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EPIDEMIOLOGICAL PATTERNS AND PREVENTABILITY OF TRAUMA LEADING TO FINGER AMPUTATION: A PROSPECTIVE HOSPITAL-BASED STUDY**

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SUMMARY: Traumatic finger amputation is a widespread preventable public health problem. This study aimed to define the epidemiology of finger amputations to identify important related factors in order to suggest pertinent prevention strategies. A cross-sectional study was conducted in 2015 at the main orthopedic referral university hospital of Shiraz. All patients with any type of traumatic finger amputation were included. For each patient a questionnaire including demographic and injury characteristics was filled and analyzed. One hundred patients (92 men and 8 women, mean age: 32.5 ± 18 years) were enrolled. The vast majority of subjects were young men, more than half (53 cases) sustained occupation-related injuries during working time. Finger amputation following severe jammed finger in door was the second most frequent damage (18 %). Approximately 59% of victims labeled inattention during work as the reason of injury. Finger amputations in right hand were equal in frequency to the left one. Amputation of the index and middle fingers were seen as the most common amputated fingers in hands, 27% and 26% respectively. It was found that young beginner worker man with low educational level is at the highest risk of traumatic finger amputation especially with positive history of drug abusing. So, effective interventions such as closer supervision, more training programs, detection of drug addiction, and using safe engineering machines are urgently needed.

Key words: amputation, finger, epidemiology, Iran

INTRODUCTION

Trauma-related amputation has been recognized as a serious public health concern worldwide. Fingers of workers are common sites of traumatic amputations because of encountering several hazardous incidents at the work environment. Fingertip amputation could result in loss of work time or even job, finally leading to loss of income. So, the patient would

experience significant psychological and socioeconomic problems. Epidemiological data, as an essential subject to make policies in health care, could optimize resources and determine more practical safety strategies (Burger et al., 2007, Zyluk and Janowski, 2011, Friedman et al., 2013, Peterson et al., 2014, Largo and Rosenman, 2015). However, the epidemiological patterns of traumatic finger amputations vary widely by region and time (Conn et al., 2005, Friedman and Forst, 2007, Chang et al., 2015) but still important information is needed to be established. To date, no any study was performed to determine the patterns of these injuries in Iran, regarding the age, sex and other important factors.

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**Study was carried out in Bone and Joint Diseases Research Center, Chamran Hospital, Shiraz University of Medical Sciences, Shiraz, Iran.

The aim of the present study is to determine the epidemiological patterns of injuries leading to traumatic finger amputation and to identify its related factors in order to suggest pertinent prevention strategies.

MATERIALS AND METHODS

After approval of the study by the ethic committee of our university which was in accordance with the declaration of Helsinki of 1975, as revised in 2000, this cross-sectional hospital-based study was conducted during year 2015 at the main orthopedic referral university hospital of Shiraz, south of Iran. All patients referred to the emergency department with any type of injuries leading to any finger amputation, defined as any finger tissue loss with or without bone loss, were enrolled after signing a written informed consent form. A trained researcher interviewed with each patient and extracted the data from his/her medical record, operation note and discharge note based on data-gathering form. The questionnaire included demographic data (age, gender, educational level, employment history, and history of any drug abusing), side of injured hand, number of injured finger(s), use of protective devices during working, any participation in training courses, exact date of the injury (month, day, and time), and incident type (occupational, home, accident).

Collected data were analyzed by the statistical package for the social sciences software, version 17.0 (SPSS Inc., Chicago, IL, USA). Continuous variables are presented as mean and standard deviation. Categorical variables are presented as absolute numbers and percentages.

RESULTS

During the study period, a total of 100 patients with finger amputation completed the survey. Of these 92 were male, and 8 were female. Mean age of the patients was 32.5 years ± 18 years. Fourteen percent of the patients were under 15 years of old and only 7% were older than 65 years of age. The highest frequency was seen in cases with age between 25 to 34 years. Patients

aged from 65 to 74 had the lowest frequency of finger amputation. A bar chart of patient ages is shown in figure 1.

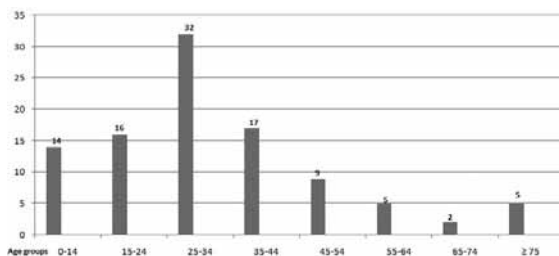


Figure 1. Age distribution of 100 patients with finger amputation

Slika 1. Dobna distribucija 100 bolesnika s amputiranim prstom

Most of the subjects (94%) had educational level of high school diploma or lower. Unfortunately, forty eight cases had positive history of drug abusing.

The most common cause of finger amputation was occupation-related injuries (n=53, 53%) including industrial machinery such as engineering belts and saws. Thirty six percent of these patients were beginner with experience of less than a year for working with these devices and interestingly, more than half of them did not participate in any training courses. Most of these cases (82%) did not wear any protective or safety devices. Carelessness and inattention were mentioned by the subjects as the main contributing factor resulted in finger amputation in about 59% of the patients. The most frequent event led to non-occupational finger amputation was amputation following severe jammed finger in door (figure 2).

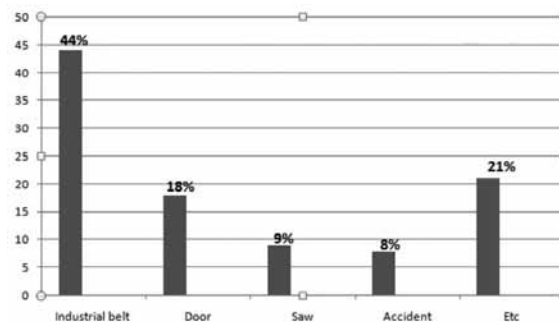


Figure 2. Causes of finger amputation in studied patients

Slika 2. Uzroci amputacija prsta kod bolesnika

Finger amputations in right hand were equal in frequency to the left one. Amputation of the index and middle fingers were seen as the most common amputated fingers, 27% and 26% respectively. Concerning the number of amputated fingers in a person, in 92% of subjects only a single finger was amputated. About half of the finger amputations (53%) occurred between 6 am to 2 pm, usual working time. Seasonal distribution of finger amputation was as follow; 71% during autumn and winter and 29% during spring and summer. Surgical reconstruction including closure of stump of amputation, flap, and reimplantation of amputated fingers has been performed for 72% of the cases. Others were treated with dressing and antibiotic therapy.

DISCUSSION

Traumatic finger amputations are widespread problems causing a financial load on the healthcare system. Hence having the epidemiological data of each region is important. Our results are consistent with previous reports which showed occupation-related injuries as the most common cause of the traumatic finger amputations and more frequently occurrence in young men (*Liang et al., 2004, Panagopoulou et al., 2013, DavasAksan et al., 2010, 2012*). It means that occupational safety standards may be insufficient, neglected, or poorly observed. So more efforts are required to emphasize and exactly observe the industrial safety protocols. In this study, among the recognized important factors including male sex, young age, machinery-working, and drug abusing, only machinery-working and drug abusing are potentially modifiable. Employing of the qualified trained healthy workers using protective devices could reduce the staffs with traumatic finger amputation.

Finger amputation after severe jamming in door was the second most common of injury (18%). This means that finger amputation by door can frequently occur even in adults. Therefore, utilizing specific protective door devices is needed.

Concerning the level of education, 94% of amputees had education level of high school diploma or lower. This is in accordance with the other study shown an association of lower socioeconomic status with higher hand amputation (*Khurram et al., 2015*).

In our study, no difference was found in the distribution of the amputations by day of the weeks, which is similar to other studies (*Atroshi and Rosberg, 2001, Panagopoulou et al., 2013*). But McCall and Horwitz in 2006 found that occupational amputations occurred more frequently on weekends than on weekdays. Moreover, there are similarities between time of injury during a day, from 6 am to 2 pm, in our study and others (*Valentić et al., 2005, Panagopoulou et al., 2013, Prasad et al., 2014*).

Almost 72% of the amputees in the presented study underwent different types of surgeries. It is in contrast to previous studies in which the rate of required surgery was lower (*Friedrich et al., 2011, Omoke et al., 2012*). A possible explanation is recent advances in microsurgical techniques in our center, consequently even less serious amputations are reconstructed by microsurgical soft tissue methods.

CONCLUSIONS

According to the result of our study, the causes of traumatic finger amputations are not random events, so more effective interventions to prevent these injuries should be implemented. Young beginner worker men without previous training were most often affected especially if they had a history of drug abusing. Closer supervision, training programs, detection of drug addiction, as well as using safe engineering machines are some of the policies which are able to significantly decrease the proportion of traumatic finger amputations.

Conflicts of interest

The authors declare that no conflicts of interest exist.

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Ethical approval

Received from the ethic committee of Shiraz University of Medical Sciences which was in accordance with the declaration of Helsinki of 1975, as revised in 2000

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EPIDEMIOLOŠKI POKAZATELJI I SPREČAVANJE TRAUMA S POSLEDICOM AMPUTACIJE PRSTA: STUDIJA BOLNIČKIH PODATAKA

SAŽETAK: Amputacija prsta čest je javnozdravstveni problem koji je moguće spriječiti. Studija definira epidemiologiju amputacije prsta kako bi se utvrdili najvažniji čimbenici i predložila strategija prevencije. Studija je provedena 2015. u glavnoj sveučilišnoj ortopedskoj bolnici u Shirazu. U studiju su bili uključeni svi bolesnici s bilo kojom vrstom amputacije prsta. Za svakog bolesnika je popunjen i analiziran upitnik s demografskim podacima i tipom ozljede. Sudjelovalo je 100 bolesnika (92 muškarca i 9 žena, prosječne dobi 32.5 ± 18 godina). Najveći broj bolesnika bili su mlađi muškarci. Više od polovice (53 slučaja) pretrpjeli su ozljede na radu u vezi s radom. Amputacija prsta zbog nagnječenja u vratima bila je drugi najčešći uzrok amputacije (18 %). Približno 59 % ozlijeđenih navelo je nepažnju pri radu kao uzrok nezgode. Amputacije prsta desne ruke bile su brojčano jednake amputacijama na lijevoj ruci. Najviše je bilo amputacija kažiprsta (27 %) i srednjeg prsta (2 %). Utvrđeno je da su mlađi, slabije obrazovani muškarci te početnici na poslu podložni najvećem riziku od amputacije prstiju, naročito ako imaju povijest zlouporabe droga. Hitno je potrebno provesti sljedeće učinkovite mjere: veći nadzor, više programa osposobljavanja, otkrivanje ovisnosti o drogama i korištenje sigurnijih strojeva.

Ključne riječi: amputacija, prst, epidemiologija, Iran

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