

# 90-Day Postoperative Complications in Anemic THA Patients: A Sex-Stratified Analysis

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**INTRODUCTION:** Preoperative anemia is a well-established risk factor for adverse outcomes following total hip arthroplasty (THA), disproportionately affecting females and contributing to increased morbidity. Both anemia and biological sex independently influence postoperative complications, yet few studies have examined whether sex-based differences persist within anemic patients undergoing THA, a high-risk surgical population in which the combination of these factors may confer additive risks. To date, outcomes incorporating both variables in THA have not been systematically stratified to determine whether sex may attenuate or exacerbate anemia-associated risks. We aimed to evaluate 90-day postoperative complication rates between anemic males and females.

**METHODS:** We performed a retrospective cohort study using the TriNetX Research Network. Adults  $\geq 18$  years with preoperative anemia, defined by WHO hemoglobin thresholds, who underwent primary THA were included. Patients were stratified by biological sex and matched 1:1 by demographics, comorbidities, and clinical risk factors using propensity scores. Ninety-day postoperative complications were identified using ICD-10 and CPT codes. Statistical analyses included risk ratios, Kaplan–Meier survival analysis, and Cox proportional hazards modeling.

**RESULTS:** After matching, 45,788 patients were included (22,894 males; 22,894 females). Anemic females demonstrated higher rates of readmission (19.02% vs. 17.87%,  $P = 0.0015$ ), wound dehiscence (1.43% vs. 0.83%,  $P < 0.0001$ ), urinary tract infection, transfusion, and mechanical loosening. Anemic males had higher incidences of acute kidney injury, osteomyelitis, and deep vein thrombosis. No significant sex-based differences were observed for sepsis, periprosthetic joint infection, pulmonary embolism, pneumonia, or mortality.

**DISCUSSION:** Our findings demonstrate that sex modifies postoperative risk profiles among anemic THA patients. While some outcomes mirrored prior literature, others diverged, suggesting that anemia may shift or attenuate known sex-based complication patterns. Notably, females exhibited higher rates of readmission and wound dehiscence, while males demonstrated elevated risks for osteomyelitis, DVT, and AKI. These results highlight the importance of considering sex-specific vulnerabilities within high-risk anemic populations, as aggregate analyses may mask clinically meaningful differences. Limitations include reliance on coded data, lack of surgical detail, and use of WHO anemia thresholds that may not fully capture clinically relevant risk in older patients. Collectively, these findings emphasize the need for refined preoperative risk assessment and tailored perioperative management strategies.

**SIGNIFICANCE/CLINICAL RELEVANCE:** This study highlights the need for sex-specific perioperative optimization strategies in anemic patients undergoing THA. Tailoring anemia management and risk stratification by sex may improve orthopedic surgical outcomes and guide refinement of current hemoglobin thresholds.

Table 1: Sex-Stratified 90-Day Postoperative Complications Following THA: Odds Ratios, Hazard Ratios, and P-Values

Complication	OR	95% CI	HR	95% CI	P-value	Favored Sex
Acute Kidney Injury	1.15	1.05–1.27	1.16	1.06–1.27	0.0030	Male
Acute Post-hemorrhagic Anemia	0.76	0.72–0.81	0.77	0.73–0.82	< 0.0001	Female
Blood Transfusion	0.63	0.57–0.71	0.64	0.57–0.71	< 0.0001	Female
Deep Vein Thrombosis	1.20	1.02–1.41	1.20	1.02–1.41	0.0298	Male
Mechanical Loosening	0.79	0.56–1.11	0.80	0.57–1.12	0.1694	No significant difference
Mortality	1.22	0.99–1.51	1.23	1.00–1.52	0.0575	No significant difference
Osteomyelitis	1.36	1.04–1.78	1.37	1.05–1.79	0.0222	Male
Periprosthetic Joint Infection	1.03	0.82–1.30	1.04	0.83–1.31	0.7717	No significant difference
Pneumonia	0.98	0.84–1.13	0.98	0.85–1.14	0.7358	No significant difference
Pulmonary Embolism	1.04	0.87–1.23	1.04	0.88–1.23	0.6960	No significant difference
Readmission/Hospitalization	0.93	0.88–0.97	0.94	0.90–0.98	0.0015	Female
Sepsis	1.01	0.86–1.20	1.02	0.86–1.21	0.8977	No significant difference
Urinary Tract Infection	0.53	0.47–0.59	0.54	0.48–0.60	< 0.0001	Female
Wound Dehiscence	0.58	0.48–0.69	0.59	0.49–0.70	< 0.0001	Female

OR = odds ratio from logistic regression; HR = hazard ratio from Cox proportional-hazards model (Kaplan–Meier/log-rank). All confidence intervals are 95%.