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Original Research Article

Prevalence and psychological impact of bone injuries in the hand and forearm

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ABSTRACT

Introduction: Bone injuries to the hand and forearm, including fractures and amputations, are prevalent and can severely impact individuals' quality of life. These injuries are not only physically debilitating but also carry significant psychological consequences, potentially leading to conditions such as post-traumatic stress disorder (PTSD). Understanding the prevalence of these injuries and their psychological effects is crucial for developing comprehensive treatment and support strategies.

Materials and Methods: This study, conducted at Mamata Medical College, Khammam, from February 2024 to July 2024, included 83 patients aged 18 to 75 years who underwent surgical intervention for hand and forearm bone injuries. Psychological impact was assessed using the Post-Traumatic Stress Disorder Checklist for DSM-5 (PCL-5) at a three-month follow-up. Patients were categorized into PTSD (+) and PTSD (-) groups based on diagnostic criteria and PCL-5 scores. Statistical analyses, including Chi-square tests and T-tests, were performed to explore correlations between injury types, locations, and PTSD.

Results: Of the 83 patients, 22 had amputations and 48 had fractures. Among them, 41 (49.4%) met criteria for probable PTSD. A significant association was found between amputation and PTSD ($\chi^2(1) = 8.63$, p = .013). Fractures in the index finger, long finger, and ring finger were more strongly correlated with PTSD symptoms (p-values: 0.047, 0.001, and 0.034, respectively). No significant differences were noted for fractures in other locations.

Conclusion: This study highlights the substantial psychological impact of bone injuries to the hand and forearm, with nearly half of the patients showing probable PTSD. Amputation, in particular, is significantly associated with increased PTSD risk. Specific fracture locations, such as those in the index finger, long finger, and ring finger, also show a higher correlation with PTSD symptoms.

1. Introduction

Bone injuries to the hand and forearm are prevalent and have a substantial impact on individuals' quality of life and overall well-being. These injuries, including fractures and dislocations, frequently occur due to the crucial role the hands and forearms play in daily activities and various occupational tasks. According to some study by the high frequency of such injuries is linked to their involvement in numerous routine and high-risk activities.[1,2] Understanding the prevalence and distribution of these injuries is critical for healthcare professionals to design effective prevention and treatment strategies.

Recent research highlights the variability in the incidence of hand and forearm injuries based on factors such as age, occupation, and activity levels. For instance some studies indicate that older adults and individuals in certain high-risk occupations experience a higher frequency of these

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injuries.[3,4] This variability underscores the need for tailored interventions that address specific risk factors and activity-related risks.

Moreover, the psychological impact of hand and forearm injuries is significant and often underappreciated. Research by some demonstrates that individuals with these injuries frequently suffer from emotional and psychological distress, including chronic pain, reduced functionality, and difficulties in adjusting to changes in their daily lives. These challenges can lead to anxiety, depression, and an overall diminished quality of life.[5,6] The stress of managing both temporary and permanent disabilities can further complicate recovery and affect overall well-being, highlighting the necessity for comprehensive treatment approaches that consider both physical and psychological aspects.[7]

This study aims to investigate the prevalence of bone injuries in the hand and forearm and examine their psychological impact. By analyzing both the physical and mental health effects of these injuries, this research seeks to enhance understanding and inform the development of more effective support and intervention strategies for affected individuals.

2. Materials and Methods

This study was conducted at Mamata Medical College, Khammam, from February 2024 to July 2024, to evaluate the psychological impact of bone injuries in the hand and forearm following surgical treatment.

The study included 83 patients aged between 18 and 75 years who underwent surgical intervention for bone injuries in the hand and forearm during the study period. Patients with other severe medical conditions or preexisting psychiatric disorders were excluded to focus on injury and surgical recovery.

Psychological assessment was carried out using the Post-Traumatic Stress Disorder Checklist for DSM-5 (PCL-5),[8] a standardized tool for evaluating PTSD symptom severity. The PCL-5 measures four symptom clusters: intrusion, negative alterations in cognition and mood, avoidance, and alterations in arousal and reactivity. Evaluations were conducted at a three-month post-discharge follow-up.

To establish a probable PTSD diagnosis, two criteria were used: a minimum PCL-5 score of 38 and meeting specific diagnostic criteria—one symptom from category B (intrusion), one from category C (avoidance), two from category D (negative alterations in cognition and mood), and two from category E (alterations in arousal and reactivity). Patients were categorized into two groups: PTSD (+) for those meeting DSM-5 criteria for PTSD and PTSD (-) for those who did not.

Data were analyzed to explore correlations among parameters using Chi-square tests (χ^2) and T-tests. The significance level was set at a p-value of less than 0.05.

Ethical approval was obtained from the Ethics Committee of Mamata Medical College, Khammam, and informed consent was acquired from all participants.

3. Results

The study included 83 individuals, aged 18 to 75 years, who underwent surgical intervention for hand and forearm bone injuries. The injuries were caused by crush incidents, tool usage, road accidents, and glass fragments. The tools involved included grinders, chainsaws, electric scissors, circular saws, knives, cutters, and axes. Although some patients had additional injuries to vessels, nerves, and tendons, the study focused solely on bone trauma.

Among the 83 patients, 22 had amputations, and 48 had fractures at various anatomical sites (Table 1). Partial amputations included 4 patients with amputations of finger 1, 5 with finger 2, 2 with finger 4, 1 with finger 5, and 2 with metacarpal bone amputations (Table 2). Complete amputations involved 2 patients with finger 1, 8 with finger 3, and 3 with finger 4 (Table 3).

Table 1: Distribution of fractures and amputations

Injury Type	Number of Patients
Amputations	22
Fractures	48
Total	83

Table 2: Partial amputations

Finger	Number of Patients
Finger 1	4
Finger 2	5
Finger 4	2
Finger 5	1
Metacarpal	2
Total	14

Table 3: Complete amputations

Finger	Number of Patients
Finger 1	2
Finger 3	8
Finger 4	3
Total	13

Regarding psychological impact, 41 individuals (49.4% of the sample) were identified as having probable PTSD based on the criteria, while 42 patients (50.6%) did not meet the criteria. This division into PTSD (+) and PTSD (-) groups allowed for further analysis of the psychological effects of bone injuries.

A chi-square test revealed a significant association between PTSD and amputation ($\chi^2(1) = 8.63$, $p = .013$), suggesting that amputation may increase the risk of PTSD.

Analysis of fracture locations showed that 12 patients had fractures in the thumb, 31 in the index finger, 17 in the long finger, 8 in the little finger, 5 in the small finger, 27 in the metacarpal bones, 2 in the carpal bones (scaphoid), and 9 in the forearm (Table 4). The distribution of phalangeal injuries was as follows (Table 5).

Table 4: Distribution of fractures by anatomical site

Anatomical Site	Number of Patients
Thumb	12
Index Finger	31
Long Finger	17
Little Finger	8
Small Finger	5
Metacarpal Bones	27
Carpal Bones	2
Forearm	9

Table 5: Distribution of phalangeal injuries

Finger	P1	P2	P3
Thumb	6	6	0
Index	8	20	6
Long	3	6	5
Ring	5	2	2
Small	0	2	3

Two-tailed t-tests showed significant differences in PTSD symptoms related to fractures in the index finger ($t(79) = 2.00$, $p = .047$), long finger ($t(77) = 3.34$, $p = .001$), and ring finger ($t(77) = 2.14$, $p = .034$). No significant differences were found for fractures in the thumb, small finger, metacarpal bones, carpal bones, or forearm. This indicates that specific fracture locations may be more strongly associated with PTSD symptoms, although further research with larger samples is needed for more definitive conclusions.

4. Discussion

This study highlights the significant psychological impact of bone injuries to the hand and forearm, revealing a notable prevalence of post-traumatic stress disorder (PTSD) among affected individuals. Nearly half of the patients in this cohort met criteria for probable PTSD, highlighting the substantial psychological burden associated with these injuries.

The findings align with existing literature that emphasizes the severe psychological consequences of physical trauma. For instance, research by Goff et al. (2014)[9] demonstrated that traumatic injuries often lead to high levels of PTSD, particularly in cases involving severe limb injuries and amputations. Our study corroborates these findings, particularly noting the strong association between amputation and PTSD. This result supports previous work by McLean et al. (2015),[10] which indicated that limb amputations are a significant predictor of PTSD due to the profound psychological impact of losing a body part.

The association between specific fracture locations and PTSD symptoms is a novel contribution of this study. The increased correlation of PTSD with fractures in the index finger, long finger, and ring finger is consistent with previous findings that suggest psychological distress may be more pronounced with injuries affecting more functionally or symbolically important parts of the hand (Falk et al., 2016).[11] This insight is crucial, as it suggests that the psychological impact of fractures might vary depending on the specific anatomical site, which can inform targeted therapeutic approaches.

Additionally, the high prevalence of PTSD observed in this study reflects broader trends in the literature. Studies such as those by Rangel et al. (2020)[12] and Zatzick et al. (2019)[13] have consistently found that traumatic injuries, including fractures and amputations, are associated with significant psychological distress. The impact of these injuries on mental health is often compounded by the chronic pain and functional limitations that accompany them, as noted by Schopflocher et al. (2019).[14]

The significant association between amputation and PTSD, as found in our study, aligns with research by Hossain et al. (2017)[15] and Haines et al. (2018),[16] who emphasized that amputation is a particularly traumatic event that can lead to severe psychological outcomes. This highlights the need for comprehensive post-surgical psychological support for amputees, as recommended by Singh et al. (2021).[17]

In contrast, fractures in other anatomical locations, such as the thumb, small finger, or carpal bones, did not show significant correlations with PTSD. This finding suggests that while fractures are generally distressing, the psychological impact may be less pronounced compared to more severe injuries like amputations. This is supported by the work of Van der Meer et al. (2020),[18] which found that while fractures can cause psychological distress, the severity of trauma plays a crucial role in determining PTSD risk.

The study's limitations include its relatively small sample size and the short follow-up period. Larger studies with extended follow-up are necessary to fully understand the long-term psychological impact of hand and forearm injuries and to explore whether PTSD symptoms persist or evolve over time. Future research should also consider incorporating qualitative data to gain deeper insights into patients' personal experiences and coping strategies, as suggested by earlier studies.

5. Conclusion

This study highlights the significant impact of bone injuries in the hand and forearm on both physical and psychological well-being. Nearly half of the patients undergoing surgical intervention for these injuries were identified as having

probable PTSD. The association between amputation and PTSD was particularly notable, indicating that amputation increases the risk of psychological distress.

Fracture locations, particularly in the index finger, long finger, and ring finger, were found to be more closely associated with PTSD symptoms. These findings emphasize the importance of addressing both physical and psychological aspects in injury management. Tailored interventions that consider the specific challenges posed by different injuries and their psychological effects are essential for improving patient recovery and quality of life.

The detailed breakdown of injury distribution in this study can inform future research and clinical practices. By recognizing the multifaceted nature of bone injuries and their psychological impacts, healthcare providers can better support patients through comprehensive treatment plans. Future research with larger samples and extended follow-up will be crucial for validating these findings and further exploring the intricate relationship between injury characteristics and psychological outcomes, ultimately enhancing patient care and outcomes in the management of hand and forearm injuries.

6. Source of Funding

None.

7. Conflict of Interest

None.

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