



## Epidemiological and Clinical Characteristics of Traumatic Hand and Finger Amputations in North Western Iran; A Single Center Experience

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### ABSTRACT

**Objective:** To determine the epidemiological and clinical characteristics of hand and finger amputations in patients referring to a single center in northern Iran.

**Methods:** This was a cross-sectional study conducted on 200 traumatic hand amputees hospitalized in Shohada Hospital in Tabriz, Northwestern Iran during a 1-year period in 2014. Data were collected through prospective interviews for variables such as demographic characteristics, accident time; exact anatomical site of amputation; reasons for amputation; amputation mechanism; and having attention deficit symptoms as well as activities causing attention deficit prior to the accident.

**Results:** The vast majority of cases were men and women accounted for only 7.5% of injured cases. In 60.5% of cases, the accident occurred on the fingers of their active hand and fingers accounted for almost 95% of accidents. 85.8% of accidents occurred at work 63.7% . of accidents occurred in the evening. 63.67% of accidents occurred in the evening. Among hazardous occupations, agricultural occupations ranked the first followed by sugar cut and pressing jobs. It was found that 10% of the victims were injured while responding a mobile phone call and 3% of the victims reported that they were listening to music through headphones before the accident. Five percent of the participants reported a quarrel with a colleague and 11.5% of them reported a quarrel with their employer prior to the accident.

**Conclusion:** Amputations are of much importance in men working in given jobs such as agricultural and pressing. Distraction caused by mobiles, music and personal relations with others is considered of importance to be prevented during job. Risk levels for potential risk indicators need to be assessed through controlled studies.

**Keywords:** Amputation; Injuries; Epidemiology; Traumatic hand injuries.

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### Introduction

Injuries comprise a major health problem and their control and prevention is critical in epidemiology

and public health practice [1]. Skeletal organs are important parts of body. Although their defect or loss does not endanger human life, it has serious negative impacts on the quality of life so that affected cases

experience many problems in their routine works. In addition, they suffer many problems and obstacles from employment and economic points of view. Moreover, any organ abnormality results in non-uniformity from physical attractiveness point of view and, in turn, imposes negative psychological impacts on cases. The recovery and rehabilitation of disabled cases as well as using artificial organs imposes serious costs on society and this intensifies the importance of this issue [2, 3]. Amputations may also affect the psychological status and health-related quality of life [4].

Amputation occur following trauma or as a result of therapeutic procedure. Despite technological advances in medical science, amputation is done for different reasons with occupational injuries and diabetes as the leading reasons, however, other reasons should also be considered including war and traffic accidents [5-9]. Occupational accidents are the main reason behind laborers' disability in industrial occupations. It is considered as a public health problem of the employed population engaging 15 million laborers per day worldwide. On a global scale, occupational injuries are the second cause of accidental fatality followed by road accidents fatality and hand or finger injuries solely account for 10-20% of all emergency department visits [10]. The aim of this study was to map out epidemiological patterns of traumatic hand amputations admitted to a referral trauma center in East Azarbaijan, Iran.

## Materials and Methods

### Study Population

This was a cross-sectional study was conducted in patients admitted to Shohada Hospital, a tertiary healthcare center affiliated with Tabriz University of Medical Sciences during a 1-year period during 2014. We included patients who referred to our center due to unintentional traumatic amputations of various injured zones of the hands, aged above 14 years, had consent to participate and had proper clinical condition for interview. Those with intentional injuries leading to hand amputations or where it was difficult to identify whether the amputation is intentional or unintentional were excluded from the study. We also excluded those with serious injuries who could not answer the questions and unconscious patients not able to take the interview. Patients were included by consecutive sampling method. The study protocol was approved by institutional review board (IRB) and medical ethics committee of Tabriz University of Medical Sciences and all the patients provided their informed written consents before inclusion in the study.

### Study Protocol

The questionnaire designed for this study consisted of four parts. The first part addressed demographical information including sex, age, residency type

and occupation, marital status, education level and occupation type. The second part addressed occupational variables including occupation type, background and occupation environment. The third part addressed personal health information and injury related characteristics including physical and emotional status of injured cases before accident, injury details of the amputated organ, accident place (home, work, and street) and day and time of accident. The fourth part included assessments regarding attention deficit hyperactivity disorder (ADHD) which is to be reported separately in another article after the full psychiatric assessments are done.

### Statistical Analysis

Stata statistical software package (StataCorp, Texas-USA) ver. 11 was used for statistical analysis. Data are presented as mean  $\pm$  SD and proportions as appropriate. Independent samples t-test was used to compare means between dual groups and Chi-square test was used to assess associations between categorical scales. A two-sided p-value of less than 0.05 was considered statistically significant.

## Results

The vast majority of cases (92.5%) were men and women accounted for only 7.5% of injured cases. The mean age of men and women was 35.211.7 $\pm$  and 39.86.48 $\pm$  years, respectively ( $p < 0.01$ ). Half of the subjects had primary and guidance school education and two-third of them were urban residents. About 70% of the victims benefitted from an insurance coverage, 57.5% being covered by social security insurance program. 62.2% of the men and only one woman was smoker.

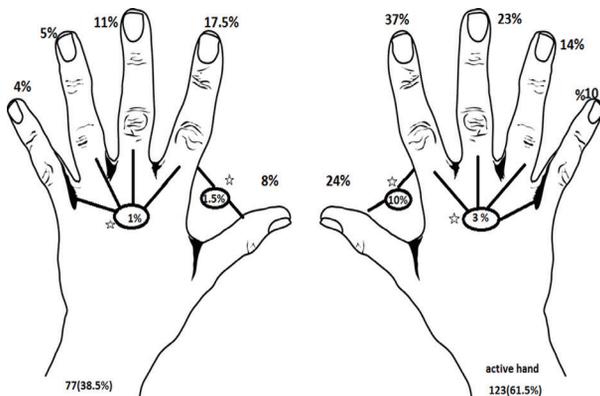
About 30% of cases stated their carelessness as the reason of accident and 6.1% said that they were tired at the time of accident (Table 1). About two-third of the subjects used to wear safety clothes at work and only 17.5% of them used to wear safety gloves. About two third of finger cut accidents occurred at work whereas 21.5% of the subjects had experienced similar accidents before. In two-third of cases, the accident occurred in the fingers of their active hand and fingers accounted for almost 95% of accidents. The mean number of cut fingers was 1.5. About 85 % of accidents occurred at work. 2.5 % of the accidents happened in the street. 12.5 % of the accidents happened at home. 61.5 % of the amputations occurred in the right hand (Figure 1). More than two-third of accidents occurred in the evening and 20% of accidents occurred on Tuesdays. Among hazardous occupations, agricultural occupations ranked the first followed by sugar cut and pressing jobs. Industrial wrist amputation increased with higher age ( $p < 0.01$ ) (Figure 2).

It was found that 10% of the victims were injured while responding a mobile phone call and 3 % of

**Table 1.** Self-reported reasons for amputation compared for various amputation mechanisms

Self-reported Reason	Device fault	Carelessness	Hurry up	Being sick	Distraction	Unsuitable workplace	Accidental	Fatigue/ Drowsiness	Nervousness
Haymaker	0 (0)	8 (3.33)	2 (8.33)	2 (8.33)	4 (16.67)	1 (4.17)	0 (0)	5 (20.83)	2(8.33)
Cutting tool	3 (8.83)	10 (29.41)	5 (14.71)	1 (2.94)	4 (11.76)	0 (0)	4 (11.76)	5 (14.71)	2 (5.88)
Stay on the machinery	14 (15.05)	27 (29.03)	3 (3.23)	2 (2.15)	19 (20.43)	0 (0)	5 (5.38)	12 (12.9)	11 (11.83)
The heavy object dropping	1 (5.58)	6 (35.29)	2 (5.88)	1 (5.88)	1 (5.88)	1 (5.88)	1 (5.88)	2(11.76)	2 (11.76)
Saw	0 (0)	3 (23.08)	5 (38.46)	0 (0)	1 (7.69)	0 (0)	1 (7.69)	1 (7.69)	2 (15.38)
Up lifter	1 (14.29)	1 (14.29)	1 (14.29)	1 (14.29)	1 (14.29)	0 (0)	1 (14.29)	1 (14.29)	0 (0)
others	1 (8.33)	4 (33.33)	1 (8.33)	0 (0)	1 (8.33)	0 (0)	2 (16.67)	1 (8.33)	2 (16.67)

The numbers refer to frequencies of amputations and percentages are given inside the parentheses

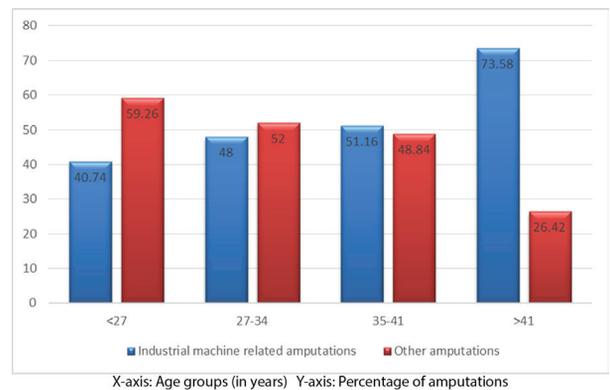


**Fig.1.** Distribution of the hand amputations according to the different fingers affected

the victims reported that they were listening to music through headphones before the accident. Five percent of the participants reported a quarrel with a colleague and 11.5 % of them reported a quarrel with their employer prior to the accident. Twelve percent of the victims stated they were hungry before the accident hunger, and 12 % felt thirsty prior to the accident time. Only 17.5 percent of the machinery had safety shields, and 8.5 % of the machinery had automatic protection shields. About 17.5% of people stated their dissatisfaction with their jobs.

**Discussion**

According to the injured subjects’ self-declaration, carelessness was the main reason behind most of the accidents and the vast majority of them occurred at work during evening working shift. Different studies indicate different contribution of carelessness to hand injuries so that the contribution of carelessness in Iran and Greece studies is reported to be 90% and 6%, respectively [10, 11]. Inattention should be addressed not just as a simple carelessness, but as a psychological and psychiatric problem increasing the liability to injuries [12, 13]. In current study above two-third of the accidents had occurred in the evening. In previous studies, the vast majority of accidents occurred around noon and at work and a small part of them occurring at night shift [10, 11, 14]. Job has always been considered a



**Fig. 2.** Distribution of hand amputations by the machinery type over different age groups.

major role player in hand amputations especially the traumatic hand amputations [10, 15-19]. In our study the vast majority of injured cases were farmers followed by those working in sugar cutting and pressing machine jobs. In other studies, however, woodcutting, pressing and casting ranked the first in 25% of amputees followed by mining industries, agriculture and glass industry [6]. Considering the international classifications getting entrapped in industrial machines was the main injury cause in majority of amputations in present study, which is in line with previous studies.

In our study, the vast majority of injured cases were male implying higher employment of males in agricultural and industrial jobs. This agrees with majority of studies [20-23]. In present study, most cases had primary and guidance school education suggesting the a potential role for education level and patients’ awareness of amputation risk [11]. Similarly in Canada, occupational accidents were remarkably higher among those who failed to complete high-school level and get diploma [22].

It was quite astonishing to find out in this study that 10% of accidental injuries leading to amputations had occurred while talking with mobile phones. In recent decades mobile phone have extensively replace most land phone communications especially among the younger users. The decreasing costs of the mobile phone ownership over the recent decade and improvement in availability of the mobile network as

well as mobile internet capabilities could be considered as major drive to expect even more extensions in the current rates of mobile phone usage [24, 25].

Despite many beneficial outcomes of mobile phone revolution many negative effects of it has also been evident. Many studies have described the effects of inappropriate mobile phone usage on traffic safety both for the drivers and pedestrians [26-31]. Mobile phones are getting more and more popular as their technical features and infrastructure improve. So the use of other features of phones such as web surfing, social network activities and online games should also be added. Although risks of mobile use are well studied in field of traffic injuries, very little attention is given towards their use and risk of other types of injuries especially the workplace injuries and occupational injuries. This is while some type of occupations such as working with cutting material of pressing machinery need high demand on concentration which is easily lost during mobile use. For robust interventions such as banning mobile phone use while at work within given workplaces there is a need for studies specifically designed to assess the role and magnitude of using mobile phones on traumatic amputation. Considering the fact that mobile phone use is a transient effect and traumatic hand amputations are sudden outcomes, our recommendation for future research could be the use of case-cross over research methodology for such a purpose.

Current study explores the main characteristics of traumatic wrist/hand/finger amputations. As the study had a mainly exploratory purpose of mapping

out the descriptive epidemiology of the traumatic hand injuries so suffering some limitations for assessing potential risk factors of these injuries. The first limitation gets back to not using a control group which is strongly recommended for future research based on our findings. The second could be that as we had not a previous evidence on what risk factors to get focused, risk specific detailed questionnaire were not used in current study. The third limitation could be that as the study was done in a referral trauma center, some minor amputations may be under presented in this study that should be taken into account while interpreting the results.

In conclusion, some jobs such as agricultural jobs, sugar cutting and pressing jobs make a priority for implementing prevention work. Inattention causes of amputations should be well investigated and taken into account in injury prevention work. Distraction caused by mobiles, music and personal relations with others is considered of importance to be targeted in prevention work. Risk levels for potential risk indicators need to be assessed through controlled studies.

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**Conflict of Interest:** None declared.

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