General

A nationwide analysis of upper extremity injuries in martial arts

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Objective

Given the rise of martial arts within the fitness and recreational industry, it is important to study trends in injury and note that practicing martial arts comes with a risk of injury, particularly to the upper extremities. By studying consumer product-related injuries to the upper extremities and addressing the current gap in the literature, future martial arts equipment can come with increased safety features, better provide information to healthcare providers treating such injuries, and improve risk mitigation through the Consumer Product Safety Commission.

Methods

The National Electronic Injury Surveillance System Database was analyzed to collect data on martial arts equipment-related injuries on the upper extremities within the last 10 years.

Results

Over the most recent span of 10 years (2013-2022), there were approximately 78,680 injuries reported to the ED. The majority of them took place in 2013 (12.8%). Men were 2.4 times more likely to get injured than women. Injuries peaked in the age group 10-19-year-olds (33%) and particularly age 12 (4.8%). The upper extremity most commonly affected was the shoulder (29.1%), and the most common diagnosis group was a fracture (29.2%). Most injuries presented to the emergency department were not hospitalized (98.7%).

Conclusions

This study highlights the occurrence of upper extremity injuries due to martial arts within the last 10 years and provides new information on the prevalence of such injuries. The results highlight that these injuries are usually non-severe and most commonly affect adolescent males; however, future research should explore performance-based recovery post-injury and long-term pain.

INTRODUCTION

The population participating in martial arts in the United States is steadily increasing as new physical, emotional, and mental benefits of martial arts are being discussed. An online survey by the statistical research department found that between 2010 and 2021, the popularity of martial arts increased by 23 percent, and martial arts now has 6.2 million participants across the United States.[1] In a comprehensive review of the health effects of 'hard' martial arts practice among adults, the authors noted that various studies consistently reported positive impacts, particularly in areas such as balance, cognitive function, and psychological health.[2] Despite methodological weaknesses across studies, the evidence suggests promising potential for martial arts to improve declining functions associated with aging, thereby potentially mitigating health risks prevalent in the elderly population. Physicians should consider the positive merits of martial arts as an exercise regimen, potentially recommending it to patients seeking a beneficial and meaningful form of physical activity.

Regrettably, participation in contact sports also increases the risk of injuries, a threat to any participant in martial arts. The CDC reports that unintentional injuries are the leading cause of death for ages 1-44.[3] Martial arts have garnered a reputation for being a very dangerous sport, preventing many people from participating and causing them to miss out on all the mind-body benefits the sport has to offer. Additionally, sports injuries place a financial burden on our nation's healthcare system while causing educational and economic loss. In a single year,

20 million days of school are missed in ages 5-22 due to sports-related injuries,[4] and 33 billion dollars are spent in converting healthcare costs alone for that age range. It is imperative to study the relationship between martial arts injuries and injuries to help make important standards for injury prevention and mitigation.

After experiencing a martial arts injury, 60% of participants can expect to return to pre-injury performance even after a major injury due to the advancements in orthopedic biomechanics.[5] Given that, injuries come with emotional damage as well. For example, in athletes undergoing ACL reconstruction, it was found that 61% of them had symptoms of depression.[6]

In light of the prevalence of upper-extremity injuries among athletes, particularly those affecting the shoulder, elbow, wrist, and hand due to falls onto outstretched arms, the current study focuses on the upper extremities. Primary care and sports medicine physicians routinely encounter such injuries in their practice. This emphasis is grounded in the recognition that upper-extremity injuries are not only common but also necessitate specialized knowledge for effective diagnosis and treatment. By concentrating on this specific anatomical region, my study aims to contribute valuable insights and guidance for healthcare professionals, providing general treatment guidelines and highlighting the criteria for referral to sports medicine or orthopedic specialists in the management of sports-related upper-extremity injuries.

METHODS

STUDY DESIGN

The National Electronic Injury Surveillance System (NEISS) database was used to perform a retrospective study of upper extremity injuries due to martial arts. NEISS is a public venture of the United States Consumer Product Safety Commission, which uses data from emergency departments from around the nation to track trauma related to consumer products.

STUDY POPULATION

The National Electronic Injury Surveillance system data uses emergency department data of around 100 hospitals out of the approximately 5000 emergency departments within the United States. The data from a ten-year span from 2013-2022 was analyzed. The youngest age presented in the database was 2 years, and the oldest was 84; however, there was not specific enough data for specific ages; individuals were evaluated in the form of 10-year age groups. Injuries only due to martial arts were evaluated and only the upper extremities were observed: Shoulder (30), Elbow (32), Upper Arm (33), Wrist (34), Upper Arm (80), Hand (82), and Finger (92). A total of 3,257 martial arts consumer products were entered into the database. All diagnosis codes were quired, but only those with numerical values were used in interpretation, including Contusions/Abrasions (53), Dislocation (55), Fracture (57), Poisoning (68), and Strain/Sprain (64).

Certain categories had to be excluded from the analysis as the NEISS database returned asterisks compared to numeral values as asterisks represent statistically insignificant (national cases less than 1200 or recorded cases less than 20)

STATISTICAL ANALYSIS

Ages, gender, diagnosis, body parts, and disposition were studied. All martial arts consumer products were grouped under one general category known as “sports and recreation equipment.” Statistical analyses were performed using JMP 17.0. The overall purpose of this examination is to evaluate if there is a link between the probability of getting injured due to martial arts.

RESULTS

Over the span of ten years there were a total of 78,680 related injuries to the upper extremities caused by martial arts equipment. Of all the injuries, males suffered 70.57 percent of all the injuries placing them 2.4 times more likely to get injured than their female counterparts. As the age group changed, so did the distribution of cases. Injury rates were the highest in the age group of 10-19 (33 percent of all injuries) followed by 20-29 (4.8 percent of all injuries) The upper extremity most commonly affected was the shoulder (29.1%), and the most common diagnosis group was a fracture (29.2%) and in terms of disposition, most injuries presented to the emergency department were not hospitalized (98.7%). Therefore, it is important to note that although martial arts injuries may be capital, they are more likely not fatal. The majority of them took place in the year 2013 (12.8%) meaning that it is plausible to assume that martial arts safety has increased over the course of the last 9 years.

DISCUSSION

While often overlooked, martial arts-related incidents drive a significant number of visits to emergency departments. The current review of the NEISS database unveiled a staggering 78,680 injuries associated with martial arts, leading to emergency care between 2013 and 2022, averaging 7,868 cases annually. In comparison, the National Safety Council records around 3.2 million emergency visits each year for sports and recreational activities. This data underscores that roughly 1 out of every 406 sports-related injuries in the United States involve martial arts. This prevalence underscores the importance of delving deeper into preventive strategies and risk-reduction techniques specifically tailored for martial arts.

A significantly larger percentage of martial arts memberships in the United States are held by men, comprising 73% of the total participants, with women accounting for a lower proportion. Typically, children engaged in mixed martial arts tend to stay active in the sport for an average of 2.6

years and typically conclude their participation in mixed martial arts by the age of 9.[7] Around half, or approximately 50%, of martial art students are below the age of 18. The most significant age bracket involved in martial arts comprises 7 to 12-year-olds, constituting approximately 26% of the total membership and on the other hand, the smallest age group involved is individuals aged 55 and older, accounting for roughly 2% of the total membership. Addressing the gender gap and ensuring equal access to the sport for all individuals, regardless of gender, can play a vital role in countering this prevailing trend.

The current database analysis aligns with earlier epidemiological discoveries, reaffirming that males experience considerably higher absolute rates of injuries related to martial arts compared to women. The research revealed that males endure martial arts related injuries at a rate 2.4 times higher than females.[8] Hence, there's a higher count of documented cases where males seek emergency department care for martial arts related injuries compared to women. Therefore, while males experience higher injury rates, it's essential to note that this doesn't necessarily indicate a higher susceptibility to injuries compared to women. This trend is influenced by the fact that the majority of martial arts participants are men.

During adolescence, both men and women experienced the highest frequency of injuries, particularly within the 10-19 age group among men, peaking at 12 years. This implies that male martial artists are notably prone to injury during this developmental stage. Given that many martial artists begin without prior experience, comprehensive and meticulous training becomes paramount. Even minor missteps in technique or handling during martial arts practice can considerably elevate the risk of injuries. Considering that injuries in both genders are prevalent during adolescence, these findings highlight the need for enhanced focus on comprehensive training and precise guidance for novice martial artists to mitigate potential injuries.

The shoulder emerged as the primary injury site for both genders, most commonly diagnosed with fractures. Despite the use of safety gear among martial artists aimed at chest and shoulder padding protection, it remains highly susceptible to injuries due to consistent and excessive pressure exerted while punching and all upper extremity movement is related back to the shoulder cuff. Fractions, frequently painful and accompanied by bruising and swelling, persist as a prevalent cause, prompting patients to seek emergency medical attention.

The next most common diagnosis group was strains and sprains. Strains and sprains are frequently observed in martial arts due to the dynamic and agile movements involved, often requiring sudden shifts in body positions and intense physical exertion, which can place significant stress on muscles and ligaments. Since many of these injuries result from inadequate technique, repetitive strain, and insufficient recovery periods, it becomes crucial to furnish martial arts practitioners with comprehensive training aiming to mitigate the risk of recurring injuries.[9-11]

There are limitations in this study worth mentioning. First, the NEISS database might underreport the total count of martial arts-related injuries since it solely captures cases where individuals sought treatment in the ED, excluding those who sustained injuries but didn't seek emergency care. Moreover, due to martial arts predominantly male participation, there's a scarcity of data available specifically for women.

Second, the NEISS database only accounts for individuals who opted to receive care in an emergency department and may not be representative of individuals with injuries who opted to either not get care or visited private non-emergency clinics. And lastly, the database also has very limited data on race and geographic location of injury.

Prior to 2019, the NEISS database did not allow for multiple diagnoses/body parts to be entered.

In 2019, the NEISS enhanced its data collection to include two diagnoses and body parts, along with up to three product codes per record. This modification impacts the computation of national injury estimates and their variability. A single NEISS record can contribute to multiple counts when estimating national injuries, affecting product groups and diagnoses. This adjustment increases data granularity. The NEISS database only uses estimates from 100 national hospitals, the numbers presented are not true incidences.

CONCLUSION

This study highlights the significant impact of martial arts on both physical and mental health, as well as the inherent risks associated with participation in this contact sport. The increasing popularity of martial arts in the United States underscores its potential as a beneficial form of exercise, particularly for aging populations. However, the prevalence of upper-extremity injuries, especially among male participants and within certain age groups, necessitates a focused approach to injury prevention and management.

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