

## INDUSTRIAL HAND INJURIES AS SEEN AT AVENUE HOSPITAL, NAIROBI

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### ABSTRACT

**Background:** Industrial hand injuries can result in functional and economic loss and poor quality of life.

**Objective:** To determine the cause and mechanism of industrial hand injuries, the risk factors and safety measures taken in industries.

**Design:** Prospective study from September 2009 to March 2012.

**Setting:** Avenue Hospital, Nairobi, Kenya.

**Methodology:** A Prospective study of consented hand injured adult workers admitted and operated on from September 2009 to March 2012. Noted was age, gender, occupation, experience, cause of injury and mechanism, industry involved, time of injury, duration of shift at injury and whether safety measures were taught.

**Results:** Of the 75 patients, males were 71 (94.7%). The average age was 34.2 years with a range of 19 to 62 years. All patients had right hand dominance. Majority 52 (69.3%) of the patients were machine operators. This together with the assistant machine operators and technicians comprised 61 (81.3%). Patients with work experience of less than 6 months and more than 60 months had a greater risk of sustaining injury and loss of concentration 25 (33.3%) was the main contributory factor. Plastic products manufacturing firms contributed 36 (48.0%) of the injuries. The mechanism of injury was crushing, 63 (84.0%) and cutting 12 (16.0%). The morning shift (7:00am to 12:00 noon) accounted for 34 (45.3%) of the injuries, with 23 (30.7%) occurring between 10:00am and 12:00 noon. The first 4 hours of the shift accounted for 39 (52%) of the injuries. A shift of 9 hours or more accounted for 15 (20%). The majority 55 (73.3%) of the workers had been taught safety measures with 96.4% having been taught more than once.

**Conclusion:** Inexperienced workers and those with long experience of more than 60 months tended to have a higher risk of injury. Most of the injuries occurred during the morning shift. A shift of 9 hours or more seemed not to be associated with increased risk of injury. Only 20 (26.7%) of the injured had not been taught safety measures compared with 55 (73.3%) who had been taught. Loss of concentration was the main contributory factor.

**Recommendation:** Enhancement in safety education and training, proper design and maintenance of equipment and machines coupled by greater involvement by management and possibly taking punitive measures on workers who flout safety measures may help to minimize injuries at the workplace.

### INTRODUCTION

The hands are the most commonly injured parts of the body in traumatic occupational injuries (1). Work-Related Hand Injuries (WRHI) result in functional impairment, economic losses and affect quality of life (2,3). In 2009, the National Safety Council (NSC) reported that the cost of occupational injuries and deaths totaled US\$169.8 billion in the U.S.A (4), while over 1 million workers with acute hand injuries annually visit emergency department (5).

Most studies have shown males being more affected than females (1, 2, 6-9) with a mean age of between 29 and 39 years (6-8). In a USA study conducted by Hart *et al* (2) 68% of the hand injuries occurred in the 36

to 55 years of age bracket while Serinken *et al* (6) in Turkey it found 57% in the age bracket of 25 to 34 years. WRHI recorded in industries involving metal and machinery accounted for 41.4% (n=101) of all injuries in Turkey, while 116 (90.7%) of WRHI were caused by compression or sharp-blade instruments in Iran (7).

The dominant hand was reported to be 97.7% of the study population in which the left hand was injured in 52.0% in China study (9) while the right hand injury comprised 68% in the Hong Kong study (8).

Various studies have documented different mean work experiences (5,7,8). Sorock *et al* (5), concluded that a job experience of less than three years was associated with higher relative risks when using

unfamiliar equipments, using an unusual method to perform a task or being distracted.

In the study of Zahran *et al* (10), 87 (74%) of the victims had worked over 8 hours per day and 81% did not follow safety measures at the times of the injury, while Farhadi *et al* (7) found most of the injuries, 105 (82%) occurred during the morning shift with 61 (47.6%) in the middle of the time and there were inadequate safety standards at their work place. Various suggestions have been advanced to enhance safety at the work place (5,7,10) however, Hart *et al* (2) found that while knowledge and attitude improved, behavior scores in the treatment group was not significantly differently from the controls and suggested greater involvement of management in enhancing safety at work place.

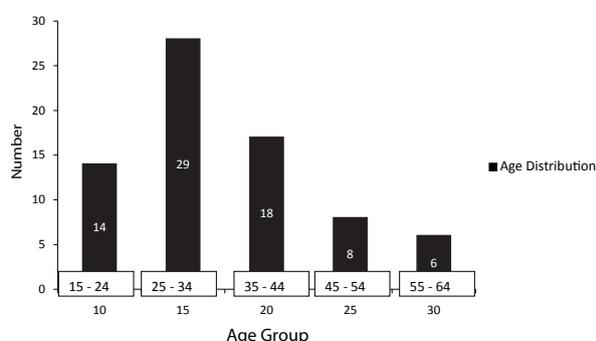
## MATERIALS AND METHODS

This was a prospective study of consented industrial hand injured workers who were admitted and operated on at Avenue Hospital, Nairobi from September 2009 to March 2012. The following were noted:- age, gender, occupation, experience, cause of injury and mechanism of injury, industry involved, time of injury, duration of shift at time of injury and whether the worker had been taught safety measures.

## RESULTS

The study population was 75 (males 71 (94.7%), females 4(5.3%). The dominant hand was right 75 (100%). The side injured – right – 39 (52%) left 36(48%). Figure 1 shows the age distribution. Age range was 19 to 62 years, while the average age was 34.2 years.

**Figure 1**  
*Age distribution*



Majority of the patients were machine operators. The machine operators, assistant machine operators and technicians comprised 61 (81.3%) (Table 1).

**Table 1**  
*Occupation*

Occupation	No.	(%)
Machine operator	52	69.3
Assistant machine operator	2	2.7
Carpenter	1	1.3
Technician	7	9.3
Welder	1	1.3
Mason	1	1.3
Cleaner	2	2.7
Manual Labourer	9	12.0
Total	75	99.9

Workers who had a work experience of 6 months and below 16(21.3%) and more than 60 months 28 (37.3%) had a greater risk of sustaining hand injury (Table 2).

**Table 2**  
*Work experience*

Months	No.	(%)
0-6	16	21.3
7-12	3	4.0
13-18	4	5.3
19-24	6	8.0
25-30	4	5.3
31-36	7	9.3
37-42	0	0.0
43-48	5	6.7
49-54	0	0.0
55-60	2	2.7
>60	28	37.3
Total	75	99.9

Loss of concentration accounted for the majority 25(33.3%) of the injuries while faulty machine and slipped hand accounted for 12(16.0%) each (Table 3).

**Table 3**  
*Cause of injury*

Cause	No.	(%)
Dislodging material from machine while on	5	6.7
Machine switched on by colleague without warning	5	6.7
Loss of Concentration	25	33.3
Sleeve/glove caught by machine	2	2.7
Relieving colleague/unfamiliar machine	3	4.0
Faulty machine	12	16.0
Hand slipped	12	16.0
Others	11	14.7
Total	75	100.1

Plastic products manufacturing industry accounted for the majority 48.0% (36) of the injuries (Table 4).

**Table 4**  
*Industry*

Industry	No.	(%)
Plastic products manufacturing	36	48.0
Food processing	10	13.3
Timber	5	6.7
Printing	4	5.3
Steel	6	8.0
Others	14	18.7
Total	75	100.0

The mechanism of injury was 63 (84.0%) crushing and 12(16.0%) cutting. Time of day when injury occurred was as follows;

Morning 7:00 hours to 12:00 hours – 34 (45.4%)

Afternoon 13:00 hours to 18:00 hours – 20 (26.7%)

Night 19:00 hours to 6:00 hours – 21 (28.0%) (Table 5).

**Table 5**  
*Time of injury*

Time	No.	(%)
7.00 to 9.00 hours	11	14.7
10.00 to 12.00 hours	23	30.7
13.00 to 15.00 hours	6	8.0
16.00 to 18.00 hours	14	18.7
19.00 to 21.00 hours	7	9.3
22.00 to 24.00 hours	5	6.7
1.00 to 3.00 hours	6	8.0
4.00 to 6.00 hours	3	4.0
Total	75	100.1

Majority of the injuries 34 (45.4%) occurred during the morning shift and that 23 (30.7%) between 10:00 hours to 12:00 hours, while 16:00 hours to 18:00 hours accounted for 18.7% (14) of the injuries (Table 6).

**Table 6**  
*Duration of shift at injury*

Shift duration (hours)	No.	(%)
0 – 2	21	28
3 – 4	18	24
5 – 6	9	12
7 – 8	12	16
9 – 10	9	12
>10	6	8
Total	75	100.1

The first 4 hours accounted for 39 (52%) of the injuries while a shift of 9 hours and more accounted for 15 (20.0%). The majority, 55 (73.3%) of the workers had been taught safety measures with 53 (96.4%) having been taught more than once, while 20 (26.7%) had not been taught.

## DISCUSSION

Of the 75 patients, males were the majority 71 (94.7%), just like in other studies (1,2,6-9). However the proportion of women was lower than in the Western, Hong Kong and Chinese studies (1,2,6,8,9) and was comparable to studies in the Middle East (7,10). In the Iranian study (7), there was only one female out of the 128 patients. In the current study the average age was 34.2 years with a range of 19 to 62 years. Several studies found a mean age of between 28 years and 39 years (6-9). The age bracket of 25 to 34 years comprised 29 (38.7%) and 61 (81.3%) were aged 44 years and below while in the Serinken *et al* (6) study in Turkey, 57% were in the age bracket of 25 to 34 years, while Hart *et al* (2) found the majority of the patients (68%) were in a higher age bracket (36 to 55 years). In the Jin *et al* (9) study the patients tended to be younger, (36% were 24 years and below).

All the patients in this study had a right dominant hand in which the right side was injured 39 (52%). Eighty four percent injuries had crushing as the mechanism. Jin *et al* (9) in China, had similar findings in which the right dominant hand was 97.7%, with right side injured in 52% while Chow *et al* (8) in Hong Kong found the right hand injury occurred in 68% of the patients.

Majority 52 (69.3%) of the patients were machine operators, while technicians comprised 7 (9.3%). Machine operators, assistant machine operator and technicians comprised 61 (81.3%) in this study hence workers handling machines were at the greatest risk of sustaining hand injuries. Serinken *et al* (6) in Turkey found that 101 (41.4%) of all injuries occurred in industries involving metal and machinery.

Patients who had work experience of 6 months and below, 16 (21.3%) and more than 60 months 28 (37.3%) had a greater risk of sustaining hand injury. Inexperience predisposes to hand injury, however patients with vast experience could have become over confident, complacent and easily flouted safety measures, thus leading to injury. However Sorock *et al* (5) concluded from their study that a job experience of less than 3 years (36 months) was associated with higher relative risks when using unfamiliar equipment, unusual method to perform a task or being distracted. In the Farhadi *et al* (7) study, the patients had an average of 13.5 months experience with their jobs.

Loss of concentration accounted for 25 (33.3%) of the injuries while faulty machines and a slipped hand, were the cause of hand injuries in 12 (16.0%) each. There were 5 cases where a colleague switched on machine without warning while a worker was handling it and a similar number where a worker was dislodging material while the machine was on. Twelve (16%) patients were injured by a faulty machine (failed sensor), of which the management was aware. Clearly, most of these injuries were preventable.

Plastic products manufacturing industries accounted for most of the injuries 36 (48.0%) followed by food processing industries 10 (13.3%). Majority of these industries had a medical scheme with the hospital and this could explain the distribution pattern of the industries where the patients came from. Serinken *et al* (6) found that industries involving metal and machinery accounted for 41.4% of all injuries, with textile industries accounting for 16.8%.

Crushing was the mechanism of injury in 63 (84.0%) while cutting was 12 (16.0%). Compression or sharp instruments traumas accounted for 90.7% in the Farhadi *et al* (7) in Iran.

The study found that 34 (45.4%) of the patients were injured during the morning shift (7.00 am to 12.00 noon) and that in 23 (30.7%) the injury occurred between 10:00 am and 12:00 noon. The afternoon shift (13:00 to 18:00) accounted for 20 (26.7%). Night shift (19:00 to 6:00) account for 21 (28.0) of the injuries. Farhadi *et al* (7) found that most of the injuries 105 (82%) occurred during the morning shift as is the current study but their figure was higher.

The first two hours of a shift accounted for 21 (28%) of the injuries while 18 (24%) were injured between the 3<sup>rd</sup> and 4<sup>th</sup> hour of the shift. The first four hours accounted for 39 (52%) of the injuries. Injuries occurring at 9 or more hours of a shift accounted for 15 (20%). These findings are in contrast with the Zahran *et al* (10) study in which 87 (74%) of the patients had worked for more than 8 hours. In the current study, a long shift duration was not associated with increased risk of injury.

The majority, 55 (73.3%) of the injured had been taught safety measures at work and 53 (96.4%) had been taught more than once. This study seems to suggest that teaching safety measures to workers did not necessarily translate to improved safety of workers. Various suggestions have been proposed to enhance safety at work place (5, 7,8,10). Chow *et al* (8) identified the following as transient risk: malfunctioning equipment/materials, using a different work method, working overtime, being distracted, performing an unusual work task, being ill and rushing at work. They recommended, raising awareness of risk factors among workers and that efforts should be made to minimize exposure to these factors by means of engineering and administration controls coupled by safety education and training. Hart *et al* (2) also suggested greater involvement of management in enhancing safety at work place after noting that while knowledge and attitude improved, behavior scores in the treatment group was not significantly different from the controls, a position the current study advocates as most of the injuries were clearly preventable.

## CONCLUSION

Inexperienced workers and those with long experience of more than 60 months tended to have a higher risk of injury. Most of the injuries occurred during the morning shift and a shift of 9 hours or more seemed not to be associated with increased risk of injury. Only 20 (26.7%) of the injured had not been taught safety measures compared with 55 (73.3%) who had been taught. Loss of concentration was the main contributory factor.

## RECOMMENDATION

Enhancement in safety education and training, proper design and maintenance of equipment and machines coupled by greater involvement by management and possibly taking punitive measures on workers who flout safety measures may help to minimize injuries at the workplace.

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