

GENDER DIFFERENCES IN EXPOSURE TO HAND TRAUMA

RAZLIKE MEĐU POLOVIMA U IZLOŽENOSTI POVREDAMA ŠAKE

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Abstract

Introduction. Hand injuries are among the most frequently treated conditions in plastic surgery. Suboptimal management can lead to prolonged healing, complications, significant morbidity, and severe disability. This study aimed to evaluate gender differences in the mechanisms, etiology, physical impairments, and post-traumatic stress symptoms associated with hand and forearm injuries following treatment. **Material and Methods.** This study included 101 patients with hand injuries treated at the Clinic for Plastic and Reconstructive Surgery, University Clinical Center of Vojvodina in Novi Sad, between 2020 and 2023. Data collected encompassed age, gender, education level, injury mechanism, hospitalization duration, defect reconstruction type, number of surgical procedures, and the Modified Hand Injury Severity Score. The Quick Disabilities of the Arm, Shoulder and Hand score and the Short Post-Traumatic Stress Disorder Rating Interview Score were calculated through telephone interviews. **Results.** The mean Quick Disabilities of the Arm, Shoulder and Hand score was 37.8 in men, and 55.7 in women, while the mean Short Post Traumatic Stress Disorder Rating Interview Score was 8.6 in men and 12.1 in women. The mean Modified Hand Injury Severity Score was 47.1 in men and 43.2 in women. **Conclusion.** Women exhibited significantly higher Quick Disabilities of the Arm, Shoulder and Hand score and Short Post-Traumatic Stress Disorder Rating Interview Score scores than men, indicating greater physical impairments and an elevated risk of posttraumatic stress disorder following injuries. Additionally, circular saw injuries emerged as the most common injury mechanism.

Key words: Hand Injuries; Sex Factors; Stress Disorders, Post-Traumatic; Risk Factors; Injury Severity Score

Introduction

The hand plays a vital role in both daily activities and occupational tasks, facilitating motor functions and refined sensory processes essential for object recognition and manipulation. Hand injuries are among the most common traumatic conditions, significantly affecting quality of life and posing substantial medico-legal challenges [1]. These injuries encompass a wide

Sažetak

Uvod. Povrede šake spadaju među najčešća hirurški lečena stanja u plastičnoj hirurgiji. Suboptimalni tretman može dovesti do produženog zarastanja, komplikacija, značajnog morbiditeta i teškog invaliditeta. Ova studija je imala za cilj da proceni polne razlike u mehanizmima povrede šake/podlaktice, etiologiji, fizičkim oštećenjima i simptomima posttraumatskog stresa nakon tretmana. **Materijal i metode.** U istraživanju je učestvovao 101 pacijent sa povredama šake lečen na Klinici za plastičnu i rekonstruktivnu hirurgiju Univerzitetskog kliničkog centra Vojvodine u Novom Sadu od 2020. do 2023. godine. Prikupljeni podaci obuhvataju starost, pol, nivo obrazovanja, mehanizam povrede, dužinu hospitalizacije, vrstu rekonstrukcije defekta, broj hirurških procedura i modifikovanu ocenu ozbiljnosti povrede ruke. Na osnovu telefonskih intervjuova izračunali smo skor invaliditeta ruke, ramena i šake i skor za posttraumatski stresni poremećaj. **Rezultati.** Prosečan skor invaliditeta ruke, ramena i šake bio je 37,8 kod muškaraca i 55,7 kod žena. Slično tome, srednja ocena, skor za posttraumatski stresni poremećaj, bila je 8,6 kod muškaraca i 12,1 kod žena; srednja vrednost modifikovani skor povrede šake bila je 47,1 kod muškaraca i 43,2 kod žena. **Zaključak.** Studija pokazuje da žene imaju značajno viši skor invaliditeta ruke, ramena i šake i skor za posttraumatski stresni poremećaj od muškaraca, što ukazuje na veći broj fizičkih oštećenja i povećan rizik od posttraumatskog stresnog poremećaja nakon povrede. Pored toga, zapaženo je da je najčešći mehanizam povređivanja cirkularom. **Gljučne reči:** povrede šake; pol; post traumatski stresni poremećaj; faktori rizika; ocena težine povrede

spectrum, including lacerations, cuts, crush injuries, amputations, sprains, infections, fractures, and burns [2]. While rarely life-threatening, these injuries can lead to considerable morbidity and functional impairment. Individuals with visible scarring or deformities may experience feelings of shame, leading them to conceal the affected hand in social settings [3].

According to a 2019 report by Serbia's Ministry of Labour, upper limb injuries account for 44.91% of

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Abbreviations

RTW	– return to work
QoL	– quality of life
PTSD	– post-traumatic stress disorder
QuickDASH	– Disabilities of the Arm, Shoulder and Hand
SPRINT	– Short Post-Traumatic Stress Disorder Rating Interview
MHISS	– Modified Hand Injury Severity Score

occupational injuries, predominantly affecting males (64.23%), with the highest incidence observed in individuals aged 46-55 years (28.33%) [4]. Hand injuries frequently disrupt routine tasks, delay return to work (RTW), and impose substantial financial burdens [5]. The severity and nature of the injury significantly influence recovery, functional independence, and overall quality of life (QoL), a multidimensional concept encompassing physical, psychological, and social aspects [6, 7].

Beyond physical impairment, traumatic hand injuries are associated with an increased risk of post-traumatic stress disorder (PTSD), affecting 8-24% of patients [8, 9]. If rehabilitation focuses solely on physical recovery, PTSD symptoms may go unrecognized and untreated [10, 11]. Studies highlight a strong correlation between the severity of hand trauma and PTSD symptom intensity [12]. Recognizing and addressing PTSD in treatment plans can enhance patient outcomes, as supported by evidence for the effectiveness of cognitive-behavioral therapy [13]. Gender differences further influence trauma response, with variations linked to factors such as age, socioeconomic status, and coping mechanisms [14].

This study investigates gender disparities in injury mechanisms, physical impairment, and PTSD symptoms among patients with hand trauma treated at the Clinic for Plastic and Reconstructive Surgery in Novi Sad.

Material and Methods

This retrospective epidemiological study was conducted at the Clinic for Plastic and Reconstructive Surgery, University Clinical Center of Vojvodina, Novi Sad. It included patients with hand trauma who received treatment between January 2020 and November 2023. A total of 101 adult patients with hand injuries were enrolled in this study. Data were extracted from patient medical records and the institution's electronic database. Ethical approval was granted by the Ethics Committee of the University Clinical Center of Vojvodina (ID number 600-342, issued on December 22, 2023).

The study collected sociodemographic and clinical data, including gender, age, injury mechanism, dura-

tion of hospitalization, number of surgical procedures during hospitalization, type of surgical procedure, occurrence of injury in an occupational setting, time of injury, ability to return to work post-injury, health insurance status at the time of injury, education level, participation in occupational therapy, timing of occupational therapy, and patient's subjective assessment of improvement following treatment.

The Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) and the Short Post-Traumatic Stress Disorder Rating Interview (SPRINT) scores were calculated for each patient using standardized questionnaires via telephone interviews. Additionally, the Modified Hand Injury Severity Score (MHISS) was determined based on surgical reports.

The QuickDASH is an 11-item self-report questionnaire used to evaluate upper limb disability and related symptoms. Patients rate their difficulty performing various activities on a 5-point scale (1 = no difficulty, 5 = unable to perform). Scores are then converted to a 0-100 scale, with higher scores indicating greater disability. The QuickDASH has shown good reliability and validity in various populations with upper limb conditions, and it is often used to assess treatment outcomes and monitor changes over time.

The SPRINT is a 19-item structured interview designed for rapid screening and assessment of PTSD severity. It evaluated the four primary symptom clusters of PTSD: intrusion, avoidance, negative alterations in cognition and mood, and alterations in arousal and reactivity. Each item is rated on a 5-point scale (0 = not at all, 4 = extremely), with the total score reflecting the overall PTSD symptom severity.

The MHISS is a comprehensive scoring system used to classify the severity of acute hand injuries. It accounts for multiple factors, including the type of injury (e.g., fractures, tendon or nerve damage), the specific anatomic structures affected, and complications such as open wounds or infections. Each component is assigned a weighted score, and the total score determines the injury severity category. The MHISS is commonly employed to guide treatment decisions, predicts functional outcomes, and facilitates research in hand trauma.

Based on the MHISS values, patients were categorized into four severity groups:

1. Mild – MHISS <20
2. Moderate – MHISS 21 – 50
3. Severe – MHISS 51-100
4. Major – MHISS >101

Statistical analyses were performed using JASP 0.17.1 software. Descriptive statistics, including arithmetic mean, median, and standard deviation, were used to summarize the data. The Kolmogorov-Smir-

nov Test of Normality was applied to assess the normality of data distribution. Comparison of variables between genders was conducted using Student's t-test and Mann-Whitney. A p-value of <0.05 was considered statistically significant.

Results

The study included 101 patients, comprising 74 men and 27 women, with a mean age of 43.3±16.5 years. All patients underwent surgical treatment for hand trauma at the Clinic for Plastic and Reconstructive Surgery between January 2020 and November 2023.

Analysis of injury mechanisms revealed that the most common cause of injury was a circulating saw. A gender-based comparison showed notable differences in injury mechanisms (Table 1). Over 50% of male patients sustained injured from either a circulating saw or a knife, whereas over 55.5% of female patients were injured by a knife or glass. A Mann-Whitney U test confirmed a statistically significant difference in injury mechanisms between genders (p = 0.032).

The duration of hospitalization was slightly longer for women than for men; however, this difference was not statistically significant. The mean hospital stay was 3.3 days for men and 3.4 days for women. The majority of patients, regardless of gender, underwent a single surgical procedure, with direct suture being the most commonly performed intervention.

Non-occupational injuries account for 73.26% of cases in both genders. Following treatment, 76.28% of patients reported could the ability to return to their previous job, while 20.8% described their pain as

mild. At the time of their injury, 91.1% of patients had health insurance.

Regarding the time of injuries, most male participants (44.6%) sustained their injuries in the morning (6:00 AM - 12:00 PM), whereas most female participants (40.7%) were injured in the afternoon (12:00 PM – 6:00 PM). Educational background analysis revealed that 61.4% of patients held high school diploma. Additionally, 58% of female participants held a college degree, compared to 42% of their male counterparts, highlighting a significant educational disparity between genders.

Post-operative rehabilitation data showed that all female patients (100%) underwent occupational therapy, compared 95.9% of male patients. The mean interval between immobilization removal and the initiation of occupational therapy was 13.9 days for men and 14.8 days for women. Subjective assessments indicated an average well-being improvement of 82.4% for men and 72.2% for women. More male patients (16) reported complete recovery compared to female patients (2).

A gender-based comparison of QuickDASH scores revealed significantly lower mean values in male patients (37.8) compared to female patients (55.7), with a highly significant p-value <0.001, indicating substantial differences in functional outcomes. Similarly, the SPRINT score was significantly lower in men (8.6) than in women (12.1), with a p-value of 0.003, suggesting notable differences in pain perception. In addition, over 58% of female patients had a SPRINT score exceeding 14. In contrast, the MHISS scores did not show significant differences between genders (Table 2).

Table 1. Distribution of injury mechanisms between men and women

Mechanism	Men	Women
Circulating saw	27.1%	7.4%
Knife	22.9%	14.8%
Glass	17.6%	33.3%
Metal	12.1%	11.1%
Chainsaw	6.7%	7.4%
Axe	1.3%	3.7%
Traffic accident	1.3%	11.1%
Industrial machine	8.1%	7.4%
Grinder	2.7%	0%
Blender	0%	3.7%

Table 2. Gender differences in DASH, SPRINT, and MHISS scores

Score	Men	Woman	p
QuickDASH	37.8 ± 18.2	55.7 ± 21.4	<0.001
SPRINT	8.6 ± 6.3	12.1 ± 5.8	0.003
MHISS	47.1 ± 15.1	42.2 ± 17.6	0.3

Table 3. Gender differences in QuickDASH and SPRINT scores for specific groups of MHISS classification

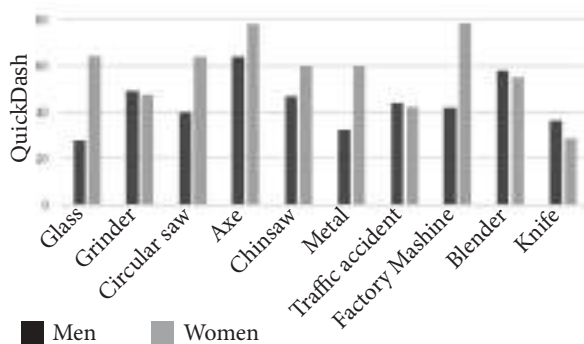
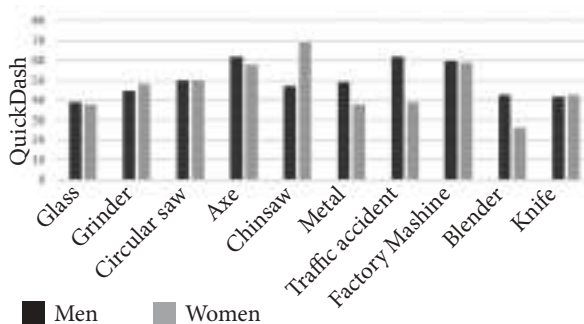
MHISS group	Mild	Moderate	Severe	Major
Men	2	46	26	/
Women	1	18	8	/
QuickDASH (men)	25 ± 9.2	36.2 ± 18.2	41.6 ± 18.2	/
QuickDASH (women)	68	52.3 ± 24.5	61.7 ± 12.3	/
SPRINT (men)	7 ± 4.2	7.3 ± 5.4	11.1 ± 7.3	/
SPRINT (women)	11	11 ± 5.9	14.9 ± 5.4	/
p (QuickDASH)	/	0.005	0.007	/
p (SPRINT)	/	0.02	0.193	/

Further classification of patients based on MHISS values yielded the following results (**Table 3**):

1. Mild group – Due to the small sample size (2 men and 1 woman), statistical significance between genders could not be determined.

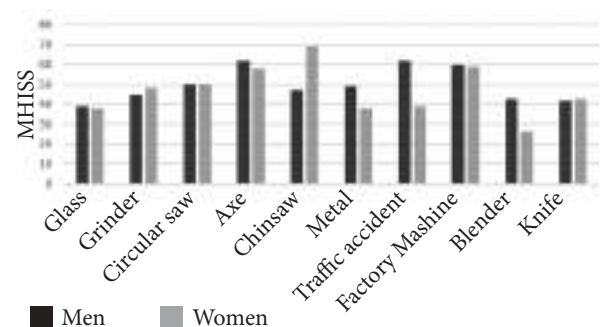
2. Moderate group – The QuickDASH score was significantly lower in male patients (36.2) than in female patients (52.3), with a p-value of 0.005. Similarly, the SPRINT score was significantly lower in men (7.3) than in women (11), with a p-value of 0.02.

3. Severe group – The QuickDASH score was statistically significantly lower in men (41.6) than in women (61.7), with a p-value of 0.007. However, the SPRINT score did not show a statistically significant difference ($p = 0.193$).

**Graph 1.** QuickDASH score in correlation with mechanism/tool of injury**Graph 2.** SPRINT score in correlation with mechanism/tool of injury

4. Major group – No patients met the criteria for this group; thus, gender-based comparisons were not possible.

The following graphs illustrate the correlation between average QuickDASH, SPRINT, and MHISS scores and injury mechanisms (**Graphs 1, 2 and 3**).

**Graph 3.** MHISS score in correlation with mechanism/tool of injury

Discussion

Hand injuries have significant socioeconomic implications, medical costs, occupational therapy expenses, lost workdays, and challenges in the return-to-work (RTW) process. This retrospective study identified notable gender differences in QuickDASH and SPRINT scores, whereas MHISS scores showed no significant differences between men and women. These findings align with previous studies, such as those by Reitan et al. in Norway, where men exhibited less functional impairment in QuickDASH scores [15], and Aasheim and Finsen, who also reported lower QuickDASH scores among male patients [16].

Regarding PTSD symptoms, Ghițan et al. in Romania found no overall gender differences; however, women without permanent disability exhibited higher SPRINT scores than men [12]. Our results are consistent, with an average SPRINT score of 12.1 in women, and over 58% scoring 14 or higher, indicating a heightened PTSD risk. This aligns with Connor and

Davidson's recommendation that such patients undergo structured PTSD assessment [17].

The patients were categorized into four groups based on the Modified Injury Severity Score (MHISS) in order to compare the average QuickDASH and SPRINT scores between genders for each MHISS classification group (mild, moderate, severe, or major). We hypothesized that patients within one MHISS group would have a similar injury severity, and that comparing the average QuickDASH and SPRINT scores within one group would provide a more realistic insight into the actual differences between genders rather than *en masse* comparison. Our results revealed that most patients fell into the moderate and severe categories, consistent with findings by Marinković et al. [18].

The absence of gender difference in MHISS scores may be explained by the male-dominated sample, a trend observed by Marinković et al., where men tend to have higher MHISS scores due to injury types and severity. However, the higher QuickDASH and SPRINT scores among women in our study suggest that gender-sensitive rehabilitation strategies could enhance recovery, particularly given the increased likelihood of severe PTSD symptoms among female patients [18, 19].

Workplace-related injuries were more frequent among men (29.7%) than women (18.5%), mirroring prior research in occupational risk disparities. Men are more frequently engaged in high-risk, physically demanding occupations, increasing their likelihood of sustaining workplace injuries, as noted in studies on gender and occupational safety [20].

RTW emerged as a key socioeconomic factor post-injury, with 77% of men and 74% of women returning to their previous roles post-treatment. While Chu et al. found no significant gender effect on RTW in Taiwan [21], Laisné et al. reported that women in Canada initially faced poorer RTW outcomes, likely influenced by workplace conditions and gender-based social roles affecting injury management and recovery [22].

Our study, limited to hospitalized patients, may not fully reflect the broader population of hand trauma injuries, as highlighted by Nikolić et al., who reported that only a small fraction (1.6%) of such injuries require hospitalization [2]. Gender-based differences in injury mechanisms were evident: men were more frequently injured by circular saws in non-occupational settings, aligning with findings from Pantelić et al. Women, in contrast, were more commonly injured by glass, consistent with data from Gokhan et al. in Turkey [23, 24].

A gender-based pattern also emerged in injury timing; men were more often injured in the morning, likely during tool use, whereas women sustained injuries more frequently in the afternoon, potentially during food preparation. Kringstad et al. reported similar gender-related patterns in injury timing [25].

Although the average hospitalization duration was slightly longer for women (3.4 days vs. 3.3 days for men), this difference was not statistically significant. However, previous trauma care studies suggest that women generally experience longer hospital stays due to injury complexity and potentially different rehabilitation needs [26].

Most hand trauma cases required only one surgical intervention, a finding consistent with Momcilovic et al., indicating that initial surgical management is often sufficient. The effectiveness of early and precise surgical intervention minimizes the need for additional procedures, reducing patient burden and optimizing recovery timelines [27].

Future research should explore long-term psychological and functional recovery outcomes in hand trauma patients, consisting of gender-based differences in social support, socioeconomic factors, and access to mental health care. Lucas et al. advocate for routine PTSD assessments in hand trauma follow-ups, especially for women, to facilitate timely mental health interventions and improve post-injury outcomes [28].

Conclusion

Our findings reveal distinct gender-based patterns in hand injury mechanisms: men predominantly sustained injuries from circular saws, whereas women were more frequently injured by glass. Although Modified Hand Injury Severity Scores did not show significant gender differences, women reported substantially higher functional disability (as measured by Quick Disabilities of the Arm, Shoulder and Hand) and more severe post-traumatic stress symptoms Short Post-Traumatic Stress Disorder Rating Interview compared to men. These results underscore the importance of integrating gender-specific considerations into the assessment and rehabilitation of hand trauma patients. Tailoring interventions to address these differences could improve patient outcomes. Further research is warranted to explore the biopsychosocial factors underlying these disparities, which may guide more effective prevention and rehabilitation protocols.

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