

BODY ARMOR WEAR AND INJURY PREVALENCE IN MILITARY POPULATIONS: A SYSTEMATIC REVIEW

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INTRODUCTION

- Body armor is a critical component of military personal protective equipment and has substantially reduced combat-related mortality
- Despite advancements in armor design, service members continue to experience thoracoabdominal, spinal, and musculoskeletal injuries
- Coverage gaps in the lateral, inferior, and posterior torso may contribute to persistent injury risk
- Few studies have systematically characterized injury patterns among military personnel wearing armor

PURPOSE

To systematically evaluate injury prevalence and patterns among military personnel wearing body armor

METHODS

- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 Guidelines
- Databases: CINAHL, DTIC, EMBASE, and PubMed
- Search Strategy: terms related to body armor, injury patterns, military personnel, and prevalence
- Search Period: Sept 2020 – Sept 2025
- Joanna Briggs Institute (JBI) Critical Appraisal Tool
- Inclusion Criteria: military personnel (all branches, components, and countries) presumed to be in body armor with reported injury outcomes

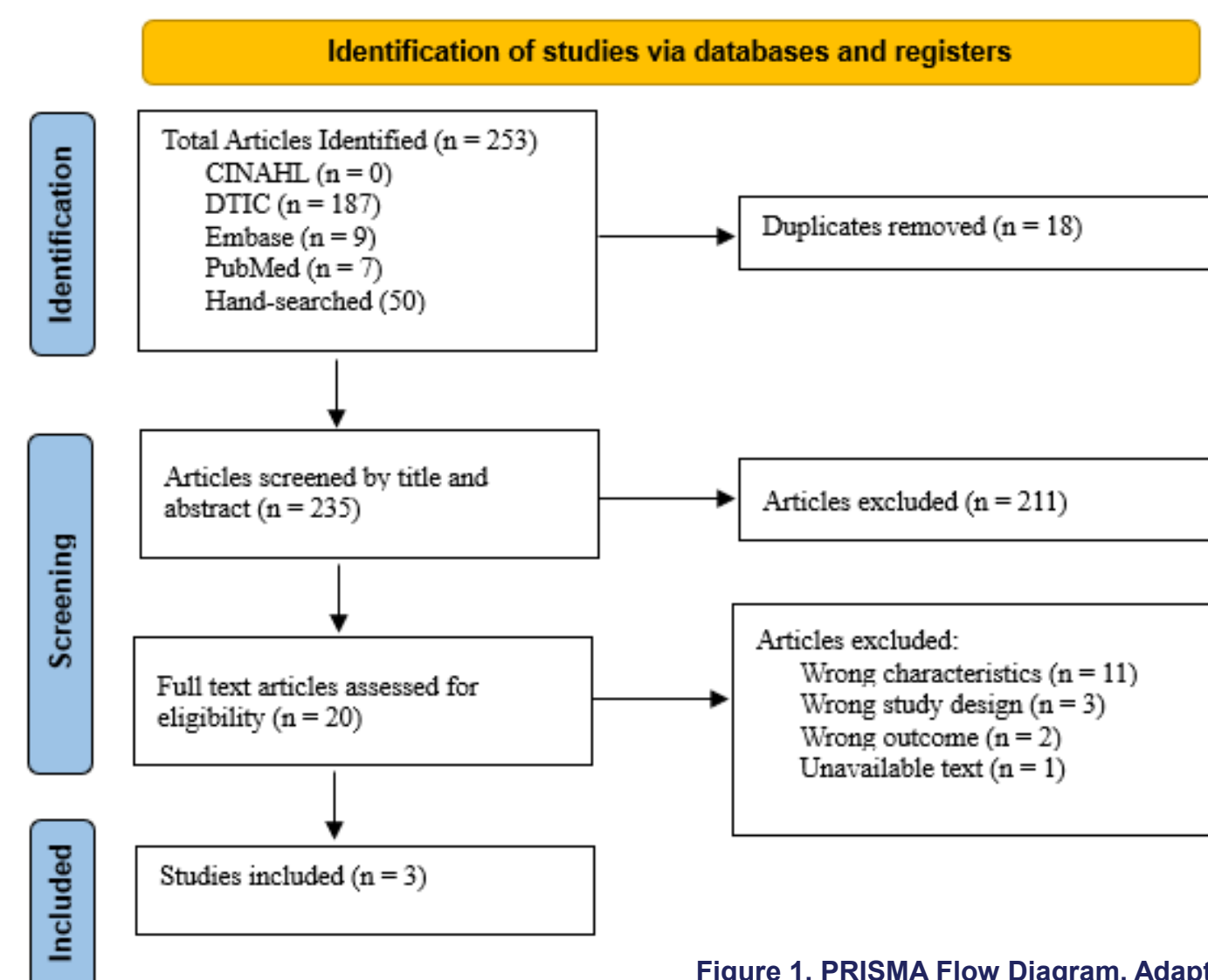


Figure 1. PRISMA Flow Diagram. Adapted from Page et al. (2021).

RESULTS

• Abdominal

- Increased stomach and small bowel injuries, **colon** commonly injured
- 83.6% vs. 65.8% hollow viscus injury (military vs. civilian)

• Musculoskeletal

- 61% vs. 5% physical therapy use during mandated body armor wear
- More NSAID prescriptions during body armor wear (16% vs 10%)

• Spinal

- Blunt trauma (3.31 OR) and polytrauma (8.98 OR) associated with spinal injury risk
- Primary injury observed was spinal fractures (96.5%)
- 45% lumbar, 29% thoracic, and 26% cervical spine injuries observed
- Frequently required ICU admission and rehabilitation

Author/year/country	Population	n	Female (%)	Injury location(s) (%)	Injury type	Injury mechanism(s) (%)	RoB
Dilday et al. (2023), USA	Military w/ GSW	183	2	TCA (100)	Organ injury	GSW (100)	M
Kuckelman et al. (2025), USA	Deployed SMs	968	2	Back (24) Shoulders (23) Hip (4) Neck (9) TCA (1) Extremities (23)	MSK	Gear weight, prolonged use (100)	M
Shapira et al. (2025), Israel	Soldiers in SIW	93	1.1	Spine (100)	Fracture	Explosion (53.8) GSW (21.5) Blunt (24.7)	H

Table 1. Characteristics of studies included in the systematic review



DISCUSSION

• Modern body armor has changed combat injury patterns

- Across studies, effective thoracic protection was accompanied by persistent injuries to the lateral and inferior abdomen and the lumbosacral spine, suggesting that injury burden has shifted towards less-protected anatomical regions.

• Regional coverage appears to influence injury distribution

- Hollow viscus injuries and lumbar spine trauma occurred in areas with limited armor coverage or areas susceptible to coverage gapping. Indicating that current armor systems provide nonuniform protection against penetrating, blast, and blunt-force mechanisms

• Protection must be balanced with operational performance

- Prolonged body armor wear with increased load carriage was associated with musculoskeletal injuries, reduced mobility, fatigue, and greater healthcare utilization, suggesting that ergonomic design is as important as ballistic protection

• Current evidence limits optimization of future armor systems

- The predominance of retrospective studies and the near absence of female participants prevent evaluation of sex-specific injury patterns, limiting the evidence needed to guide anthropometrically optimized body armor

CONCLUSION

- Modern body armor has substantially reduced combat mortality but has also revealed persistent anatomical and biomechanical challenges
- Future armor designs should improve protection of vulnerable torso regions while optimizing ergonomics and incorporating sex-specific anthropometric considerations to reduce injury burden and improve operational performance

References available upon request