

# Causes of Hand Impairment

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## ABSTRACT

**Objective:** The objective of this study was to identify the causes leading to impairments of hand

**Study Design:** Descriptive case series

**Place and Duration of Study:** This study was conducted at Rehabilitation Medicine department of Combined Military Hospital, Abbottabad from July 2010 to Jun 2011.

**Materials and Methods:** 100 patients diagnosed to be having hand impairments were sampled by convenience sampling and through a face-to-face interview. Data was collected and analyzed using SPSS 10. Frequencies and descriptive statistics were calculated for the various variables.

**Results:** 84% (n=84) of the participants were males whereas 16% (n=16) were females. Mean age of study participants was 37.36 years (SD  $\pm$  16.18 yrs). Among these patients 94% (n=94) were right-handers and 6% (n=6) were left-handers. Dominant hand was affected in 51% (n=51) of patients, non-dominant hand was affected in 37% (n=37) of patients while in 12% (n=12) of patients both hands were affected. The most common cause of hand impairment was road traffic accidents at 28% (n=28), followed by falls 16% (n=16) and firearm injuries at 12% (n=12). Number of genetic causes, sharp injury, blast injury and overuse were 7% (n=7), 6% (n=6), 6% (n=6) and 5% (n=5) respectively. Carpal tunnel syndrome, electric shock, infection, iatrogenic injury and sports injury were 3% (n=3) each. While cubital tunnel syndrome, and occupational injury were found to be 2% (n=2) each and Neuroma was 1% (n=1).

**Conclusion:** A large number of patients had hand impairments resulting from trauma. At the top of the list of causes of impairment was road traffic accidents followed by falls. Traumatic causes of hand impairment were 75% while non-traumatic causes were 25%.

**Key Words:** Causes, Hand, Impairments, Traumatic, Non-traumatic

## INTRODUCTION

Hand impairments are a frequent cause of chronic disability and handicap. Hand impairments cause both psychological and physical disability. Hand has been the focus of attention of physicians, surgeons and palmists for centuries. Hand surgery and hand rehabilitation have come a long way since then. Most important function of the shoulder, elbow and wrist is to position the hand<sup>1</sup>. Once the hand is positioned, it is able to proceed with its functional task, whether in earning a living, practicing a hobby or allowing independence in daily activities. Damage to muscles, tendons, nerves, joints, skin, subcutaneous tissues and fasciae of the hand is incapacitating and limiting the independent functioning of the affected individual<sup>2</sup>. Injury, disease or surgical interference, therefore, do much more than interfere with grip or touch; they affect the personality itself.

According to the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) by WHO, impairment is defined as:

Impairment occurs at the organ system level and is defined as a loss or abnormality of psychological, physiologic or anatomic structure or function resulting from pathology<sup>3</sup>.

The American Medical Association Guides define impairment as 'a loss, loss of use, or derangement of any body part, organ system, or organ function<sup>4</sup>.

Damage to muscles, tendons, nerves, joints, skin, subcutaneous tissues and fasciae of the hand is incapacitating and limiting the independent functioning of the affected individual<sup>2</sup>. And because of their intricacy, the care of the hand, both surgical and non-surgical, is dependent on causes of impairment. Understanding the mechanism of injury and knowing the frequency of different diseases is very important in reaching the correct diagnosis<sup>5</sup>. Determination of most appropriate type of surgical procedure or rehabilitation plan is also dependent on the underlying cause of hand impairment.

The rationale of this study is to identify and determine the frequency of causes of impairments of hand. This is expected to provide adequate and useful information pertinent to the population studied, for the prevention and control programs along with development of appropriate treatment strategies.

## MATERIALS AND METHODS

This descriptive Study was carried out at Rehabilitation medicine department of combine military hospital, Abbottabad. The study duration was one year from July 2010 to June 2011. 100 patients presenting with impairments of hand were included in the study by convenience sampling.

All the patients presenting with local disease or injury of the hand were included while those patients having hand impairment due to systemic illness affecting their

hands, such as polyneuropathy, stroke, spinal cord injury and systemic arthritis, were excluded. Informed consent was taken from each patient about collection of data. And data was collected by the specialist in rehabilitation medicine from among outdoor patients of rehabilitation medicine department and analyzed on SPSS version 10. The collected data included, age gender, hand dominance and nature of impairment of the patients. Assessment of impairments included muscle power, sensations, reflexes, coordination, range of motion, deformities, swelling and tenderness. Investigations included radiological examination like x-rays for fractures, lab studies to rule out systemic illnesses and nerve conduction study for nerve injuries.

## RESULTS

A total of 100 patients fulfilling the inclusion criteria were included in this study, amongst the total study participants 84% (n=84) were males whereas 16% (n=16) were females. The mean age of study participants was 37.36 years (SD  $\pm$  16.18 years), youngest patient was 6 years of age and eldest was 90 years of age. The most frequent age group visiting the OPD for hand impairments was 21 to 40 years, followed by 41 to 60 years. Among these patients 94% (n=94) were right-handers and 6% (n=6) were left-handers. While none of the patients exhibited ambidexterity. Dominant hand was affected in 51% (n=51) of patients, non-dominant hand was affected in 37% (n=37) of patients while in 12% (n=12) of patients both hands were affected. The most common occupation associated with hand impairments was soldiering, soldiers were 29% (n=29) of the total, followed by housewives who were 12% (n=12) and students were 11% (n=11). Farmers and clerks were 8% (n=8) each. 5% (n=5) were the retired persons, while technicians were 4% (n=4). Watchmen, cooks, operators and shopkeepers were 2% (n=2) each. Carpenter, electrician, lineman, office worker, pilot and searcher comprised 1% (n=1) each of the total. The most common cause of hand impairment was found to be road traffic accidents with a great toll of 28% (n=28), followed by falls which were 16% (n=16) and firearm injuries at 12% (n=12). Number of genetic causes, sharp injury, blast injury and overuse were 7% (n=7), 6% (n=6), 6% (n=6) and 5% (n=5) respectively. Carpal tunnel syndrome, electric shock, infection, iatrogenic injury and sports injury were 3% (n=3) each. While cubital tunnel syndrome, and occupational injury were found to be 2% (n=2) each and Neuroma was 1% (n=1) (See Table 1 and Figure 1). 75% (n=75) of these causes were traumatic and 25% (n=25) were non-traumatic. Frequencies and percentages of different hand diseases resulting from above mentioned causes include, fractures, which were 27% (n=27) of total diseases, peripheral nerve injuries were 23% (n=23)

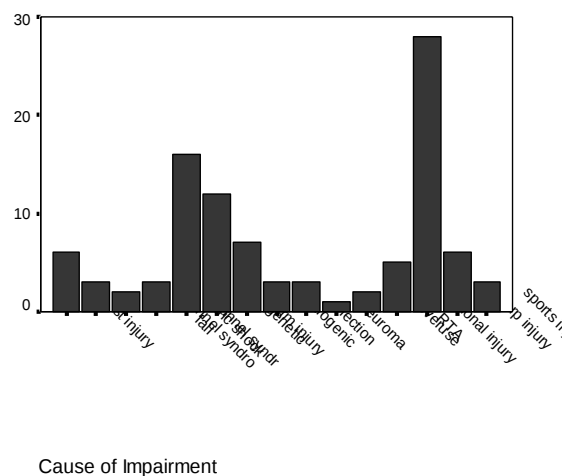
while ruptured tendons were 7% (n=7). 6% (n=6) each of burns, lacerations and Dupuytren's contracture. Each of the complex regional pain syndrome, crush injury and mallet finger comprised of 3% (n=3) of the diseases. Avulsion injury, brachial plexus injury, Dequervain's tenosynovitis, dislocation, pulp infection (felon) and trigger finger were 2% (n=2) each of total diseases. Hypoplastic hand, tuberculous osteomyelitis, vascular injury, and writer's cramp were 1% (n=1) each. Impairments resulting from these diseases included, stiff hand which was 39% (n=39) of total impairments followed by contractures which were 20% (n=20) and claw hand which was 10% (n=10). Wrist drop was 8% (n=8). Amputation and weakness were 7% (n=7) each of total impairments. Pain was found in 5% (n=5) patients as an impairment. Inability to extend DIP was found to be 3% (n=3). Dystonias were 1% (n=1).

**Table No.1: Causes of Impairment**

|                         | Frequency | Percent |
|-------------------------|-----------|---------|
| blast injury            | 6         | 6.0     |
| carpal tunnel syndrome  | 3         | 3.0     |
| cubital tunnel syndrome | 2         | 2.0     |
| electric shock          | 3         | 3.0     |
| fall                    | 16        | 16.0    |
| fire arm injury         | 12        | 12.0    |
| genetic                 | 7         | 7.0     |
| iatrogenic              | 3         | 3.0     |
| infection               | 3         | 3.0     |
| neuroma                 | 1         | 1.0     |
| occupational injury     | 2         | 2.0     |
| overuse                 | 5         | 5.0     |
| RTA                     | 28        | 28.0    |
| sharp injury            | 6         | 6.0     |
| sports injury           | 3         | 3.0     |
| Total                   | 100       | 100.0   |

Table Showing Frequencies and Percentages of different Causes of impairments

Cause of Impairment



**Figure No.1: Graph Showing Frequencies of Causes of Impairment**

## DISCUSSION

Impairments of hand are agonizing and depressing for both the patient and the family. While doing this study it was seen that patients were psychologically very disturbed because of limited or no use of hand, inability to carry out activities of daily living and restricted use of hands in expression of one's feelings. In my research, 84% of the patients were males while 16% were females. In a study by Trybus and colleagues<sup>6</sup> 80.6% patients were males. There is slight male predominance in my sample of patients, most probably because of our male-dominant society where most of the outdoor manual work is done by the males. The mean age of study participants was 37.36 years (SD  $\pm$  16.18 years), youngest patient was 6 years of age and eldest was 90 yrs of age. The most frequent age group visiting the OPD for hand impairments was 21 to 40 years, followed by 41 to 60 years. In the study by Trybus and colleagues<sup>6</sup> age range was from 14 to 79 years with an average of 37. Which means working age group suffered the most in both set of samples. Among my patients 94 % were right-handers and 6 % were left-handers. While none of the patients exhibited ambidexterity. In a study carried out by Chen CC et al it was found that 88 % of the patients were right-hander, 10 % were left-hander while 2 % of the patients exhibited ambidexterity<sup>7</sup>. Dominant hand was affected in 51 % of patients, non-dominant hand was affected in 37 % of patients while in 12 % of patients both hands were affected. A study carried out by Watts et al, showed that 61 % of the patients suffered from injuries to the dominant hand<sup>8</sup>. In another study carried out at Bahawal Victoria hospital it was found that in 73.7% patients' right hand was involved<sup>9</sup>. The most common occupation associated with hand impairments is soldiering, soldiers were 29 % of the total, followed by housewives who were 12 % and students were 11%. Farmers and clerks were 8 % each. 5% were the retired persons, while technicians were 4%. Watchmen, cooks, operators and shopkeepers were 2 % each. Carpenter, electrician, lineman, office worker, pilot and searcher comprised 1% each of the total. It is evident from these statistics that most commonly affected population is that of young manual workers. In the study by Trybus and colleagues<sup>7</sup> manual workers were 50.2% of the total patients. In my study the most common cause of hand impairment was found to be road traffic accidents with a great toll of 28%, followed by falls which were 16% and firearm injuries at 12%. Percentages of genetic causes, sharp injury, blast injury and repetitive use were 7%, 6%, 6% and 5% respectively. 3% were affected by carpal tunnel syndrome, electric shock, infection, iatrogenic injury and sports injury each. While cubital tunnel syndrome and occupational injury were found to be 2 % each. In the last neuroma were 1% of the causes of impairment. Among these causes

75% were traumatic while 25% were nontraumatic. In the study carried out by Trybus and colleagues<sup>7</sup> results were different. In this study leading cause of impairment was machine trauma at 34.87 % followed by cuts, which were 33.03 %, while road traffic accidents caused hand impairments in only 5.25 % of patients included in their study. Falls accounted for 7.09 % and blows for 3.42 % of injuries. This discrepancy can be explained on the basis that our economy is agriculture based and machine injuries resulting from industrial accidents are not very common. On the other hand our traffic control system is not very good as compared to western nations making road traffic accidents a leading cause of hand impairments. Recent upsurge in domestic violence and terrorist activities in our society has resulted in rise of other causes like firearm injuries and blast injuries. A study by Barr et al<sup>10</sup> demonstrated that among the non-traumatic causes of hand impairments, carpal tunnel syndrome is at the top of the list followed by other disorders resulting from repetitive use of hand and upper limb such as De Quervain's tenosynovitis and trigger finger. In my study carpal tunnel syndrome is less common as compared to other repetitive use disorders. This difference is most probably because Barr and colleagues did their study on manual workers including assemblers, construction laborers, and supervisors in sales, carpenters, and cashiers. While my study was conducted on general population, associated with various occupations including retired persons, who reported to rehabilitation OPD with hand disorders. Another study by Sampaio et al<sup>11</sup> demonstrated that tendon lesions resulting from overuse were common as compared to nerve lesions. In my study 3% of the causes of impairment were sports injuries while Molen et al<sup>12</sup> demonstrated that it was 1% in their sample of patients. This discrepancy can be explained on the basis of better sporting and injury prevention techniques in their set of population.

## CONCLUSION

Identification of causes of impairments is as important as is treatment and rehabilitation of these impairments. Because not only it can facilitate prevention of these impairments but also provides evidence for clear clinical decision making. This prevention and clarity in clinical decisions can avoid negative physical, psychological and economic impact of these impairments, which occurs in the form of expenditure incurred for healthcare provision and days lost from work. This study has revealed that 75% of the causes of impairments are traumatic and road traffic accidents and falls constitute most of these causes. Prevention for these can be implemented by taking better road safety measures, observing fall prevention programmes and providing better working conditions to the manual workers along with ergonomic adjustments.

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