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CAUSES AND PATTERN OF UNILATERAL HAND INJURIES
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ABSTRACT

***Objective*: To assess the causes and pattern of hand injuries in patients with isolated unilateral acute hand injuries managed at the Kenyatta National Hospital (KNH).**
***Design*: A prospective cross-sectional descriptive study.**
***Setting*: Kenyatta National Hospital, Nairobi, Kenya, between May and August 2006.**
***Subjects*: All patients with isolated unilateral acute hand injuries who presented at the casualty department.**
***Results*: A total of 99 patients were recruited. The mean age was 28.2 years with the modal age being 21-30 years. More males were injured than females. Occupational injuries and assaults were the most prevalent causes of hand injury. Majority of the injuries included lacerations, fractures and tendon injuries. The distal phalanges of the ring and long fingers were the most common sites of injury on the digits.**
***Conclusion*: Occupational hand injuries, a largely preventable problem, are the most prevalent cause of hand injury. This offers opportunity for strategies in preventing a large number of hand injuries by initiating safety measures at the work place.**

INTRODUCTION

The hand is a super tool, an organ of communication, used for gestures and expression of a range of emotions; determination, control and environment manipulation (1). Given this importance, hand injuries are a real burden to society and therefore worthwhile to be prevented (2).There is a need to record data on the background of the injuries and their consequences. Documentation would quantify society burden and assist in managing long-term effects of the injuries. Understanding the causes would contribute to prevention strategies. This study documents the demographic characteristics, causes, site and patterns of hand injuries at an urban referral hospital in Kenya.

MATERIALS AND METHODS

Study area: Kenyatta National Hospital (KNH), a national referral and teaching hospital, which also receives most of the emergency cases in the greater Nairobi region.
Subjects: All consecutive patients with isolated unilateral acute hand injuries who presented at the casualty department during the period between May and August 2006 and satisfied the inclusion criteria below.
Data collection. Patients recruited were evaluated and information on age, gender, education level, cause of injury, site and structures injured obtained. Sites were categorised as individual digits versus the carpus (rest of the hand minus the digits). Radiographs were obtained when indicated and those who required operative management were followed-up to document additional injuries.
Eligibility: Subjects must have had a laceration, crush, avulsion, puncture, fracture, contusion or dislocation involving any part of the hand. Hand being considered to be any part distal to the distal wrist crease. Those with burn injuries, previous hand injury and bilateral injuries were excluded.
Ethical consideration: Approval was sought from the University of Nairobi and the Kenyatta National Hospital Research and Ethics Committee. Written informed consent was obtained from the participants.
Data analysis: SPSS 11.5 software was used for data entry and analysis. Student's *t*-test was used to compare the means.

RESULTS

Patient characteristics: A total of 99 patients were recruited. The age range was 2 to 59 years with a modal age set of 21-30 years followed closely by 31-40 year group. The extremes of ages formed the least group of patients (Table 1). The sample population had a mean age of 28.2 years, a median age of 26 years with a standard deviation of 9.5. The mean ages for males (27 years) and females (30 years) were statistically similar (p=0.33).

There were 78 (78.9%) male and 21(21.2%) female patients giving a male to female ratio of 3.7: 1. Most patients had primary level of education 52 (52.5%) followed by those with secondary level education 34 (34.3%), (n=9) nine (9.2%) had tertiary education while four (4%) had no formal education (Table 1).

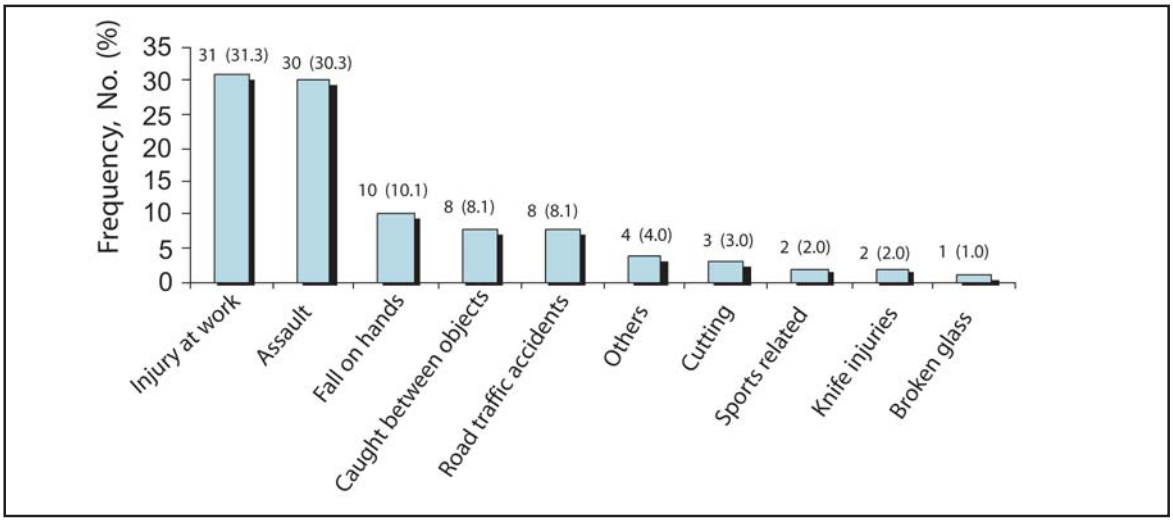
Table 1

Social demographic characteristic of the study population

Characteristic	Frequency	(%)
Age distribution (n = 99)		
0 - 10	2	2.0
11 - 20	14	14.1
21 -30	45	45.5
31 - 40	27	27.3
41 - 50	9	9.1
51 - 60	2	2.0
Sex (n = 99)		
Male	78	78.8
Female	21	21.2
Level of education (n = 99)		
None	4	4.0
Primary	52	52.5
Secondary	34	34.3
College	9	9.2

Figure 1

Causes of the injuries



Cause of injury: The most common cause of injury (31.3% Injury characteristics n = 31), was work or machine related (occupational). Other causes included assaults (30.3%, n = 30), falls (10.1%), hand being caught in objects (8.1%) and road traffic accidents (8.1%). Other causes accounted for 10% of the cases (Figure 1).

Site of injury: The digits were the most prevalent site of injury (75.8%). The most affected digits were the ring (19.6%) and the index fingers (17.5%). The distal phalanges of long and ring fingers were each injured at a frequency of 9.8% while that of index finger was 9.1%. The proximal phalanx of thumb was affected 7.6 % of the time (Table 2).

Pattern of injury: A variety of injuries were noted. These affected the skin, bones, nerves, joints and tendons. The skin was injured in 74.75% of the cases of which 42.4% were lacerations and 32.3% contusions. In 25.3% of the cases the skin was intact (Figure 2).

Distribution of fractures: There were 76 fractures with 55 (72.4%) involving the phalanges, while 19 (25.0%) involved metacarpals. Fractures occurred on carpal bones in two (2.6%) cases (Table 3). The distal phalanx of the long finger was the most fractured bone 11(20%), followed by the distal phalanx of ring finger eight (14.5%) (Table 3). Among the metacarpals, the second metacarpal was the most fractured seven (33.3%), followed by the fifth metacarpal four (19%), with the third being least injured two (9.5%). The scaphoid and hamate were the only carpal bones fractured (Table 3).

Table 2

Site of injury

	Position (Phalanges)					
	Proximal		Middle		Distal	
	No.	(%)	No.	(%)	No.	(%)
Thumb	10	7.6	-*		6	4.5
Index finger	8	6.1	3	2.3	12	9.1
Long finger	3	2.3	6	4.5	13	9.8
Ring finger	7	5.3	6	4.5	13	9.8
Little finger	8	6.1	2	1.5	3	2.3
Carpus	32	4.2*				

* No middle for thumb

* No divisions for carpus

Figure 2

Skin injury

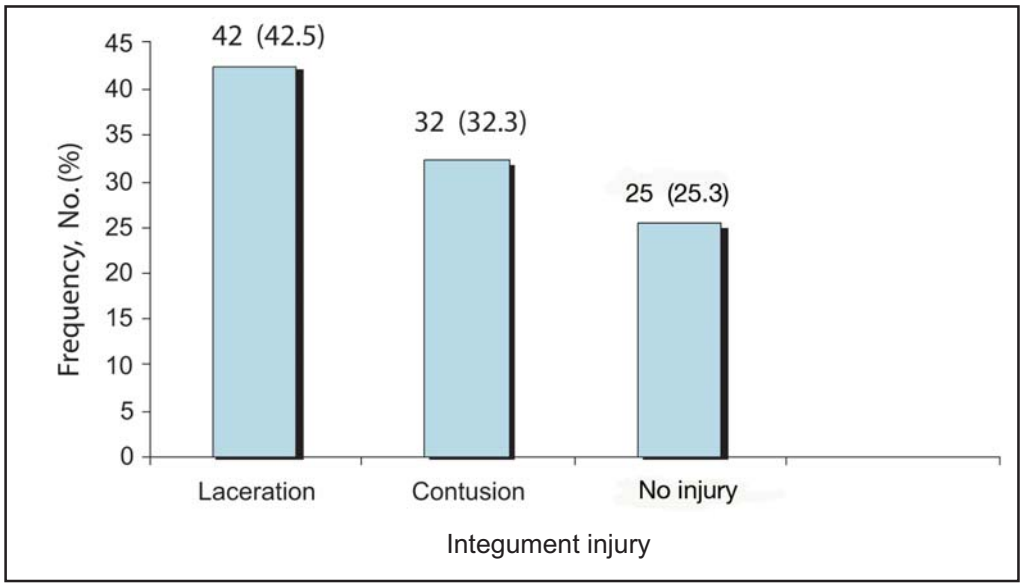


Table 3

Distribution of fractures

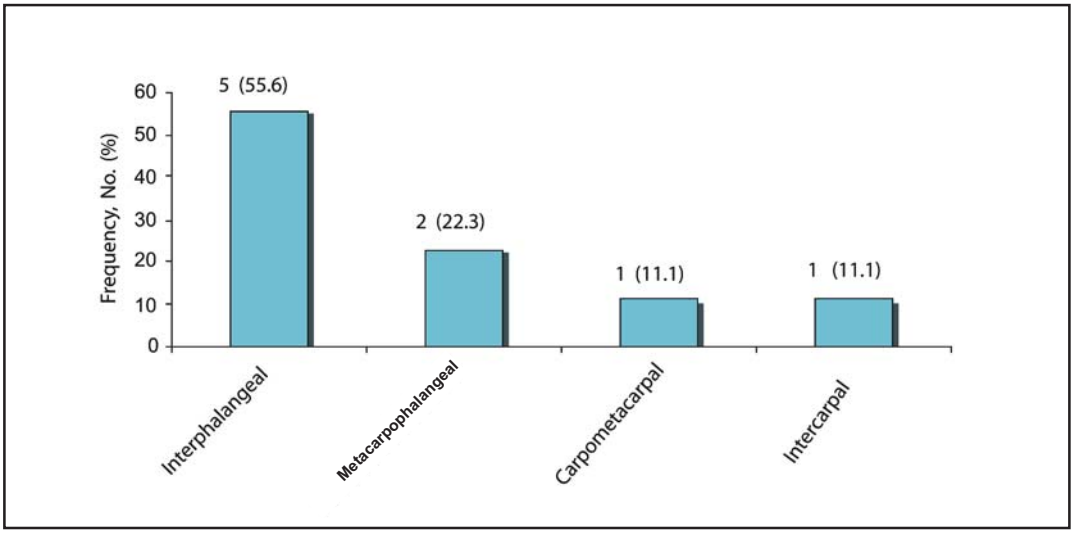
Phalanges	55 (72.4%)					
Metacarpal	19 (25.0%)					
Carpals	2 (2.6%)					
Phalangeal fractures						
	Proximal		Middle		Distal	
	No.	(%)	No.	(%)	No.	(%)
Thumb	5	9.1		*	2	3.6
Index	7	12.7	1	1.8	6	10.9
Long	3	5.5	2	3.6	11	20.0
Ring	3	5.5	2	3.6	8	14.5
Little	3	5.5	1	1.8	1	1.8
* No middle for thumb						
Carpal and metacarpal fractures					Finding	
Metacarpal					No.	(%)
1st					3	14.3
2nd					7	33.3
3rd					2	9.5
4th					3	14.3
5th					4	19.0
Carpal						
Scaphoid bone					1	4.8
Hamate bone					1	4.8

Nerve injuries: The prevalence of nerve injuries was 2% which involved the median and ulnar nerves.

Joint injury (dislocation). Nine patients (10 %) had a joint dislocation with the interphalangeal joint being the most affected five (55.6%). The metacarpophalangeal joint was involved in two (22.2) (Figure 3).

Figure 3

Joint dislocation



Injured tendons. Seventeen patients had tendon injuries, with 21 individual tendon injuries being identified. The flexor tendons were affected more than the extensors. The most prevalent tendon injuries were flexor digitorum superficialis followed by flexor digitorum profundus and extensor digitorum communis (Table 4).

Table 4

Distribution of injured tendons

	No.
Flexor digitorum superficialis	5
Flexor digitorum profundus	4
Extensor communis	4
Flexor pollicis longus	3
Extensor indicis	3
Others	2

DISCUSSION

Age: Nearly all the age sets were affected by hand injury. However the modal age set was the 21-30 year group who consisted 45.5 % of the patients. These findings compare well with other studies (3-6). According to Wanjohi, a similar modal group formed 39.9% of patients with hand fractures (3). These results are also consistent with others in Northern Ireland and Qatar (4,5). However, Larsen *et al* in a study in The Netherlands and Denmark described the peak of injury to be in teenagers (6). These were largely due to recreational causes. This difference could be attributed to presence of less work place-related injuries which usually occur among older individuals. However the distribution across age groups differs with Shaheen *et al* reporting a higher figule of 12% in the l-10 year group while Hill *et al* had about 10% (4,5). In the current study only 2% belonged to the l-l0 year group. This may be explained by differences in the definition and case selection of patients. Hill's study had loose selection criteria for hand injury in which the wrist was included (4).

Sex: Males formed a disproportionately high group of patients in this study, with a male to female ratio of 3.7:l. The figure compares well with Eastern European country of Poland (7) where male-female ratio was 4:1, but is higher than that in Northern Ireland (2.2:1) and Denmark (l.6:1) (4,8). A possible explanation may be that women are more involved in the economies of western European countries. However the ratio is quite low compared to Qatar's figures 10.1: 1, which may be due to cultural issues that hinder women's participation in society (5).

Education level: Most of the patients had primary level education and these tended to be the ones with occupational injuries and assaults. This group tends to be manual workers with little safety education. In Shaheen's study 59% of the subjects injured were manual workers, which he attributed to laxity of implementation of work place safety measures (5).

Causes of injury: The aetiology of injuries was varied with work-related (31%) causes and assault (30%) being the two leading causes, while falls and hand being caught in objects were next in line. This pattern may reflect the socio-economic state of the victims and the country's level of development. Compared to industrialised country like Qatar (5), this differs greatly as industrial causes accounted for 59% with domestic and recreational injuries accounting for 30%. In Ireland, falls (15%) and sports (15%) were the leading causes, while injury at work contributed 5.4%. This may be due to developed nature of the country with less industrial manual workers. Pietrobon observed that assaults were the leading cause of hand injuries in South Africa (9). He attributed this to the period 1992 to 1994 when the country was in transition characterised by violence, social upheaval and uncertainty about the future. In The Netherlands and Denmark however, home and leisure accidents caused by objects and falls were the leading cause of injury to the hand (6).

The predominance of work-related injuries suggests that preventive measures focused at the work place may lead to reduction in the prevalence of occupation-related hand injuries.

Site of injury. The digits were the most affected site compared to the carpus. This finding compares well with the study in Ireland in terms of ratios although the Irish had significantly less injuries on the carpus. Among the digits, the ring and the index fingers were the most injured closely followed by the long finger. This differs from Shaheen's study in which the long finger was the most affected with index finger and thumb next in predominance. The distal phalanges of the index and long fingers were the most affected sites and this is explainable by the fact that these are the leading parts of the body especially in those with occupational injuries.

Pattern of injury: Most of the injuries were open. This pattern may reflect the severity of the force and the nature of the cause at the time of injury. Machine related and assaults involving sharp objects are likely to cause lacerations/ penetrating injuries. The phalanges (72.9%) were the most fractured bones followed by the melacarpals (25%). This is in keeping with site of injury distribution and reflects the fact that the phalanges are the leading part of the hand.

Of the metacarpals injured, second and fifth were most affected. These metacarpals are on the open side of the hand, therefore exposed to violence of assaults and machine injuries. These figures compare well with those in The Netherlands (10). Here phalangeal fracture prevalence was 59% while that of metacarpals was 33%. Hove *et al* (11) in Belgium observed that the phalanges, metacarpals, and carpal bones accounted for, 46%, 36% and 18% of the fractures, respectively. Fractures of the scaphoid made up 10.6% of the total. In Finland a pattern in which lacerations constituted 45% of the injuries, while fractures represented 26% was reported (12).

Nerve injuries: In this study the prevalence of nerve injuries was about 2%. This is comparable with the findings of Nieminen *et al* in Finland who reported a prevalence of 2% (12). Nieminen's study had a similar prevalence of nerve and tendon injuries. In this study however, the tendon injury prevalence was 17%. It would be expected that the tendon and nerve injury prevalence should be the same as both are usually caused by lacerations. Probably the nerve and tendon injuries were discordant because many of the tendon injuries were in zone 1 and 2 of the hand where tendons and nerve are not as closely related as compared to zone 3 and 4.

Joint: There was a 10% rate of joint dislocation with the interphalangeal joints being the most affected. This pattern of injury is in keeping with the distribution of sites injured and the corresponding bone fractures.

In conclussion, hand injuries are a common problem at the accident and emergency units worldwide. This study illustrates the difference in demographic features and pattern of injuries seen at KNH compared to other institutions found in areas with different levels of development. It is further noted that most hand injuries are largely due to preventable causes (occupational / assaults) and are therefore avoidable. We recommend enhancement of work-place safety measures that would reduce incidence of hand injuries.

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