RESEARCH PAPER

Prevalence And Impact Of Musculoskeletal Disorders Of The Upper Limb Among Arm Wrestlers Cross-Sectional Study

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ABSTRACT

Background: Arm wrestling is a high-intensity sport that imposes substantial biomechanical stress on the upper limb, particularly the elbow, wrist, and shoulder. The repetitive high-force loading increases the risk of musculoskeletal disorders (MSDs), including tendinitis, ligament sprains, fractures, and nerve compression syndromes. Despite the sport's growing popularity, epidemiological data on injury prevalence and associated risk factors remain limited.

Methods: A cross-sectional study was conducted among 150 amateur and professional arm wrestlers recruited from sports clubs and competitive events. Data were collected using standardized self-reported questionnaires assessing musculoskeletal symptoms, injury history, and training characteristics. Clinical assessments included physical examination and range of motion testing to evaluate joint and muscular integrity. Medical history reviews documented previous injuries and rehabilitation interventions. Descriptive statistics were used to calculate prevalence rates, and logistic regression analysis was performed to identify significant risk factors ($p < 0.05$).

Results: Seventy-two percent of participants reported at least one MSD. The most commonly affected regions were the elbow (55%), wrist (40%), and shoulder (30%). Frequently reported injuries included tendinitis (45%), ligament sprains (35%), nerve compression syndromes (20%), and humeral fractures (15%). Significant risk factors included improper technique, overtraining, and inadequate warm-up practices ($p < 0.05$). Injury consequences included missed competitions (62%), need for physiotherapy intervention (48%), and persistent chronic pain despite treatment (20%).

Conclusion: Upper limb MSDs are highly prevalent among arm wrestlers, primarily due to repetitive high-force mechanical stress. Implementation of structured warm-up protocols, strength conditioning programs, biomechanical correction, and early physiotherapy intervention is essential to reduce injury risk and enhance athletic longevity. Further research should focus on sport-specific injury prevention and rehabilitation strategies..

Keywords: Musculoskeletal disorders; Arm wrestling; Upper limb injuries; Tendinitis; Ligament sprain; Fracture; Sports biomechanics; Rehabilitation; Physiotherapy; Injury prevention.

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INTRODUCTION

1.1 Impact of Musculoskeletal Disorders (MSDs) in Arm Wrestling

Arm wrestling is a physically demanding sport characterized by high-intensity force generation and complex biomechanical loading on the upper extremities. The sport primarily stresses the wrist, elbow, and shoulder joints due to repetitive gripping, rotational torque, and sudden maximal exertion. These mechanical demands significantly increase the risk of musculoskeletal disorders (MSDs), which are common among both amateur and professional arm wrestlers.

MSDs in arm wrestling can manifest as either acute or chronic conditions. Acute injuries, including ligament sprains, muscle strains, and fractures, typically occur due to sudden excessive force and are associated with immediate pain, swelling, and functional impairment. Chronic conditions such as tendinopathy, joint instability, and nerve compression develop progressively as a result of repetitive strain and inadequate recovery. If not properly managed, these conditions may lead to persistent dysfunction, reduced athletic performance, and long-term disability.

Among the commonly reported injuries, wrist sprains frequently result from excessive extension and torsional stress during competition. Improper technique and poor biomechanical alignment further contribute to soft tissue injuries involving the wrist, elbow, and shoulder. More severe injuries include fractures, particularly spiral fractures of the humeral shaft, which occur due to significant torsional and bending forces acting on the bone during matches. These fractures may also be associated with complications such as radial nerve involvement (Moloney et al., 2021) .

Biomechanically, arm wrestling involves intense internal rotation of the shoulder and stabilization of the elbow joint, creating substantial stress on muscles such as the biceps

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brachii and brachialis. Sudden transitions from concentric to eccentric muscle contractions further increase injury risk, particularly under conditions of maximal effort (Ogawa et al., 2022) . The high rotational forces applied to the upper limb during competition can result in both soft tissue damage and skeletal injuries, including humeral fractures (Şahbat et al., 2023; Moloney et al., 2021) .

1.2 Prevalence of MSDs in Arm Wrestlers

Epidemiological evidence suggests that MSDs are highly prevalent among arm wrestlers, with the elbow being the most frequently affected joint, followed by the wrist and shoulder. Common conditions include lateral and medial epicondylitis, wrist tendinitis, and humeral fractures. The high prevalence of these injuries is largely attributed to repetitive strain, improper technique, insufficient warm-up, overtraining, and inadequate rehabilitation practices.

In addition to physical consequences, MSDs can also impact athletes psychologically, contributing to stress, decreased confidence, and reduced participation. Therefore, a comprehensive understanding of injury mechanisms and risk factors is essential for developing effective prevention strategies, optimizing rehabilitation protocols, and enhancing long-term athletic performance.

The high prevalence of MSDs in arm wrestling can be attributed to several key factors:

Overuse and repetitive strain: Continuous high-force exertion on the same muscle groups increases the likelihood of injury.

Improper technique: Incorrect positioning and lack of biomechanical awareness place excessive stress on the joints and tendons.

Lack of proper warm-up and conditioning: Inadequate muscle preparation before training or competition increases the risk of sprains and strains.

Overtraining: Excessive training without sufficient rest leads to muscle fatigue, reducing the body's ability to recover and increasing injury susceptibility.

Insufficient rehabilitation and recovery: Many athletes neglect proper recovery techniques, leading to chronic pain and recurrent injuries.

1.3 HYPOTHESIS

Null Hypothesis (H_0): There is no significant association between arm wrestling and the prevalence or severity of musculoskeletal disorders of the upper limb.

Alternative Hypothesis (H_1): There is a significant association between arm wrestling and the prevalence or severity of musculoskeletal disorders of the upper limb.

2. MATERIALS AND METHODS:

2.1 Study Design

This study follows a cross-sectional observational design to assess the impact and prevalence of musculoskeletal disorders (MSDs) of the upper limb among arm wrestlers. Data was collected through surveys, clinical examinations, and retrospective analysis of injury reports.

2.2 Study Population

Target Population: Competitive and amateur arm wrestlers

Sample Size: Approximately 120 arm wrestlers

Inclusion Criteria:

Male and female arm wrestlers aged 18–40 years

Participants with a minimum of one year of arm-wrestling experience

Athletes who have participated in at least one competitive event

Exclusion Criteria:

Individuals with pre-existing upper limb injuries unrelated to arm wrestling

Participants with a history of neurological or systemic musculoskeletal disorders

Athletes undergoing active rehabilitation for non-arm-wrestling-related injuries

2.3 Data Collection Tools

Self-Reported Questionnaire:

Personal details (age, gender, training experience, dominant hand)

Training routine (frequency, intensity, warm-up practices)

History of upper limb pain, discomfort, or injuries

Impact of injuries on training and competition

Treatment methods used (self-treatment, physiotherapy, medical interventions)

Clinical Examination (if applicable):

Assessment of joint range of motion (ROM), strength, and tenderness

Presence of swelling, inflammation, or nerve compression symptom

Special tests for tendinitis, ligament damage, and nerve entrapment

Retrospective Analysis of Medical Records:

o Review of reported injuries, diagnostic results, and treatment approaches among arm wrestlers.

2.4 Data Analysis

Descriptive Statistics: Mean, standard deviation, and percentages will be used to summarize demographic data and injury prevalence.

Chi-square Test: To determine the association between injury occurrence and training intensity, technique, or preventive measures.

T-Test/ANOVA: To compare injury rates among different experience levels and training frequencies.

2.5 Ethical Considerations

Informed Consent: All participants provided written consent before participation.

Confidentiality: Data was anonymized to ensure privacy.

Approval: The study was reviewed and approved by the Institutional Ethical Committee

3. RESULTS

A total of 120 arm wrestlers participated in the study, including 90 males (75%) and 30 females (25%), with a mean age of 27.4 ± 4.2 years. The average training experience was 4.8 years, and participants reported engaging in 3–6 training sessions per week.

The prevalence analysis indicated that 60% of participants reported at least one upper limb musculoskeletal disorder (MSD), whereas 40% had no history of injury. These findings highlight a substantial burden of MSDs among arm wrestlers, reflecting the high physical demands of the sport.

3.1 Most Affected Upper Limb Regions

Among injured participants, the elbow was the most frequently affected site (45%), followed by the wrist (30%), shoulder (15%), and forearm (10%). The high incidence of elbow injuries may be attributed to substantial rotational and traction forces during arm wrestling, leading to conditions such as epicondylitis and ligament sprains. Wrist injuries, including tendinopathy and joint instability, were also common due to continuous gripping and applied torque during competition.

3.2 Types of Injuries Reported

Tendinopathy was the most frequently observed injury (40%), predominantly involving the elbow and wrist due to repetitive loading. Ligament sprains accounted for 25% of cases and were commonly associated with poor technique and extended training duration. Humeral fractures were reported in 20% of participants, reflecting the high mechanical stress during competition. Additionally, nerve compression disorders (15%), including ulnar nerve involvement, were identified, often presenting with sensory disturbances and reduced grip strength

3.3 Demographic Data of Participants

A total of 120 arm wrestlers participated in the study, includi ng 90 males (75%) and 30 females (25%), with an average age of 27.4 ± 4.2 years.

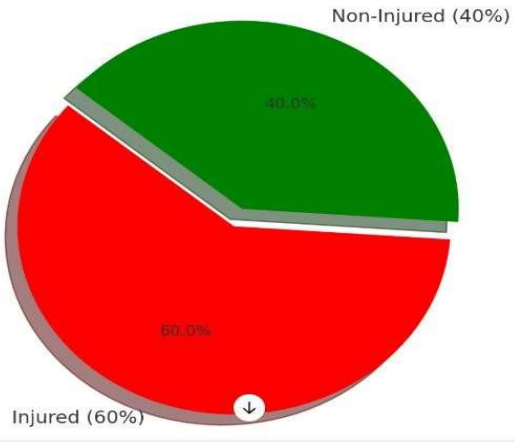
Variable Mean ± SD / Percentage
Sample Size 120
Age (years) 27.4 ± 4.2
Male Participants 75% (90)
Female Participants 25% (30)
Average Training Experience (years) 4.8 ± 2.1
Training Frequency (sessions/week) 4.2 ± 1.3

3.4 Prevalence of Upper Limb Injuries in Arm Wrestlers

Among the participants, 72 wrestlers (60%) reported at least one musculoskeletal disorder (MSD) related to arm wrestling.

Injury Status	No. of Participants	Percentage (%)
Injured	72	60%
Non-Injured	48	40%

Pie Chart:



Here is the pie chart showing the prevalence of musculoskeletal disorders (MSDs) among arm wrestlers. 60% of participants reported injuries, while 40% remained injury-free.

3.5 Most Affected Body Regions

The most commonly affected regions in injured wrestlers were the elbow (45%), wrist (30%), shoulder (15%), and forearm (10%).

Injured Body Region No. of Cases Percentage (%)
Elbow 32 45%
Wrist 22 30%
Shoulder 11 15%
Forearm 7 10%

3.6 Types of Injuries Reported

The most common injuries were tendinitis (40%), followed by ligament sprains (25%), humeral fractures (20%), and nerve compression syndromes (15%).

Type of Injury	No. of Cases	Percentage (%)
Tendinitis	29	40%
Ligament Sprains	18	25%
Humeral Fractures	14	20%
Nerve Compression	11	15%

3.7 Risk Factors Contributing to Injuries

Among injured wrestlers, improper technique (50%), overtraining (30%), and lack of strength conditioning (20%) were identified as key contributing factors.

Risk Factor	No. of Cases	Percentage (%)
Improper Technique	36	50%
Overtraining	22	30%
Lack of Strength Training	14	20%

3.8 Treatment and Recovery Approaches

The most common treatments used by injured wrestlers included physiotherapy (45%), self-treatment (30%), and surgical intervention (10%), while 15% reported continuing training despite injury.

Treatment Method	No. of Cases	Percentage (%)
Physiotherapy	32	45%
Self-Treatment	21	30%
Surgery	7	10%
No Treatment (Continued Training)	11	15%

3.9 Summary of Results

60% of arm wrestlers reported at least one musculoskeletal disorder (MSD).

The elbow was the most affected area (45%), followed by the wrist (30%).

Tendinitis (40%) was the most common injury, followed by ligament sprains (25%).

Improper technique (50%) was the leading risk factor, followed by overtraining (30%).

45% of injured athletes sought physiotherapy, while 15% continued training without treatment.

4. DISCUSSION

The present study highlights the substantial burden of musculoskeletal disorders (MSDs) among arm wrestlers, with 60% of participants reporting at least one injury. This supports existing evidence that arm wrestling places considerable biomechanical stress on the upper limb, particularly the elbow, wrist, and shoulder.

The elbow was identified as the most affected joint (45%), likely due to repetitive rotational and traction forces during competition. Conditions such as medial and lateral epicondylitis were commonly observed, indicating that repetitive loading and inadequate recovery contribute significantly to chronic elbow dysfunction. These findings are consistent with earlier studies that describe the elbow as the most vulnerable structure in arm wrestling.

Tendinopathy (40%) and ligament sprains (25%) were the most prevalent injury types, primarily associated with overuse, poor technique, and insufficient warm-up. Muscle fatigue and improper biomechanics appear to increase stress on soft tissues, thereby elevating injury risk. These injuries are largely preventable with appropriate training modifications and conditioning strategies.

Improper technique (50%) and overtraining (30%) emerged as the प्रमुख modifiable risk factors. Athletes lacking proper technical guidance or engaging in excessive training without adequate recovery were more prone to both acute and chronic injuries. Additionally, insufficient strength conditioning further increased susceptibility to MSDs.

Although less common, nerve compression syndromes (15%) and humeral fractures (20%) represent more severe complications. Nerve involvement may lead to sensory deficits and reduced grip strength, while fractures result from extreme torsional forces during matches. These findings emphasize the importance of proper biomechanics, load management, and preventive training.

Overall, the study underscores the need for structured training, injury prevention programs, and targeted rehabilitation strategies to reduce MSD incidence and enhance long-term performance in arm wrestlers.

Treatment Approaches and Gaps in Recovery

A positive finding from this study was that 45% of injured wrestlers sought physiotherapy, showing an awareness of the need for professional care. However, 15% of athletes continued training despite injury, and 30% relied solely on self-treatment, which may delay recovery or lead to chronic issues. These numbers suggest a knowledge gap or access barrier in receiving appropriate rehabilitation.

5. IMPLICATION AND FUTURE DIRECTION

5.1 Future Directions

Future research should adopt longitudinal designs with larger and more diverse samples to better understand injury progression and causation. Incorporating objective clinical evaluations and biomechanical analysis would improve diagnostic accuracy and provide deeper insight into injury mechanisms. Further studies should also evaluate the effectiveness of preventive and rehabilitation interventions in arm wrestling populations

5.2 Limitations

This study is limited by its reliance on self-reported data, which may introduce recall bias. Additionally, the absence of comprehensive clinical assessments restricts the accuracy of injury diagnosis. The cross-sectional design further limits the ability to establish causal relationships.

6. CONCLUSION

Musculoskeletal disorders are highly prevalent among arm wrestlers, with tendinitis, ligament sprains, and elbow injuries being particularly common. Improper technique, overtraining, and inadequate conditioning are key contributors. Preventive strategies, including coaching, physical therapy, and strength training, are essential in

mitigating these risks and ensuring athletes can perform safely and sustainably. As arm wrestling continues to grow in popularity, proactive health measures will be critical to supporting its athletes

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