Research Article

Evaluation of Pattern of Deep Wrist Injuries in Suicidal versus Accidental Cases Presenting in a Tertiary Care Hospital

Rabeeaa Farrukh*, Faisal Akhlaq Ali Khan, Erum Naz, Saira Ahmed Chhotani, Mehak Ali Memon, Saira Bhutto

Department of Plastic and Reconstructive Surgery, Dr. K.M. Ruth Pfau Civil Hospital, Dow University of Health Sciences (DUHS), Karachi, Pakistan.

Abstract: Background: The hand is the most dominant and important part of human body. Hand and wrist injuries are frequently associated with long-term pain, loss of productivity, disability and hence compromised quality of life. The primarily cause of wrist injuries are can be accidental or suicidal.

Objective: to determine accidental and suicidal deep wrist injury (DWI) rate and compare patients' anatomical features among the two injury types.

Materials and Methods: This cross-sectional study was performed in Ruth Pfau Civil Hospital, DUHS during June to December, 2022. Patients visiting emergency rooms with acute hand injuries were enrolled into the study. The assigned data collectors' participants' features in a pre-designed structured proforma. Data was analyzed using SPSS version 26.

Result: Total 384 patients were enrolled into the study with median age of 32 (IQR=25-45) years. Majority of victims were males (77.3%). Frequency of accidental injury was 82.6%. Out of 317 (82.6%) patients with accidental injury, common mechanism was road traffic accident (51%) followed by occupational injury (21.1%) and domestic violence (14.1%). None of the patients' features were significantly different among accidental and suicidal injuries except marital status. Frequency of suicidal injury was significantly higher among married individuals than those who were single. Frequency of ulnar nerve (p=, flexor pollicis longus tendon (p= and flexor digitoram profundus (p=) was significantly higher in accidental cases than suicidal cases whereas ulnar artery (p=) and radial artery was significantly higher in suicidal cases.

Conclusion: The current study found that almost one-fifth of DWI were suicidal attempts. Suicidal injuries were mainly damaging to radial and ulnar arteries where accidental injuries affected deep wrist structures such as ulnar nerve, flexor tendons and flexor digitoram profundus.

Keywords: Accidental injury, Hand injury, Suicidal injury, Plastic reconstruction, Wrist injury, Long-term disability.

INTRODUCTION

The hand is the most dominant and important part of human body. There are total 27 bones in hand and wrist for the purpose of rolling, spinning and sliding due to which hands are able to explore and control the environmental objects [1]. Even the some biologist believe that hand movements promote brain development through interaction, manipulation and exploration of the environment [2]. Hand is the mostly vulnerable part of the human body to get injured as this part is involved in work, leisure and daily living activities and such involvement of hand makes injuries frequently and lead to long-term disability [3].

Globally, hand injuries contribute 10-15% of the total emergency visits in the developed world [4]. In developing countries, there is negligence in injuries epidemics that accounts for more than 5 million deaths yearly which roughly equates to the death count occur due to tuberculosis, malaria and HIV/AID [5]. Hand and wrist injuries are frequently associated with long-term pain, loss of productivity, disability and hence compromised quality of life [6].

The primarily cause of wrist injuries are can be accidental or suicidal. Suicide is defined as a potentially self-injurious behavior associated with at least some intent to die [7]. According to World Health Organization (WHO), worldwide 4% of the adult population attempts suicide yearly [8]. Patients surviving with the deep wrist injuries can have even more severe outcomes than death as they may become permanently handicap with impaired hand function due to damage of median or ulnar nerves and arteries of wrist responsible for proper hand functioning [9, 10]. A study conducted in Germany reported that suicidal attempt accounted for 20% of deep wrist injuries mainly damaging palmarislongus, radial artery, median nerve and flexor carpi radials [11].

Accidental injuries are mainly caused by road traffic accidents and accounts for a significant proportion of mortalities, injury-related disability-adjusted life years with posing a substantial economic burden and societal pressure [12]. Patterns of hand injury trauma were ascertained in a study public sector hospital in Karachi, which reported that 45%, 22%, 1.3% hand injuries occurred at workplace, road and sports respectively. Nearly quarters of the injuries were occurred at home but it was not elaborated whether they were suicidal [13].

* Address correspondence to this author at the Department of Plastic and Reconstructive Surgery, Dr. K.M. Ruth Pfau Civil Hospital, (DUHS), Karachi, Pakistan. Email: ra.beeafarrukh@gmail.com

It is necessary for the reconstructive surgeon to understand the difference in epidemiological and anatomical features of the accidental and suicidal wrist injuries to appropriately devise the surgical management. To the best of our knowledge, previously no study has been conducted in our region to determine the burden of suicidal and accidental injuries and compare their presenting features. Therefore, the current study was planned to determine accidental and suicidal deep wrist injury (DWI) rate and compare patients' anatomical features among the two injury types.

MATERIALS AND METHODS

This cross-sectional study was performed in emergency room at Dr. Ruth KM Pfau Civil Hospital, Dow University of Health Sciences, Karachi, during June to December, 2022. The study was commenced after acquiring formal permission from Institutional Review Board (IRB-2273/DUHS/Approval/2021/787). Patients of any gender and age at least 18 years, presenting to emergency room with deep wrist injury were enlisted. Patients with musculoskeletal diseases and unwilling for participation were excluded. A verbal approval from patient and written informed consent from attendant was taken for study recruitment.

Sample size was estimated on online calculator Open-Epi taking 20% frequency of suicidal wrist injuries [11], 95% confidence and 4% margin of error which yielded a sample size of 384. Non-probability consecutive sampling technique was opted for enlisting targeted population.

Patients presenting to emergency room with wrist injuries were assessed by on duty doctor who took their detailed history identified either the case was accidental or suicidal. Later on plastic surgery team identified the structures involved in DWI and documented in patients' record file. The assigned data collector recorded the data in pre-designed structured performa.

STATISTICAL ANALYSIS

Data was analyzed using SPSS version 26. Frequency and percentages were computed for categorical variables. Numerical variable 'age' was expressed as median with inter-quartile range as it was non-normally distributed. Normality assumption was tested using Shapiro Wilk test. Chi-square test was applied to compare patients' features among accidental and suicidal cases. Statistical significance was defined on the basis of two tailed p-value at 5% of alpha error.

RESULT

Total 384 patients were enrolled into the study with median age of 32 (IQR=25-45) years. Age range was 18-89 years. Majority of victims were males (77.3%) and belonging to rural areas (67.2%). Table **1** displays sociodemographic features was study participants.

Table 1. Summary of Sociodemographic Features of Study Subjects.

Variables	Groups	Frequency	Percentage
Age groups	<20 years	51	13.3
	20-29 years	118	30.7
	30-39 years	76	19.8
	40-49 years	92	24.0
	50-59 years	19	4.9
	60 years and above	28	7.3
Gender	Male	297	77.3
	Female	87	22.7
Residence	Urban	126	32.8
	Rural	258	67.2
Education	Illiterate	147	38.3
	Primary	105	27.3
	Secondary	11	2.9
	Matric	75	19.5
	Intermediate	40	10.4
	Graduate	6	1.6
Marital status	Single	188	49.0
	Married	193	50.3
	Divorced	3	0.8

One-fifth of the cases were suicidal injuries (17.4%). Out of 317 (82.6%) patients with accidental injury, common mechanism was road traffic accident (51%) followed by occupational injury (21.1%) and domestic violence (14.1%).

Table **2** compares patients' sociodemographic features among those having accidental and suicidal injuries. None of the patients' features were significantly different among accidental and suicidal injuries except marital status. Frequency of suicidal injury was significantly higher among married individuals than those who were single.

Table 2. Comparison between Suicidal and Accidental of Sociodemo.

Variables	Groups	Injury Type		p-value
		Accidental	Suicidal	
Age	<20 years	46(14.5)	5(7.5)	0.286
	20-29 years	98(30.9)	20(29.9)	
	30-39 years	56(17.7)	20(29.9)	
	40-49 years	79(24.9)	13(19.4)	
	50-59 years	19(6)	0(0)	
	60 years and above	19(6)	9(13.4)	
Gender	Male	255(80.4)	42(62.7)	0.286
	Female	62(19.6)	25(37.3)	

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Residence	Urban	109(34.4)	17(25.4)	0.153
	Rural	208(65.6)	50(74.6)	
Education	Illiterate	124(39.1)	23(34.3)	0.106
	Primary to Secondary	98(30.9)	18(26.9)	
	Matriculation	63(19.9)	12(17.9)	
	Intermediate or Higher	32(10.1)	14(20.9)	
Marital status	Single	165(52.1)	23(34.3)	0.008
	Married/Divorced	152(47.9)	44(65.7)	

Fig. (**1**) displays frequencies of structured involved in DWI among accidental and suicidal cases. Frequency of ulnar nerve (p=, flexor pollicis longus tendon (p= and flexor digitoram profundus (p=) was significantly higher in accidental cases than suicidal cases whereas ulnar artery (p=) and radial artery was significantly higher in suicidal cases.

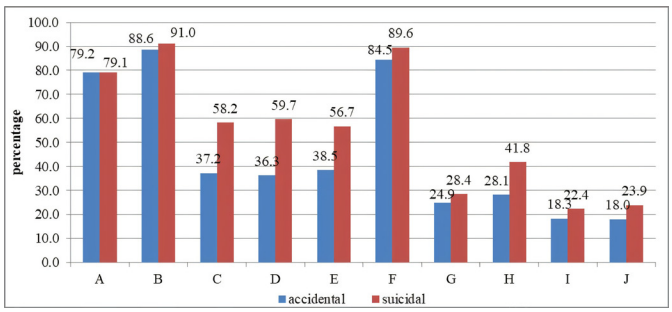

Fig. (1). Comparison of Injuries between Suicidal and Accidental. **A:** Median nerve, **B:** Flexor carpi radialis, **C:** Ulnar nerve, **D:** Ulnar artery, **E:** flexor carpi ulnaris, **F:** Palmaris longus, **G:** Flexor digitoram superficialis tendon, **H:** Radial artery, **I:** Flexor pollicis longus tendon, **J:** Flexor digitoram profundus.

DISCUSSION

This study analyzed that around one-fifth of the cases were suicidal injuries (17.4%). A similar study reported that 4.5% patients had purposeful injury because of different circumstances. 1.4% had self-inflicted injury secondary to suicide attempt [14]. Another study followed up wrist injury patients for post-traumatic disorders and found that 19.7% of patients who were part of their study had DWI stemmed from suicide attempt which occurred as reaction to stress, mental disorders, substance use and/or depressive episodes [15]. Another study reported that 20% of DWIs stemmed from suicide attempts [11]. A Pakistani study analyzing patterns of hand injuries reported that frequency of self-inflicted injury was 3.1% [16].

In our study most frequent mode injury in accident wrist injuries was road traffic accident (RTA) followed by occupational injuries and domestic violence. A study evaluating pattern of hand injuries reported RTA stands as second common cause while occupational injuries ranked top. Some other mode of accidental injuries that we did find in study were door injury and sports injury [17]. A study reported that more than 90% of hand injuries occurred due to RTA while some other causes included door trap injuries, knife and machine cut injuries [16]. RTA is consistently reported in literature as top 3 causes of hand and wrist injuries [18]. Hand and wrist injuries after a car accident are common and very disruptive. They include fractured bones, torn ligaments, dislocations and sprains, which can prevent people from caring for themselves and returning to work. Due to rapid urbanization and motorization trends, traffic violations, road encroachment, and a lack of proper road safety programs, RTA are emerging as a serious public health concern in Pakistan [19, 20].

The present study analyzed that median age was 32 years with mostly affected age group of 20-29 years. Moreover, we did not find significant differences in among two injury type based on age of affected individuals. The finding is similar to other similar study from Nepal which reported that most affected age group was 15-34 years [17]. A similar study from Poland reported that over half of the subjects were under 40 years of age [21]. A study analyzed that out 178 hand injuries, 69.1% were those of age range 18-35 years [4]. Since the injuries were mainly common to age group 20-49 years of age with almost equal age group representation so age groups frequencies were not differing accidental and suicidal wrist injuries in this study. We assume that injuries are common to this age group this age group because people are young and more involved in daily life routine like occupational work and travelling as compared to adolescents and senior citizens.

In this study, accidental and suicidal injuries did not differ among male and female gender. However, it was seen that accidental injuries were disproportionately higher in males than females. Interestingly, this finding is throughout reported in literature with no conflicting results. The reason of this skewed data is obvious that males from the time they are babies and grown up boys are more engaged in unsafe activities with casual behavior like bike and car racing, handling of sharp objects without safety measures and more engagement in outdoor game activities with no proper safety measures. On the other hand, suicidal wrist injuries were also higher in males than females. However, pooled data reports that risk of suicidal attempt is higher in females than males with possible risk factors of mental health, interpersonal violence and substance abuse [22]. The explanation of higher burden of suicidal attempts in our local population could be that usually males are solely breadwinners for their family independent of their marital status and the responsibility gets doubled after their marriage.

Attainment of higher education has the potential to be safeguard against accidental as wells as suicidal injuries. However, in our study we did not difference in accidental and suicidal cases on the basis of education. One the reason is one sidedness of the data as majority of our patients were either illiterate or primary or secondary pass. An interesting finding of this study is association of marital status with type of injury which showed that higher likelihood of suicidal injuries among either married or divorced individuals in contrast to singles. Existing literature

reports variable findings regarding this association [23-25]. This association could vary region to region because socio-demographic and cultural differences in their societies.

The current study analyzed that frequency of ulnar nerve, flexor pollicis longus tendon and flexor digitoram profundus was significantly higher in accidental cases than suicidal cases whereas frequency of ulnar artery and radial artery was significantly higher in suicidal cases. This pattern simply indicates that wrist injuries were more severe and deep in accidental cases than suicidal attempt cases. In consistent to findings, frequency of DWI in terms on ulnar nerve, ulnar traid and deep layer were higher in accidental injuries wehereas, ulnar artery and radial arteries were more seen among suicidal cases in a study [11]. We assumed that the reason of superficial injuries in suicide attempts is that patients were less knowledgeable about anatomical structures and its harmful impact. So it might be possible that they stopped right away cutting their wrist and seeing themselves bleed with an understanding that they had done damage to their self which would be enough to destroy their life. Only the radial side of the wrist pointed upward as a result of this abrupt halt to wrist cutting, making it the most accessible side.

The present study performed in single public sector institution in Karachi with a limited sample size with majority of population belonging to rural side areas like small towns and slum areas in Karachi. The study findings could be different for private sector institution and urban population. Therefore, the findings of current study should not be generalized for all Pakistani or Karachi based population. A larger multicenter study should be performed in future to validate findings of current study at a mass level.

CONCLUSION

The current study found that almost one-fifth of DWI were suicidal attempts. Suicidal injuries were mainly damaging to radial and ulnar arteries where accidental injuries affected deep wrist structures such as ulnar nerve, flexor tendons and flexor digitoram profundus.

AUTHORS' CONTRIBUTION

- **Rabeeaa Farrukh**: Conceptualized the study, Literature search, Developed study protocol, Prepared initial manuscript draft.
- **Faisal Akhlaq Ali Khan**: Developed study protocol, Critically reviewed the initial draft and revised it.
- **Erum Naz**: Literature search, Developed study protocol, Prepared initial manuscript draft.
- **Saira Ahmed Chhotani** and **Mehak Ali Memon**: Data collection, Prepared initial manuscript draft.
- **Saira Bhutto**: Data collection, Data analysis, Result writing.

CONFLICT OF INTEREST

Declared none.

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REFERENCES

[1] Maitland GD. Maitland's Peripheral Manipulations. 3rd ed. Edinburg: Elsevier Butterworth-Heinemann 1999.

[2] Gwenda Sharp OTR, Dave Thompson PT. Biomechanics of the hand. 2021; Available from: https://ouhsc.edu/bserdac/dthompso/web/namics/hand.htm. [Last accessed 1.7.2021].

[3] Serletti JM, Taub PJ, Wu LC, Slutsky DJ.Current reconstructive surgery. New York: The Mc Grow Hill Companies 2013.

[4] Abebe MW. Common causes and types of hand injuries and their pattern of occurrence in Yekatit 12 Hospital, Addis Ababa, Ethiopia. Pan Afr Med J 2019; 33: 142.

[5] Gosselin RA, Spiegel DA, Coughlin R, Zirkle LG. Injuries: The neglected burden in developing countries. Bull World Health Organ 2009; 87(4): 246.

[6] de Putter CE, Selles RW, Polinder S, Panneman MJ, Hovius SE, van Beeck EF. Economic impact of hand and wrist injuries: health-care costs and productivity costs in a population-based study. J Bone Joint Surg Am 2012; 94(9): e56.

[7] Turecki G, Brent DA. Suicide and suicidal behaviour. Lancet 2016; 387(10024): 1227-39.

[8] World Health Organization. Preventing suicide: A global imperative. Geneva, Switzerland: World Health Organization 2014.

[9] Gu JH, Jeong SH. Self-wrist cutting injury: A traumatologic and psychological analysis. Plast Reconstr Surg 2012; 129(4): 763e-4e.

[10] Park HY, Kim YC, Park SC, Cho YJ, Sur YJ. Comparison of the demographic and wound characteristics of non-suicidal and suicidal self-wrist cutting injuries. Medicine 2020; 99(8): e19298.

[11] Kisch T, Matzkeit N, Waldmann A, *et al*. The reason matters: Deep wrist injury patterns differ with intentionality (accident versus suicide attempt). Plast Reconstr Surg Glob Open 2019; 7(5): e2139.

[12] Bachani AM, Peden M, Gururaj G, *et al*, Eds. Road traffic injuries. In: Injury Prevention and Environmental Health. 3rd ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank 2017.

[13] Ahmad A, Memon SF, Khan AA, *et al*. Patterns of peripheral nerve and tendon injury in hand trauma patients in a tertiary care hospital of Pakistan. Cureus 2021; 13(1): e12889.

[14] de Jong JP, Nguyen JT, Sonnema AJ, Nguyen EC, Amadio PC, Moran SL. The incidence of acute traumatic tendon injuries in the hand and wrist: A 10-year population-based study. Clin Orthop Surg 2014; 6(2): 196-202.

[15] Westermair AL, Matzkeit N, Waldmann A, *et al*. Traumatizing oneself-deep wrist injuries self-inflicted with suicidal intention are associated with more severe PTSD symptomatology than similar injuries from accidents. Suicide Life Threat Behav 2020; 50(4): 856-66.

[16] Ali H. Pattern and etiology of acute hand injuries. J Surg Pak 2021; 26(2): 47-50.

[17] Shrestha S, Tamrakar S, Banskota AK. Outline of hand and wrist injuries presenting to an emergency of a tertiary care centre in Nepal. J Nepal Health Res Council 2019; 17(3): 340-4.

[18] Desai B, Makwana H, Bhavsar NM, Shah D, Patel PR. Epidemiology of hand injuries in adults presenting to a tertiary trauma care centre: A descriptive study. J Clin Orthop 2018; 3(1): 5-9.

[19] Muhammad K, Shaikh S, Ashraf J, Hayat S. Characteristics, reasons and patterns of road traffic injuries presenting in emergency department of a tertiary care public hospital in Karachi. Pak J Med Sci 2022; 38(4Part-II): 862-7.

[20] Abdullah MA, Yasin MA. Road traffic accidents in Pakistan: Unveiling the emergency service challenge. J Basic Clin Med Sci 2023; 2: 1-3.

[21] Dębski T, Noszczyk BH. Epidemiology of complex hand injuries treated in the Plastic Surgery Department of a tertiary referral hospital in Warsaw. Eur J Trauma Emerg Surg 2021; 47(5): 1607-12.

[22] Miranda-Mendizabal A, Castellví P, Parés-Badell O, *et al*. Gender differences in suicidal behavior in adolescents and young adults: systematic review and meta-analysis of longitudinal studies. Int J Public Health 2019; 64(2): 265-83.

[23] Øien-Ødegaard C, Hauge LJ, Reneflot A. Marital status, educational attainment, and suicide risk: A Norwegian register-based population study. Popul Health Metr 2021; 19(1): 33.

[24] Arafat SMY, Menon V, Khan MAS, *et al*. Marital status and suicidal behavior in South Asia: A systematic review and meta-analysis. Health Sci Rep 2023; 6(12): e1781.

[25] Kposowa AJ, Ezzat DA, Breault KD. Marital status, sex, and suicide: New longitudinal findings and Durkheim's marital status propositions. Sociol Spectr 2020; 40(2): 81-98.

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