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Traumatic Upper and Lower Limb Amputations of Saudi Arabian Locals: A Ten-year Epidemiological Overview

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ABSTRACT

Background: There is a scarcity of understanding about the region-specific trends and relations of amputation-related parameters for Saudi Arabia.

Objective: The primary objective of this study was to study the epidemiology of a cross-section of the Saudi Arabian population that has undergone upper or lower limb amputation due to trauma in terms of epidemiological parameters (age, gender, and side of amputation) in the past ten years.

Methods: Medical records of five tertiary care hospitals of Saudi Arabia were retrieved to collect data.

Results: Data of 245 amputees was analyzed (age: 28.04 ± 23.31 years), out of which 71.42% were male (male: female = 5: 2). The frequency of amputations in five tertiary care hospitals in Saudi Arabia was inversely related to the amputees' age group. No significant relationship of gender was found with the level of amputation. However, a significant relationship was found between annual distribution and level of amputation ($p = 0.036$).

Conclusion: Year of amputation had a significant relationship with the level of amputation. Further studies can categorize these amputations according to trauma type to further explore the relationship between demographic parameters and amputation level.

Keywords: Upper limb amputation, Lower limb amputation, Saudi Arabia, Traumatic.

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INTRODUCTION

Removal of a bone or a part of a bone, medically known as 'amputation,' is considered a last resort to rescue a dying or severely damaged limb [1]. The procedure of amputation, dating back to the pre-Christian era as a therapeutic and ritualistic practice, is still in use despite remarkable medical advancement [2-5]. Despite their inevitability in some instances, such procedures are never welcomed by the patient and healthcare professionals. Total or partial limb loss inflicts serious damage to the amputee's psychology, cosmetics, and impact income [6, 7]. Therefore, the gravity of this issue requires a comprehensive study on the relationship between the frequency of amputations and different potential risk factors. Conduction of such a study may help in devising strategies to prevent limb loss.

Recent epidemiological data of the Saudi Arabian population that focuses on limb amputation is scarce. Only a handful of studies are present that concentrate majorly on Diabetes-related limb loss [8-10]. There is clear evidence that geographical changes cause variations in amputation rates [11]. For the USA alone, as much as six times variation was reported for amputation rates in different states [12]. Therefore, a region-specific observational study is necessary to monitor the trends and relations of amputation-related parameters accurately.

The objective of this study was to analyze the epidemiology of a cross-section of the Saudi Arabian population that has undergone upper or lower limb amputation due to trauma in terms of epidemiological parameters (age, gender, and side of amputation) in the past ten years.

MATERIALS AND METHODS

Data Collection

Medical records of five tertiary care hospitals of Al-Madinah Al-Munawarah (King Fahad Hospital, Medical Rehabilitation Hospital, Al Ansar General Hospital, Miqat General Hospital, and Al-Dar Hospital) were retrieved for the collection of data. The data of partial and total upper and lower limb amputations were extracted from these records for the past ten years, i.e., 2010 to 2019. In addition, demographic data of each amputee was obtained from these records.

Inclusion Criteria

Data included in the study was only of traumatic amputation. Any participant's data with a history of diabetes were excluded. Categorization of trauma type was not performed.

Statistical Analysis

Data were retrieved manually and entered in SPSS v20 (SPSS Inc., USA) spreadsheets. All analyses were performed using SPSS v19 and MS Excel. An alpha value of 0.05 was set for the determination of statistical significance. Correlation between nominal variables was evaluated using Pearson's Chi-Square Test, while continuous variables were analyzed using Student's *t*-test.

RESULTS

Patient Characteristics

The study sample included 245 participants. 71.42% of these were men (male: female ratio = 5: 2). The average age of the participants was 28.04 ± 23.31 years.

Level of Amputation

Table 1 and Figure 1 represent the frequency of amputations for each amputation level. Partial hand amputation accounted for a majority of amputations (46.12%), followed by partial foot amputation 23.67%) and transtibial amputation (13.88%).

Table 1: Demographic distribution of major upper and lower-limb amputations in Saudi Arabia between 2010 and 2019.

	Variable	Number Mean ± SD	Percentage
Gender			
	Male	175	71.42
	Female	70	28.57
Age (years)		28.04 ± 23.31	
Level of Amputation			
	Partial Hand Amputation	113	46.12
	Hand Amputation	4	1.63
	Transradial Amputation	13	5.31
	Transhumeral Amputation	1	0.41
	Partial Foot Amputation	58	23.67
	Foot Amputation	3	1.22
	Transtibial Amputation	34	13.88
	Transfemoral Amputation	19	7.76
Side of Amputation			
	Right	145	59.18
	Left	100	40.81

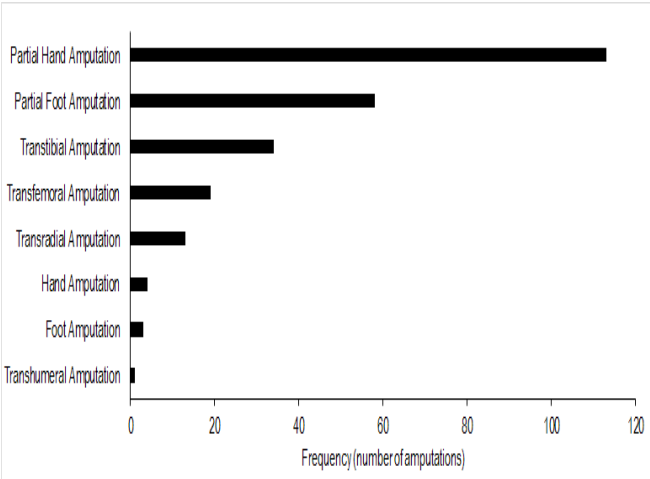

Figure 1: Frequency of amputations for at amputation level during 2010 and 2019 in Saudi Arabia.

Annual Distribution

Figure 2 represents the annual distribution of amputations at each level. Again, a significant correlation was found between the level of amputation and the annual distribution of the amputations ($p = 0.036$).

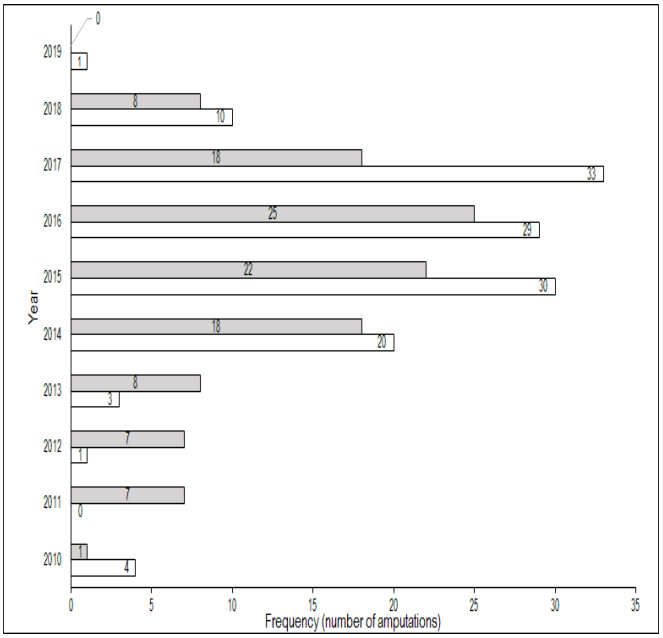

Figure 2: Annual distribution of the number of amputations. The solid blocks in each bar represent the frequency of lower limb amputations, while the transparent blocks represent the frequency of upper limb amputations

Side of Amputation

Table 1 shows that most of the amputations in our sample were on the right side (59.18%). Out of 131 upper limb amputations, 54.86% were on the right side. While out of 114 lower limb amputations, 72.80% were on the right side.

Age Group

Figure 3 shows a trend line representing the relation between age groups and the frequency of amputations. The amputation and age group level were not found to be significantly related ($p = 0.06$).

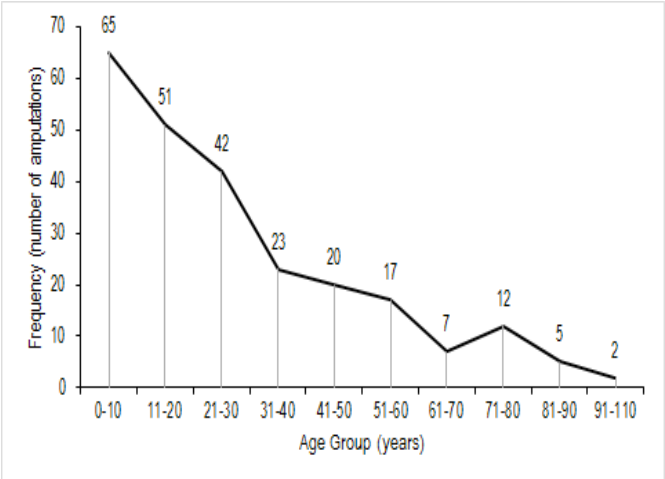

Figure 3: Distribution of upper and lower limb amputations according to age groups during 2010 and 2019 in Saudi Arabia.

Gender and Level of Amputation

A chi-square test of independence was performed to examine the relationship between gender and the level of amputation. The relation between these variables was not significant, $\chi 2$ (7, N = 245) = 12.19, $p = 0.094$. Figure 4 presents a graphical representation of the distribution of different levels of amputation according to gender.

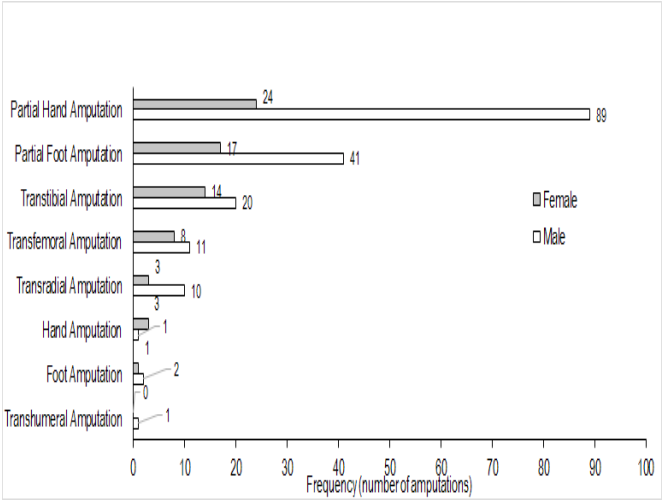

Figure 4: Distribution of different amputation levels according to gender during 2010 and 2019 in Saudi Arabia.

DISCUSSION

The study aimed to carry out a cross-sectional analysis of the Saudi Arabian population for the years 2010 to 2019 in terms of epidemiological factors associated with traumatic limb loss. Analyses showed a considerable range of variations according to age, gender, and side of amputation.

A significant correlation was found between the level of amputation and the annual distribution of the amputations. Amputation frequency remained high from 2014 to 2018, accounting for half of the total number of amputations during the past ten years. The most typical type of amputation, according to the level of amputation was found to be partial hand amputation. This, because more than half of partial hand amputees lose their ability to continue their previous jobs, [13] is a matter of consideration for healthcare providers and policy-makers. Lower limb amputation rates were higher as compared to Lower limb amputations. This, as reported by a review conducted by Challa et al. (2018), [14] may be caused by the higher rates of lower limb injuries in developing countries.

A clear dominance of males was evident in overall data. The trend continues from older studies by Al-Turaiki and Al-Falahi (1993), Al-Jarrah et al. (2019), and Maimani et al. (2009) [15-17], who has studied the Saudi Arabian population, not considering amputation cause. In addition, the same trend of male dominance was found in upper limb amputations in France by Pomares et al. [18]. In the USA, however, the female amputation rate is higher [11].

The age group was found to be an impacting parameter in amputation rates. Interestingly, our analyses show an inverse relationship between age group and frequency of

amputations, i.e., amputation was performed mainly in the younger ones. Since we did not consider the cause of trauma in our analyses, an educated guess based on previously published works can be considered for this trend. Road traffic accidents, reported by Al-Wahbi et al. to affect the younger population more, may be contributing factors [19]. Furthermore, a study in Greece reports inadequate door closure systems as a major cause of hand amputation [20].

Most amputations were on the right side. This is understandable since Saudi Arabia is a majorly Muslim country, and there is a clear right-hand preference among Muslims [21]. Unfortunately, this leads to the right hand being exposed to traumatic incidences more often. The same trend is reported by Al-Jarrah et al. for the country [17], and a negative trend is reported for France by Pomares et al. [18].

Not considering the cause of amputation is a limitation of this study. A deeper understanding of the reported trends may be achieved by analyzing which type of trauma has caused the amputation.

CONCLUSION

The frequency of amputations in five tertiary care hospitals in Saudi Arabia was inversely related to the amputees' age group. A significant relationship was found between annual distribution and levels of amputation. No significant relationship of gender was found with the level of amputation. Further studies can categorize these amputations according to trauma type to further explore the relationship between demographic parameters and amputation level.

Conflicts of interest: None

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