary or revision TJA before the study period. Patients who were not accepted to be part of the study.

2.2. Characteristics of the study population

A total of 401 patients who underwent total hip arthroplasty during the study periods were included. Each patient completed a questionnaire with their symptoms before and after surgery. The mean age of the patients was 67.1±5.4 years, and the range of ages from minimum to maximum ranged from 22 to 89 years old. Approximately 51.6% (207/401) of the patients were women, and 48.4% (194/401) were men.

2.3. Collection of the data

We analyzed epidemiological and sociodemographic data (such as age, gender, place of residence, ASA score [12,13], mobility, and type of injury). We also described the patients' comorbidity profile [14], as well as clinical data and the operators and post-operator (such as data related to the process, the type of prosthesis used, the result obtained after the intervention, days of hospital stay, complications encountered, and mobility in 90 days).

2.4. Statically data

The obtained data were analyzed with the statistical program SPSS (Inc., Chicago, Illinois), version 23.0. The data were presented as frequency, percentage, mean, and standard deviation. Continuous variables of patients' socio-demographic characteristics were analyzed using descriptive statistics, followed by independent Student's t-tests and the chi-squared ^{2} test. In contrast, categorical variables were analyzed using Fisher's exact test, comparing the changes in the variables with the results obtained from the intervention. Variables used in the analyses were complication risk factors identified in previous research papers [15-18]. To compare the data obtained when gender was taken as an independent variable, we used in-depth logistic regression analysis. Odds ratios (OR) and intervals were evaluated at a 95% confidence level (95% CI), and a p-value less than 0.05 was considered statistically significant.

3. THA - ARTHROPLASTY DATA COLLECTION

3.1. Epidemiological data

ID_____/ Year of THA arthroplasty_____
Name Surname_____/ Gender: □ men □ women
Age (years)_____/ Residence_____
Marital status: □ Single □Widow, □ Divorced, □ Married
Education level: □ Primary level □ High school □ University
BMI: □ Underweight □ Normal weight □ Overweight □ Obese class I□class II□Class III
Employment status: □Full and part-time employment/□ Unemployed /Retired/□ Invalid
Living Habits: □ Alcohol use □ Smoking □ Use of illicit drugs
ASA score: □ First category □ Second category □ Third category □ Fourth category
Comorbidities: □ Metabolic syndrome □ Others/
Contralateral articulation: □Included but not operated □ Included and operated □ Not included

Clinical data

Complaint: □ Pain □ Limping, □ Reduced movement in the hip joint □ Muscle stiffness □ Pain in the leg when you apply weight to that
Indication for HIP/THA arthroplasty: □ Osteoarthritis □ Rheumatoid, □ Other disease-degeneration due to repetitive wear and tear □ Traumatic conditions, an accident
Long stay in hospital: □ 7-15 days □ ≥15-20 days □ ≥21 days
Type of intervention: □ Emergency □ Planned
Complications: □ Minor □ Major
Surgery recuperation: □ Less than 90 days □ More than 90 days

4. RESULTS

During this 5-year study, 401 patients with damage to the coxofemoral joint underwent HIP arthroplasty replacement surgery at the Trauma Hospital. The mean age of the patients was 67.1±5.4 years, and the range of ages from minimum to maximum ranged from 22 to 89 years old. The minimum age group of 20–29 years old presented the lowest number of cases in this study, at 2.24% (9/401), while age groups 60–69 and 70–79 years old presented the highest number of cases that required HIP arthroplasty replacement during the study periods, at 29.7% (119/401) and 22.44% (90/401), respectively. There was a significant association between age and the THA, χ^2=11.8, 95% CI [5.23-24.7], and a p-value of 0.002. Based on gender, 51.6% (207/401) of the patients were women, and 48.4% (194/401) were men. There was a significant association between gender and the THA, χ^2 = 6.2, 95% CI [2.1–10.7], and a p-value of 0.01. In addition, 62.84% (252/401) of cases referred lived in urban areas, and 37.16% (149/40) were in rural areas. More than 3/4 of the cases (78.3%, or 314/401) were married, while about 1/4 (21.7%, or 87/401) were unmarried (single, widowed, or divorced). We found no significant association between the residential area and THA patients, with a p-value of 0.7. Still, we did find a significant association between marital status and THA with a p-value of 0.03. According to body mass index, 6.23% (25/401) of cases were underweight, 24.2% (97/401) were normal weight, 38.15% (153/401) were overweight, and 31.42% (126/401) were obese (from class I to class III). There was a significant relationship between BMI and THA, with a p-value of 0.0001. Moreover, 73.3% (294/401) of cases referred have high school education levels; more than half of them, 53.1% (213/401), are unemployed or retired. Besides all the demographic characteristics explained above, each patient was required to provide information regarding their living habits. Almost 34.7% consumed alcohol, 43.6% smoked, and 3.7% used illicit drugs. Before the surgery procedure, all patients were assessed for their clinical conditions or problems based on the ASA score. Regarding this assessment, 18.45% of cases were classified in the first category of the ASA score, 56.1% in the second category, 20.95% in the third category, and only 4.5% in the fourth category. Furthermore, metabolic syndrome resulted in 58.6% (235/401) of patients referring to other diseases (such as cardiovascular diseases, anemia, renal diseases, and so on). In comparison, 16.9% (68/401) of THA patients did not refer to any comorbidities. In more than half of patients, 54.35% (218/401) of contralateral articulation was included but not operated, 14.47% (50/401) of contralateral articulation was included and operated, and 33.18% of contralateral articulation was not included. Table 2 shows the baseline epidemiological characteristics of patients. There was no association between the education level and employment status of patients with THA arthroplasty replacement; we found an association between living habits, ASA score, comorbidities, and contralateral articulation with a p-value less than 0.05.

Table 2. Baseline epidemiological characteristic data of patients

Variables		Patients (No%)	P value
Mean age (St.D)		67.24±4.1	0.002
Age groups	20-29 years old	9 (2.24%)	
	30-39 years old	21 (5.23%)	
	40-49 years old	46 (11.47%)	
	50-59 years old	75 (18.7%)	
	60-69 years old	119 (29.7%)	
	70-79 years old	90 (22.44%)	

	≥ 81 years old	41 (10.22%)	
Gender	Women	207 (51.6%)	0.01
	Man	194 (48.4%)	
Residence area	Rural area	149 (37.16%)	0.7
	Urban area	252 (62.84%)	
Marital status	Single/Widow/Divorced	87 (21.7%)	0.03
	Married	314 (78.3%)	
Body mass index (BMI)	Underweight	25 (6.23%)	<0.0001
	Normal weight	97 (24.2%)	
	Overweight	153 (38.15%)	
	Obese (class I-III)	126 (31.42%)	
Education level	Primary level	10 (2.5%)	0.08
	High school	294 (73.3%)	
	University	97 (24.2%)	
Employment status	Full and part-time employment	142 (35.4%)	0.4
	Unemployed /Retired	213 (53.1%)	
	Invalid	37 (9.2%)	
Living Habits	Alcohol use	139 (34.7%)	0.042
	Smoking	175 (43.6%)	
	Use of illicit drugs	15 (3.7%)	
ASA score	First category	74 (18.45%)	0.001
	Second category	225 (56.10%)	
	Third category	84 (20.95%)	
	Fourth category	18 (4.5%)	
Comorbidities	Metabolic syndrome	235 (58.6%)	0.001
	Others	98 (24.4%)	
Contralateral articulation	Included but not operated	218 (54.35%)	0.03
	Included and operated	50 (12.47%)	
	Not included	133 (33.18%)	

Table 1 explains the epidemiological characteristics of patients that underwent THA surgery procedures over five years. A statistical association was found for age, gender, living condition, BMI, ASA score, comorbidities, etc., with the p-value <0.05. As mentioned, this study included 401 patients admitted to the hospital for THA arthroplasty replacement over five years. Figure 1 shows the distribution of cases from 2015 to 2019 divided by gender. Each year, women appeared predominance compared to men. For example, the lowest number of cases was in 2015, with 8.22% of women and 7.5% of men, while the highest cases were in 2019, with 12.5% of women and 12% of men.

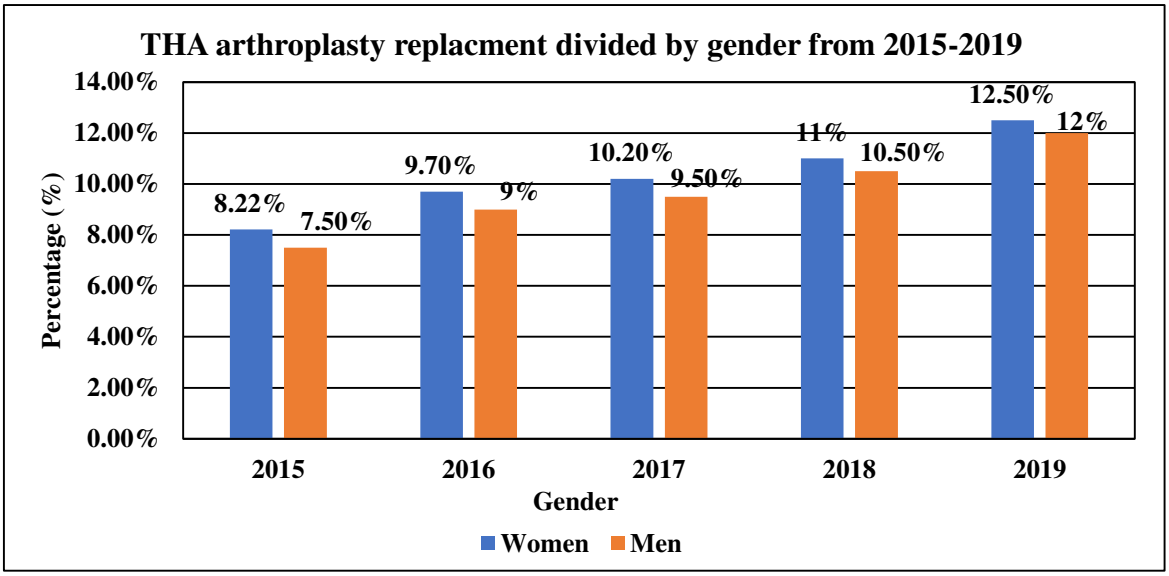

Fig 1. THA arthroplasty replacement divided by Gender from 2015-2019

Figure 1 illustrates the patients who underwent the THA surgery divided by the years for women and men. We saw from this graphic representation is that there isn't a big difference between men and women for each year. No significant association was found between gender and the years when the patients underwent the THA surgery, p-value >0.05. Table 3 shows the association between gender and some of the admitted conditions. The main complaint was pain in 85.3% (342/401) of all the cases; however, women referred pain in 94.2% (195/207) of cases, while men did so in 75.8% (147/194). The other complaint referred to less than 20% for the two genders. There was a significant association between the complaint of THA replacement and gender, p-value = 0.001. Osteoarthritis was the first indication for hip arthroplasty among our patients in 55.6% (223/401) of all cases. This indication was more frequent for women in 74.4% (154/207) than for men in 35.6% (69/194). Men had 24.2% (47/194) more traumatic conditions and accidents than women, who had 5.3% (11/207). There was a significant association between the indication for hip replacement and gender, with a p-value of 0.02 (table 3).

Table 3. Association between gender and some of the admitted conditions

Variables		Total number	Women	Men	P value
Complaint	Pain	342 (85.3%)	195 (94.2%)	147 (75.8%)	0.001
	Limping	29 (7.2%)	13 (6.3%)	16 (8.25%)	
	Reduced movement in the hip joint	74 (18.5%)	49 (23.7%)	25 (12.9%)	
	Muscle stiffness	80 (20%)	37 (17.9%)	43 (22.2%)	
	Pain in the leg when you apply weight to that	47 (11.7%)	27 (13.04%)	20 (10.3%)	
Indication for HIP/THA arthroplasty					0.02
	Osteoarthritis	223 (55.6%)	154 (74.4%)	69 (35.6%)	
	Rheumatoid	86 (21.44%)	28 (13.5%)	58 (29.9%)	
	Other disease-degeneration due to repetitive wear and tear	34 (8.5%)	14 (6.8%)	20 (10.3%)	
	Traumatic conditions and accident	58 (14.46%)	11 (5.3%)	47 (24.2%)	
Long stay in hospital	7-15 days	315 (78.55%)	150 (72.5%)	165 (85.05%)	0.008
	≥15-20 days	64 (16%)	45 (21.7%)	19 (9.8%)	
	≥21 days	22 (5.5%)	12 (5.8%)	10 (5.15%)	
Type of intervention	Emergency	42 (10.5%)	7 (3.4%)	35 (18%)	0.04
	Planned	359 (89.5%)	200 (96.6%)	159 (82%)	
Complications	Minor	25 (6.25%)	11 (5.3%)	14 (7.2%)	0.03
	Major	13 (3.25%)	7 (3.4%)	6 (3.1 %)	
Surgery recuperation	Less than 90 days	248 (61.8%)	150 (72.5%)	98 (50.5%)	0.0001
	More than 90 days	153 (38.2%)	57 (27.5%)	96 (49.5%)	

Table 3 summarizes the admitted conditions and some of the post-operative data of patients that underwent THA surgery procedures over five years. Pain and osteoarthritis were the main complaints of patients. A statistical association was found for all of this data, with the p-value <0.05. Most of the patients, 78.55% (315/401), have a long stay in the hospital, ranging from 7 to 15 days. Women were hospitalized for more days than men, and older patients (60 years) were hospitalized for more days than younger patients. There was a significant association between the days of hospitalization and gender, with a p-value of 0.008. Arthroplasty replacement is a procedure that requires time to plan, but in some cases, the type of intervention may be an emergency. Among the 401 patients undergoing HIP arthroplasty, 10.5% of the intervention was an emergency because traumatic conditions and accidents caused the damage. In 89.5% of the cases, the intervention was planned. The traumatic condition was more frequent in men than women, with a significant association and a p-value of 0.04. The rate of minor complications varied from 5.3% for women to 7.2% for men, while the rate of major complications varied from 3.4 for women to 3.1% for men. There was found to be a significant association between the complications and gender, with a p-value of 0.03. Based on statistical analysis data, the length of hospital stay was significantly longer in women versus men. Still, on the other hand, mobility or recovery after the surgery was much slower in men. Also, the men were less likely to return to their homes or mobilize independently during the 90-day follow-up, between patient factors and complications.

4.1. Gender Difference

Table 4 shows the multivariate logistic regression between gender and some of the risk factors related to gender. We used the odds ratios to indicate the relative risk of each variable in women compared to male patients (reference = 1.0). The multivariable logistic regression was used to determine the odds ratios that accounted for patient factors that demonstrated a significant association, as presented in Tables 1 and 2.

Table 4. Multivariate logistic regression between gender and some of the variables

Variables		Odds ratio (male=1)	95% CI	p-value
Demographic variables	Age	2.3	[1.97-2.6]	0.008
	Marital status	0.86	[0.81-0.90]	0.04
	Living habits	0.71	[0.68-0.74]	0.05
Comorbidities	BMI	2.8	[2.65-3.12]	0.0001
	Metabolic syndromes	0.93	[0.89-1.04]	0.004
Complaint	Pain	1.3	[1.09-1.51]	0.005
	Others	0.78	[0.74-0.82]	0.23
Indication for HIP arthroplasty	Osteoarthritis	1.5	[1.22-1.88]	0.007
	Rheumatoid	1.12	[0.98-1.37]	0.03
	Other disease-degeneration and traumatic condition	0.85	[0.82-0.88]	0.6
Long stay in hospital	7-15 days	0.51	[0.48-0.55]	0.09
	≥15 days	1.3	[1.09-1.64]	0.001
Type of intervention	Emergency	0.96	[0.72-1.30]	0.84
	Planned	0.99	[0.90-11.2]	0.09
Complications	Yes	0.86	[0.83-0.89]	0.048
Surgery recuperation	Less than 90 days	2.08	[1.94-3.51]	0.004
	More than 90 days	1.05	[0.97-1.48]	0.08

Table 4 is a logistic analysis regression resume between gender differences in THA arthroplasty surgery responses and different risk factor variables. The most significant variables that risk women more than once compared to men to undergo arthroplasty resulted in age, BMI, pain, and osteoarthritis.

5. DISCUSSION

THA arthroplasty replacement through surgical intervention is seen as the only effective solution for many people worldwide. Arthroplasty has not only replaced the damaged part of the body (joint), but in many cases, it has also improved the quality of life for these patients. The development of techniques and procedures that are applied today in the world has also reduced the complications during and after these interventions. In this study, we have evaluated the epidemiological situation of hip replacement and shed light on whether gender differences impact the response to surgery in the hip replacement procedure. Some studies have reported increased THA incidence, primarily during the last few decades [19-21]. Our findings are along the same lines as those reported in the above articles. So, we had a low increase mainly in 2015 – 2017, while in 2018–2019, we had a slightly higher increase in patients admitted to the Trauma Hospital for HIP arthroplasty replacement. In many articles relating to epidemiological data, age and gender are viewed as predictor factors. According to one study conducted by Goveia et al. [22] in Brazil, approximately 60% of patients who underwent hip arthroplasty were women of similar age, and the majority (63% of them) were between the ages of 70 and 90. Although women are more likely than men to suffer from osteoarthritis, they are more likely to seek medical attention later in life. As a result, women often go to the doctor at a more advanced stage of the damaged joint. Haker et al. found that in their study, both sexes underutilize arthroplasty for severe arthritis, although women underutilize it more than three times as much as men [23]. In one study conducted by Bryan et al., among 273 patients undergoing total hip arthroplasty replacement, it was found that 49% of patients were females and 51% were males, with a range of ages of 19-49 years and a mean age of 42.3% [24]. On the other hand, Kostamo et al., in their study, even though they analyzed 3461 patients who underwent total hip arthroplasty replacements, with a predominance of females in

55.6% of patients, no difference was reported between gender and outcomes of arthroplasty intervention [25]. Of the 401 patients recruited in this study, 51.6% were women, and 48.4% were men. Due to the age of patients who undergo THA, many researchers highlight a relative risk of complications in elderly people. This fact is sometimes closely associated with the comorbidities that characterize elderly people, mainly those over 70 years old [26-28]. The mean age of the patients in this study was 67.1 ± 5.4 years, and the age groups 60–69 and 70–79 years old had the highest number of cases requiring HIP arthroplasty replacement during the study periods: 29.7% (119/401) and 22.4% (90/401), respectively. Cho et al., in their study, found that patients aged 66 to 90 had a high prevalence of diabetes ranging from 12 to 16%, congestive heart failure (CHF) ranging from 4% to 18%, and chronic obstructive pulmonary disease ranging from 6% to 11%, based on a population cohort study [29]. In this study, we used the APA score to assess the situation of patients before the intervention. Most patients fell into the second and third categories, at 56.1% and 20.95%, respectively. The association between obesity and the accelerated development of degenerative joint conditions is becoming more and more evident. Obese patients have a 4- to 5-fold increased probability of developing end-stage osteoarthritis, requiring total joint arthroplasty (JTA) earlier in life than patients with a normal BMI [(30-32).] Hasham et al. highlights that an increased BMI raises the possibility of problems after total joint arthroplasty [33]. In our study, related to body mass index, 38.15% were overweight, and 31.42 percent were obese (from class I to class III). We found a significant association between THA arthroplasty replacements and body mass index. This finding aligns with another study conducted by Abdulla et al. [31]. To improve and prevent the postoperative results of patients that can differ between the sexes, and we need to know how sex and factors related to it may affect THA outcomes. These factors should be thoroughly analyzed and addressed in patients who have had surgery [34]. Stephanie et al. (2017) concluded that both men and women saw equivalent improvements in pain and a wide range of motion. Furthermore, the women may have a more severe functional impairment due to differences in daily activity [35]. In contrast, male patients had considerably higher risks of adverse events, death, MI, and sepsis following SA. Female patients had significantly longer durations of stay but lower hospital costs following SA, according to Saltzman et al.'s 2018 study [346]. Our study came to the same conclusions as earlier ones.

6. CONCLUSION

The findings of this study show a significant association between the gender effect and outcomes of replacement response. Total arthroplasty used is more than four times as great in women as in men, while elderly people more than 60 years old presented the highest number for TJA surgery. Despite age, comorbidities that characterize elderly people complicate the surgery results. The most significant variables that risk women more than once time for TJA surgery compared to men resulted: in age, BMI, pain, and the presence of osteoarthritis. Furthermore, women stayed hospitalized for more days than men, and there was found an association between gender and some of the admitted conditions. The pain was the main complaint referred by all patients, but women referred pain in 94.2% compared to men in 75.8%. We recommend future studies to clear up the underlying causes of gender differences in joint arthroplasty. More research focusing on these factors must be designed and carried out.

7. ABBREVIATION

THA Total hip arthroplasty (THA)
OR Odds ratios (OR)
BMI Body Mass Index

8. ETHICAL APPROVAL STATEMENT

The director of the University Trauma Center in Tirana was informed about the study's aim and approved the data collection agreement. All patients were notified before participation in the study, and no personal information was recorded. Patients could discontinue the study at any time because their participation was voluntary. They were also told that any information provided would be kept anonymous and only used for the current study.

9. AUTHORS CONTRIBUTION STATEMENT

Serdi Memini. was involved in the collection of the data from patients. Serdi Memini. and Erjona Abazaj were involved in the conception and design of the study. Serdi Memini, Erjona Abazaj, and Ela Ali, we're part of analyzed the data, drafted the manuscript, and approved the final version of the manuscript.

10. CONFLICT OF INTEREST

Conflict of interest declared none.

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