

General

Predictors of Total Hip Arthroplasty Among Patients with Chronic Comorbidities: A Multivariate Analysis of a Medically Underserved Region

Blake C Martin¹ , Manoj Peiris¹

¹ School of Medicine, The University of Texas Rio Grande Valley

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Background

THA is a common orthopedic procedure that is expected to increase in the coming years. Obesity and osteoarthritis are major factors that increase the risk of individuals requiring THA. The Rio Grande Valley (RGV) is a distinctive health professional shortage area with high rates of obesity, arthritis, and diabetes. This study aims to examine the relationship between chronic medical conditions and the need for THA in this at-risk, medically underserved population.

Methods

This investigation employed a retrospective chart review encompassing patient records from January 1, 2018, through January 1, 2025, using the University of Texas Rio Grande Valley electronic medical record system. ICD-10 codes were used to identify patients with a range of pre-existing medical conditions. CPT codes were utilized to identify patients who underwent THA. Bivariate and multivariate analyses were conducted, and results were expressed as odds ratios (ORs) with corresponding 95% confidence intervals.

Results

Multivariate analysis showed that being overweight/obese ($OR = \exp(0.656) \approx 1.93$, $p = 0.005$) had significantly increased odds of having THA. Individuals with T2DM ($OR = \exp(-1.109) \approx 0.33$, $p < 0.001$) had decreased odds of THA compared to individuals without T2DM. Individuals who were overweight/obese had nearly two times increased odds of surgery compared to individuals who were not overweight/obese and individuals with T2DM had 67% reduced odds of THA.

Conclusion

These findings underscore the importance of chronic comorbidities as risk factors and the multifactorial nature of surgical decision-making in hip arthroplasty, especially in a medically underserved, chronic disease-stricken population.

1.0 INTRODUCTION

Total hip arthroplasty (THA) is one of the most cost-effective and consistently successful orthopedic surgeries.^{1,2} THA provides reliable outcomes such as pain relief, functional restoration, and overall improved quality of life for patients suffering from end-stage degenerative hip osteoarthritis.³ THAs performed due to end-stage osteoarthritis account for around 91-93% of THAs (91% in the United States) according to numerous studies.^{4,5} Other common reasons for needing THA include hip osteonecrosis, congenital hip disorders including hip dysplasia, and inflammatory arthritic conditions.¹ On average, hip osteonecrosis, present in the younger patient population (35

to 50 years of age), accounts for about 10% of annual THAs with some studies indicating hip osteonecrosis accounts for approximately 42% of THAs.^{1,6}

THA had a prevalence of approximately 2.3% in 2010 with a 69.50% increase in patients receiving THA and a 28.50% increase in revision THA from 2006 to 2014.⁷ The amount of THAs performed each year and the total prevalence of individuals with THA is expected to continue to increase in the coming years.^{7,8} Furthermore, THA has been increasing in younger age groups and is expected to continue to increase in these younger individuals.⁹ An explanation for the increase and expected continued increase of THA is increasing obesity both in the United States and globally.¹⁰⁻¹³ Due to obesity being a major risk factor for

developing osteoarthritis, this in turn may increase the incidence and prevalence of osteoarthritis, the main predisposing factor for THA.^{4,5,14,15} Data from the CDC indicates that 41.9% of individuals living in the United States were obese from 2017-2020, marking a 30.5% increase from 1999-2000.^{10,11} Children are also seeing an increase in obesity rates with approximately one out of every six children in the United States suffering from the condition.^{10,11} Globally, around one billion individuals are living with obesity, with more than half of the global population expected to be suffering from obesity by the year 2035.¹¹⁻¹³

THA, in general, does come with increased risks such as sepsis, infection, prolonged surgery time, blood loss, and increased length of stay in the hospital.⁷ These complications are relatively rare with one study showing a major complication rate of 4.2% and a minor complication rate of 25.1%.⁸ However, postoperative complications have also been proven to occur at higher rates. One retrospective study, utilizing over three million patient records, showed a 27.3% complication rate for primary THA and a 39.5% complication rate for revision THA. Due to these possible complicated outcomes, increasing the focus on understanding demographics and comorbidities may lead to improved perioperative optimization and post-operative outcomes.⁷

The Rio Grande Valley (RGV) is a distinctive health professional shortage area where socioeconomic, cultural, and demographic factors intersect to shape population health outcomes. High rates of obesity and diabetes are common in this region, compounded by limited healthcare access and poverty.¹⁶⁻¹⁹ The prevalence of osteoarthritis and rheumatoid arthritis in the RGV surpasses national averages, which is likely attributable to the region's elevated obesity rates and aging population.^{16,20} This study aims to examine the relationship between chronic medical conditions and the need for THA in this at-risk, medically underserved population.

2.0 MATERIALS AND METHODS

2.1. STUDY DESIGN AND DATA COLLECTION

This investigation employed a retrospective chart review encompassing patient records from January 1, 2018, through January 1, 2025. Data were extracted from the University of Texas Rio Grande Valley (UTRGV) electronic medical record system. Ethical approval for this study was granted by the UTRGV Institutional Review Board prior to commencement. Medical records were screened to identify patients with a range of pre-existing medical conditions, including immunodeficiency, type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), obesity/overweight, hypertension (HTN), alcohol misuse, tobacco use, anemia, and vascular disease. Diagnoses were coded according to the International Classification of Diseases, 10th Revision (ICD-10): D80-D84 for immunodeficiency, E10 for T1DM, E11 for T2DM, E66 for obesity/overweight, I10 for HTN, F10 for alcohol misuse, Z72.0 for tobacco use, D62-D64 for anemia, and I70, I73, and I77-I79 for vascular disorders. Patients who underwent THA were identified us-

ing Current Procedural Terminology (CPT) codes 27130, 27132, 27134, 27137, 27138. Demographic variables abstracted from each chart included age at diagnosis, sex, body mass index (BMI), and race/ethnicity.

2.2. INCLUSION AND EXCLUSION CRITERIA

All patients who underwent THA were included, while partial hip arthroplasties were excluded. Patients diagnosed with multiple conditions were included for each diagnosis, and analyses were performed according to the date of diagnosis and the demographic profile at that time. Duplicate charts resulting from multiple provider encounters were consolidated, retaining the earliest entry corresponding to the initial diagnosis. Individuals who were not evaluated within a UTRGV-affiliated institution were excluded.

2.3. STATISTICAL ANALYSIS

Bivariate statistical testing was conducted to determine associations between each pre-existing condition and THA occurrence. For categorical data, Chi-square tests with Yates' correction were applied, and Fisher's exact test was used in cases of small, expected frequencies ($n < 5$). A multivariate binary logistic regression model was subsequently performed to identify independent correlates of THA. In this model, THA served as the dependent outcome, while pre-existing medical conditions constituted predictor variables. Regression coefficients representing the log odds (odds ratios) were derived for each covariate. Results were reported as odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was defined at the 0.05 level. All analyses were performed with R statistical software (Version: 4.2.2 R Core Team, 2022).

3.0 RESULTS

This study analyzed 45,350 patient records. The cohort was predominantly Hispanic or Latino (66.1%), with 22.9% of patients opting not to disclose ethnicity. Female patients represented 55.7% of the study population, compared to 44.3% being male patients. Of this study population, 149 (0.33%) patients underwent total hip arthroplasty.

Bivariate analysis showed that being overweight/obese had 2.6 times increased odds (OR = 2.625) of having THA. T2DM (OR = 0.31) and anemia (OR = 0.46) were associated with decreased odds of having THA ([Table 1](#)).

Multivariate analysis showed that being overweight/obese (OR = $\exp(0.656) \approx 1.93$, $p = 0.005$) had significantly increased odds of having THA ([Table 2](#)). Individuals with T2DM (OR = $\exp(-1.109) \approx 0.33$, $p < 0.001$) had decreased odds of THA compared to individuals without T2DM ([Table 2](#)). Individuals who were overweight/obese had nearly two times increased odds of surgery compared to individuals who were not overweight/obese and individuals with T2DM had 67% reduced odds of THA ([Table 2](#)).

Table 1. Bivariate Analysis via Chi Square/Fisher's Exact Test results for assessing the relationship between THA and healthy control variations and medical conditions. Note, 95% CI represents the 95% confidence interval for crude Odds Ratio. The p-values based on Fisher's Exact tests are denoted by *.

	Total Hip Arthroplasty	
	Odds Ratio (95% CI)	p-value
Immunodeficiency	Ref	1.000*
	0.710 (0.031,3.111)	
T1DM	Ref	1.000*
	0.789 (0.034,3.457)	
T2DM	Ref	<0.0001
	0.306 (0.156,0.540)	
Hypertension	Ref	0.120
	0.728 (0.489,1.056)	
Obese	Ref	<0.0001
	2.625 (1.811,3.911)	
Tobacco Use	Ref	0.538*
	0.642 (0.194,1.521)	
Alcohol Misuse	Ref	0.051*
	0.349 (0.084,0.921)	
Vascular Disease	Ref	0.828
	0.892 (0.412,1.653)	
Anemia	Ref	0.0014
	0.459 (0.274,0.726)	

Table 2. Binary Logistic Regression (multivariate analysis) results in assessing the relationship between THA and healthy control variations and medical conditions. Std. error indicates standard error.

Variable	Estimate	Std. Error	z-value	P-value	OR	95% CI (Lower)	95% CI (Upper)
Immunodeficiency	-0.1979	1.012	-0.196	0.8450	0.820452	0.112881	5.963276
Type 1 Diabetes	-12.4741	308.1817	-0.04	0.9677	3.82E-06	1.8E-268	8.2E+256
Type 2 Diabetes	-1.109	0.3327	-3.333	0.000859	0.329889	0.171857	0.633239
Hypertension	0.165	0.2195	0.752	0.4522	1.179393	0.767037	1.81343
Obese/ Overweight	0.6565	0.2349	2.795	0.005185	1.928032	1.216644	3.05538
Tobacco Use	-0.3635	0.5119	-0.71	0.4779	0.695239	0.254915	1.896147
Alcohol Misuse	-0.9096	0.5922	-1.536	0.1245	0.402685	0.126146	1.285454
Vascular Disease	0.235	0.3583	0.656	0.5119	1.264909	0.626712	2.552997
Anemia	-0.5148	0.2641	-1.949	0.0513	0.59762	0.356138	1.00284

4.0 DISCUSSION

Obesity is a serious medical condition that predisposes individuals to various other medical problems. Some recognized conditions linked to obesity include High blood pressure, high cholesterol, heart disease, T2DM, joint problems and musculoskeletal discomfort, breathing problems such as asthma and sleep apnea, gallbladder disease, psychological issues such as anxiety and depression, low self-esteem, social problems, various types of cancer, and premature death.²¹⁻²⁸ Furthermore, individuals with obesity may experience economic strain due to the various medical visits required for the conditions associated with obesity.²⁹⁻³¹

One of the most significant musculoskeletal impacts of obesity increased rates of osteoarthritis.^{15,21} Obesity is associated with early-onset osteoarthritis, a disabling degenerative joint disorder that presents clinically with pain, decreased mobility, and a negative impact on an individual's quality of life.^{15,21} Osteoarthritis results from both excessive joint loading and altered biomechanical patterns (such as in obesity) as well as hormonal and cytokine dysregulation.¹⁵ Obesity has been associated with increased incidence and progression of osteoarthritis in both weight-bearing and non-weight-bearing joints, the rate of joint replacements as well as their operative complications.^{15,21} It is important to note that the incidence and prevalence of obesity and osteoarthritis have increased over the years and are expected to continue to increase, which may factor into the increased rates and expected continued increase in the rates of THA.^{7,8,10-13,15}

Our results showed that individuals who were overweight/obese had nearly two times increased odds of surgery compared to individuals who were not overweight/obese. These results agree with current literature as obesity increases the risk of early-onset osteoarthritis which is the leading cause of an individual requiring THA.^{5,6,14,15,21} With osteoarthritis being strongly associated with needing THA, obesity being a major risk factor for this condition in turn increases the risk of obese individuals needing THA.^{5,6,14,15,21}

T2DM is strongly associated with osteoarthritis.^{32,33} Meta-analyses have shown that individuals with T2DM are more likely to have osteoarthritis than individuals without T2DM.^{32,33} One meta-analysis not controlling for weight or BMI showed that individuals with T2DM were 41% more likely to have osteoarthritis.³² Another meta-analysis, controlled for weight and BMI, showed that individuals with T2DM were 25% more likely to have osteoarthritis.³³ Therefore, individuals with T2DM are at an increased risk of undergoing THA due to the increased incidence and prevalence of osteoarthritis in this population.^{32,33}

Regarding individuals with T2DM in our study, individuals with T2DM had reduced odds of undergoing THA. With obesity being a predisposing factor for T2DM and a large number of T2DM individuals being obese, it would be expected for individuals with T2DM to have an increased risk of THA, opposite of what was seen in our study.^{15,21} Furthermore, the direct increased risk for osteoarthritis in T2DM populations should further increase the rates of THA

which was not seen in our study.^{32,33} Therefore, our study results do not agree with current literature.^{32,33}

An explanation for the discrepancy between our study results and current literature is the uniqueness of the Rio Grande Valley study population. This discrepancy could be due to the large population of individuals in the region being medically underserved, poverty stricken, undocumented, and having low socioeconomic status.^{18,19,34} Also, the construct of machismo, which is present at large in Latino communities, may contribute to this as it deters Hispanic males from seeking medical care because they perceive it as feminine.³⁵ Due to these factors, the individuals living in this region may have poor accessibility and availability of healthcare, leading to a decreased rate of THA. Future studies may focus on other medically underserved areas to further investigate the findings in our study.

The study limitations should be acknowledged. The relatively small number of surgical patients may have constrained the statistical power of the study. Furthermore, because only individuals evaluated at UTRGV-affiliated facilities were included, the findings may not be generalizable to other populations. The study's focus on a medically underserved area with a high burden of chronic diseases introduces additional challenges to external validity. Future investigations utilizing larger, more heterogeneous populations are warranted to strengthen generalizability and improve the robustness of statistical analyses.

5.0 CONCLUSION

This study demonstrated that overweight and obese individuals had almost double the odds of undergoing THA compared with those of normal weight, indicating that excess body mass remains a significant risk factor for advanced hip disease. Conversely, the presence of T2DM was associated with substantially lower odds of surgery, which may reflect differences in surgical candidacy, patient comorbidities, or healthcare utilization patterns. These findings underscore the importance of chronic comorbidities as risk factors and the multifactorial nature of surgical decision-making in hip arthroplasty, especially in a medically underserved, chronic disease-stricken population.

DATA AVAILABILITY

The data that support the findings of this study are available from University of Texas Rio Grande Valley, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are, however, available from the authors upon reasonable request and with permission of University of Texas Rio Grande Valley.

FUNDING STATEMENT

No funding was received for this study.

CONFLICT OF INTEREST DISCLOSURE

The authors declare that they have no competing interests.

ETHICS APPROVAL STATEMENT

Institutional Review Board approval was obtained through the University of Texas Rio Grande Valley Institutional Review Board prior to the start of the study in accordance with the Declaration of Helsinki.

AUTHOR CONTRIBUTIONS

B.C.M. contributed to the study conception, design of the study, interpretation of data, analysis, drafting of the manuscript, reviewing, and editing of the manuscript, and approved the final version of the manuscript. M.P. contributed to the design of the study, interpretation of the data, analysis, drafting of the manuscript, and has approved the final version of the manuscript.

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