

Racial and Ethnic Variation in Inflammatory Markers and Microbiologic Profiles in Periprosthetic Joint Infection: A Multicenter Retrospective Cohort Study

Elias Nasser BS¹, Joshua Davis BS², Rohith Ryali BS³, Samhita Bandaru BS¹, Adriana Liimakka MD²,
Ayesha Abdeen MD³, Antonia F. Chen MD MBA¹

¹UT Southwestern Medical Center, Department of Orthopaedic Surgery, Dallas, TX, USA

²Brigham and Women's Hospital, Department of Orthopaedic Surgery, Boston, MA, USA

³Boston Medical Center, Department of Orthopaedic Surgery, Boston, MA, USA

Introduction

Periprosthetic joint infection (PJI) is a devastating complication after total joint arthroplasty (TJA). Diagnosis relies on serum inflammatory markers and synovial fluid analysis. One prior study demonstrated elevated serum ESR in Black patients undergoing aseptic revision, but **no studies have examined racial variation in diagnostic markers for PJI or whether such differences impact diagnostic accuracy** [1].

Methodology

A **retrospective, multi-center cohort study** was conducted on patients from **3 large academic centers** who underwent **revision TJA for PJI from 2000 to 2025**. Exclusion criteria included primary TJA for fracture or tumor indication and patients with significant immunocompromise (e.g., solid organ transplant or chronic DMARD use). **Demographic data, serum inflammatory markers (ESR, CRP, WBC), synovial fluid analysis (nucleated cell count, PMN percentage), and microbiologic culture results were collected**. Patients were assigned an **Area Deprivation Index (ADI)** score using the Wisconsin Neighborhood Atlas [2]. Statistical analysis was performed in Python (pandas, SciPy).

Objective

The purpose of this study was to **determine whether significant racial differences exist in serum and synovial fluid diagnostic markers for PJI across diverse patient populations**.

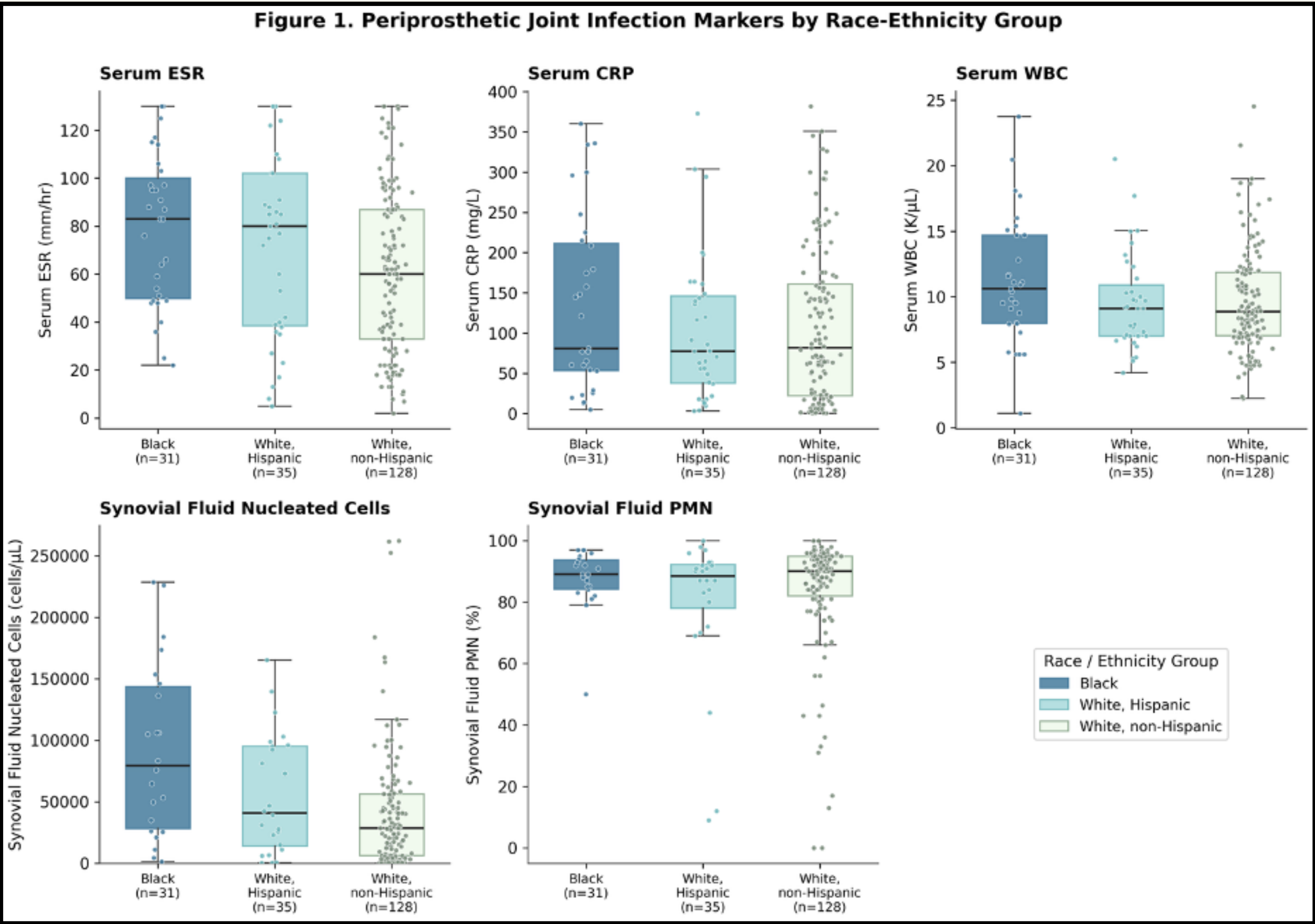
Results

There were **199 PJI patients who underwent surgical revision**. Revision strategies included debridement with implant retention (31.2%), one-stage revision (35.7%), and two-stage revision (32.7%).

Reinfection occurred in 21.1% of patients.

Serum ESR was higher in Black patients (78.8 mm/hr) compared with White non-Hispanic patients (60.5 mm/hr) and White Hispanic patients (71.8 mm/hr; **P=0.014**).

Synovial fluid nucleated cell counts were also highest in Black patients (91,611 cells/ μ L) compared with White Hispanic (55,950 cells/ μ L) and White non-Hispanic patients (44,551 cells/ μ L; **P=0.003**). **CRP, WBC, and synovial PMN percentage did not differ significantly by race** (Figure 1).



Conclusions

Significant racial and ethnic disparities exist in PJI markers, **with Black patients demonstrating higher ESR and synovial nucleated cell counts**. Despite racial differences in certain inflammatory markers, **Area Deprivation Index itself showed no relationship with systemic or synovial inflammatory markers in PJI**. These findings suggest race and ethnicity may influence inflammatory biomarker expression, potentially impacting diagnostic accuracy with standardized thresholds.

References

1. Padua FG et al. The Journal of Arthroplasty. 2021 Apr 1;36(4):1420-8.
2. Kind AJH et al. New England Journal of Medicine, 2018. 378: 2456-2458.