Research Article

Association of Hand Dominance with Mechanism and Type of Hand Trauma in Patients Presenting at Civil Hospital Karachi

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Abstract: Background: All of the daily tasks in adults' life such as eating, use of computers, kicking, throwing, learning, and writing are done with using the dominant hand. There are distinctive differences in hand functioning as an influence of hand dominance.

Objective: To determine the pattern of hand injury, its mechanism and its association with hand dominance in patients presenting at emergency department of Civil Hospital Karachi.

Materials and Methods: This cross-sectional study was performed in Emergency department, Civil Hospital Karachi, during February to October, 2023. Adults of age 18 years and above of any gender presenting with acute hand injuries were included into the study. Patients committed suicide and amputed upper limbs were excluded from this study. Patients' data was documented in a pre-designed proforma. Data was analyzed using SPSS version 26.

Result: Total 249 patients were enrolled into the study. Median age of patients was 22 (IQR=18-33) years. Majority of patients were males (n=209, 80.6%). Majority had injury in their right hand (n=175, 70.3%) and dominant hand (n=171, 68.7%). The most common injury mode was road traffic accidents (n=90, 36.1%) followed by assault (n=71, 28.5%), workplace (n=70, 28.1%), burns (n=10, 4%) and knife cut injuries (n=8, 3.2%). Frequency of workplace injury was significantly higher among dominant hand than non-dominant hand. Frequency of RTA and assaults was higher in non-dominant hand ($p<0.001$).

Conclusion: The present study analyzed that in most of hand injuries cases dominant hand was affected. Frequency of workplace related hand injuries was significantly higher among dominant hand than non-dominant hand.

Keywords: Hand injury, Hand trauma, Plastic reconstruction, Traumatic injuries, Dominant hand, Amputed.

INTRODUCTION

The anatomy of human hand is tremendously complex and quite challenging to understand. The hand is one of the most complicated part of human comprising of 20, 27 muscles and bones respectively with multiple tendons and a large network of veins and arteries. Hand injuries accounts for nearly a quarter of all musculoskeletal injuries cases attended in the emergency rooms [1, 2]. Literature widely reports that hand injuries makes up 10% of total emergency room visits with injuries ranging from simple lacerations to amputations [3]. Hand injuries are considered to have a potential influence on physical, functional and psychological abilities of the victim [1].

Handedness simply means the formation of hand dominance which commonly becomes apparent during the ages of 7-9 months when the baby frequently targeting the objects for grabbing using single hand [4]. All of the daily tasks in adults' life such as eating, use of computers, kicking, throwing, learning, and writing are done with using the dominant hand. However, many people sometimes use non-dominant hand due to various reasons. There are distinctive differences in hand functioning as an influence of hand dominance [3, 5, 6].

Hand injuries usually occur because of unanticipated and upsetting events at workplace or home. Occupational hand injury stands as one of the top reasons from work absence, and it also contributes to a greater economic burden [5]. The problem of upper limb dominance is of distinctive concern. This concern exists fundamentally due to conventional presumption that the dominant limb has more strength, dexterity, speed and endurance and when injured converts into increased incapacity.

There are various studies that determined the hand dominance influence on functional outcomes [7-9]. The impact of hand dominance on grip strength was studied by Incel *et al* who demonstrated that dominant hand was considerably resilient in right handed patients but did not find difference among sides in left handedness [5].

It was also revealed in a study that comparatively dominant side indicated more stabled movements with greater stability through the range of motion in angular acceleration [10]. However, there is not a wide literature that assessed the association of hand dominance with mechanism and type of hand trauma. However, previously a study assessed association of hand dominance with mode of injury [11]. The effect of handedness on site and pattern of injury has not been studied in Pakistan yet. Therefore, we planned to conduct this study to further have evident literature

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regarding the association of handedness with mechanism and type of hand injury in patients presenting at emergency unit of Civil Hospital Karachi.

MATERIALS AND METHODS

This cross-sectional study was performed in emergency department of Ruth Pfau Civil Hospital, Karachi, during February to October, 2023. The study was commenced with approval of Institutional Review Board (IRB-2729/DUHS/Approval/2022/36). Adults of age 18 years and above of any gender presenting with acute hand injuries were included into the study. Patients committed suicide and amputed upper limbs were excluded from this study.

Patients were enrolled into the study with their informed consent. Sample size was estimating taking 63.5% proportion of dominant hand injuries [12] at 95% confidence interval and 6% margin of error which came out to be 248. Patients were enrolled into the study using non-probability consecutive sampling technique.

Hand injury severity was assessed using hand injury severity score (HISS). The calculation of the hand injury severity score requires information on four components——integument, skeletal, motor and neural components. Four grades of increasing severity of hand injury are described: minor (HISS score < 20), moderate (score 21–50), severe (score 51–100) and major (score >100) [13]. Patients' data including age, gender, education, occupation, injured hand, dominant hand, injured zone, mode of injury, injured site and anatomical disruption were documented in a pre-designed proforma.

STATISTICAL ANALYSIS

Data was entered into SPSS version 26 to perform statistical analysis. Frequencies were computed for categorical variables. Numerical variables were expressed as mean ± standard deviation. Mode of injury was compared to handedness (dominant/non-dominant) using chis-square test. P-value ≤0.05 was taken as statistically significant. Results were presented in tabular and graphical form.

RESULT

Total 249 patients were enrolled into the study. Median age of patients was 22 (IQR=18-33) years with age range of 18-70 years. Majority of patients were males (80.6%). Table 1 displays summary of patients' features.

Table 1. Summary of Socio-Demographic Features of Patients.

Variables	Frequency (%)
Age Groups	
≤20 years	100(40.2)
21-29 years	64(25.7)
30-39 years	34(13.7)
40-49 years	26(10.4)
50 years and above	25(10)
Gender	
Male	209(83.9)
Female	40(16.1)
Education	
Illiterate	9(3.6)
Primary	4(1.6)
Secondary	11(4.4)
Matriculation	134(53.8)
Intermediate	64(25.7)
Graduation and above	27(10.8)
Occupation	
Driver	8(3.2)
Labor	90(36.1)
Shop keeper	57(22.9)
Office job	20(8)
Student	47(18.9)
Housewife	27(10.8)

Majority had injury in their right hand (n=175, 70.3%) and dominant hand (n=171, 68.7%). The most common injury mode was road traffic accidents (n=90, 36.1%) followed by assault (n=71, 28.5%), workplace (n=70, 28.1%), burns (n=10, 4%) and knife cut injuries (n=8, 3.2%). Table **2** displays injury related details.

Table 2. Summary of Hand Injury Related Details.

Variables	Frequency (%)
Injured Hand	
Right	175(70.3)
Left	74(29.7)
Dominant Hand Injured	
Yes	171(68.7)
No	78(31.3)
Number of Injured Fingers	
Single	198(79.5)
Multiple	51(20.5)
Injured Fingers	
Index	56(22.5)
Middle	45(18.1)
Ring	51(20.5)
Little	34(13.7)
Thumb	29(11.6)
Carpus	114(45.8)

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Injured Zone	
Zone I	75(30.2)
Zone II	29(11.7)
Zone III	16(6.5)
Zone IV	25(10.1)
Zone V	54(21.8)
Zone VI	55(22.2)
Zone VII	13(5.2)
Anatomical Disruption	
Lacerations	187(75.4)
Avulsion	31(12.5)
Crush injuries	26(10.5)
Burns	7(2.8)
Bruises	5(2)
Fractures/dislocations	66(26.6)
Hand Injury Severity	
Minor	55(22.1)
Moderate	42(16.9)
Severe	79(31.7)
Major	73(29.3)

Fig. (**1**), displays frequency of mode of injury among dominant and non-dominant hand. Frequency of workplace injury was significantly higher among dominant hand. Frequency of RTA and assaults was higher in non-dominant hand ($p<0.001$).

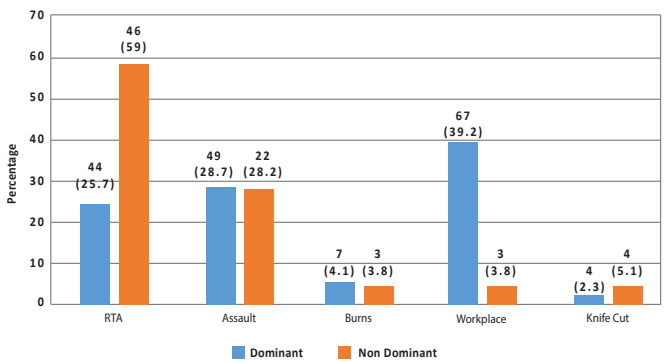

Fig. (1). Frequency of Injury Mode among Dominant and Non-Dominant Hand.

DISCUSSION

Literature documents that hand injury usually affects the working adults under the age of 40 years and may cause serious damage due to the complexity of structures within the hand which is essential for proper function [14-16]. However, in our study majority of the patients were younger with median age of 22 years. Earlier the study performed in Karachi reported that mean age of hand trauma patients was 24.86±6.41 years. Another similar from Karachi enrolled both pediatric and adult population and reported that among adult population the most frequent age group presenting with hand injuries was 21-30 years (32%) [17]. This is noticeable that a part from rest of the world, hand trauma is more common among younger population in Karachi. It may be posit that growing interest of youth for bike racing and their attitude of fearless car driving and bike riding with over speed and without any safety measures is the main reason of higher proportion of injuries in youth in this study.

In this study majority of affected individuals with hand injuries are males (80.6%). Most of the studies both local and international depicted the same finding [17-22]. The reason is obvious that males are more likely to be outside than females for various reasons and hence at higher risks of traumatic injuries. Moreover, men has more casual attitude than females regarding safety measures either at work place or while driving or bike riding, which lead to higher injuries among them than females.

In this study, the commonest affected occupation was labor (34.9%) followed by shop keeper (21.7%), students (21.1%), housewives (13.7%), office workers and drivers (3.4%). Higher proportion of hand injuries among unskilled has been consistently reported in literature [23]. The nature of their work exposed to high risk of injuries. Frequency of hand injuries among housewives is higher in this study. In contrast to our findings, another Pakistani study reported that out of 386 patients with hand injuries, only 6.5% were housewives [17]. An Indian study reported that only 4.6% housewives were affected with hand injuries in their sample [23]. Another notable higher injured group in this study were students. Students are normally exposed at sports injuries due to recreational activities. However, in our study most of the students were affected with injured hand because of road traffic students.

The present study portrays that the most common injury mode was road traffic accidents (n=90, 36.1%) followed by assault (n=71, 28.5%), workplace (n=70, 28.1%), burns (n=10, 4%) and knife cut injuries (n=8, 3.2%). RTA related injuries are preventable with proper use of safety measures and serious compliance to traffic rules. In this study, all burn injuries were those occurring at home. Domestic house chores and cooking were the common reasons of these burns injuries. Higher frequency work-related injuries is consistently reported in literature [14, 17, 23]. Training and education is needed for prevention of work-related injuries. The training should be given regarding quality control, use of personal protective equipment like gloves and safely use equipment.

In this study, most of the injuries were occurred in right hand (69.1%) and dominant hand (66.9%). Multiple studies reported that majority of the injuries were in right handed [11, 19, 24] and in dominant hand [11, 12, 17, 24]. In this study, it was found that workplace injury were significantly higher among dominant hand whereas RTA, assaults and knife cut injuries were higher in non-dominant hand. In contrast to our findings, Kaisha and coworker did not observe that mode of injuries were differing among dominant and non-dominant hand injuries [11].

Shrihari V. [25] found in his study that occupational injuries was the commonest injury mode among both dominant and non-dominant hand. In our view, traumatic injuries occur to mishandling of equipment being used or due to accidents (like assaults or RTA). It seems like risk of dominant hand injury is higher because it's the first thing that the person is using to carry out its activities. However, when some incidence occurs or accident takes place like RTA, burn injuries or assaults, it just occur suddenly and have the potential to affect any part of the body. Because of these reason we found conflicting findings.

LIMITATION

The present study demonstrate findings of a single center study with a limited sample size. Only acute hand injuries cases presented to emergency department were analyzed in this study.

RECOMMENDATION

It is suggested to perform a multicenter study with a larger sample size to validate findings of the current study.

CONCLUSION

The present study analyzed that in most of hand injuries cases dominant hand was affected. Frequency of workplace related hand injuries was significantly higher among dominant hand than non-dominant hand.

AUTHORS' CONTRIBUTION

- **Rabeeaa Farrukh**: Conceptualized this study, Performed literature search, Designed study protocol, Prepared initial draft of the study.
- **Faisal Akhlaq Ali Khan**: Designed study protocol, Critically reviewed, Revised the initial manuscript draft.
- **Waqas Sami**: Performed literature search, Designed study protocol, Prepared initial draft of the study.
- **Erum Naz**: Data collection, Prepared initial draft of the study.
- **Mehak Ali Memon and Sumaira Sattar**: Data collection, Data analysis, Result writing.

CONFLICT OF INTEREST

Declared none.

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