

ORIGINAL ARTICLE

Patterns and characteristics of occupational burn injuries managed at a plastic surgery unit: a retrospective study

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ABSTRACT

Background: Occupational burns are one of the major causes of accidental mortality and morbidity and have a significant financial burden on rehabilitation expenditures and hospitals. Such injuries cause patients to suffer from a wide range of complications based on the severity and grade of burn injuries. In Saudi Arabia, there is a lack of literature reporting occupational burn injury characteristics and patterns.

Aim: To identify the patterns and characteristics of occupational burn injuries managed at a plastic surgery unit in Saudi Arabia.

Methods: This was a retrospective study that was conducted at a plastic surgery unit in xxx x hospital between the period from June to July 2026. The study was conducted on individuals who were admitted to the hospital for occupational burn injuries. The data of patients were retrieved from the medical records.

Results: The study included 244 patients; 95.9% were males and 92.2% were non-Saudi patients. Of these, 64.3% had partial-thickness burns, and 20.1% were affected in the forearm and elbow. The length of stay (LOS) was significantly linked with gender ($p = 0.01$), burn depth, and sites ($p < 0.001$).

Conclusion: Occupational burn injuries were more common among males and tended to be of partial thickness and affecting the upper limb and head and neck. Additionally, the LOS of patients in hospital was associated with gender, site, and depth of such injuries.

Keywords: Characteristics, occupational burns, Saudi Arabia.

Introduction

Occupational burns are a health issue around the globe and one of the major causes of accidental mortality and morbidity [1]. Burn injuries are one of the most devastating injuries [2]. Occupational burn injuries represent a distinct subset of thermal trauma occurring due to high-risk industrial environments, including exposure to electrical sources, hot liquids, flames, steam, and chemical agents [2]. It was estimated that almost 240 million individuals were affected by burn injuries in 2021, and an average of 180 thousand individuals die annually as a consequence of thermal accidents [3]. Burn injuries in work settings are related to a lack of protection protocols, neglectful behavior, and a lack of safety measures in the work environment

[4,5]. Patients suffer from a wide range of emotional, physical, psychological, and financial complications due to the severity and grade of burn injuries [2].

The significance of burn injuries arising from occupation in comparison to non-occupational ones relies on the fact that occupational burn injuries are more likely to involve functionally critical sites and extend into

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Patterns and characteristics of occupational burn injuries

deeper structures. Additionally, there are long-term consequences such as pain, hypertrophic scarring, post-burn scar contracture, and hyperpigmentation; such consequences can result in delayed return to work and prolonged disability, which imposes a considerable clinical and socioeconomic burden [2]. Additionally, work accidents remain one of the first modes to produce burn injuries, leading to prolonged hospitalization, psychological and aesthetic sequels, and activity impairment [6].

In Saudi Arabia, occupational safety and health are critical priorities. The Saudi Vision 2030 emphasizes establishing a safe and healthy work environment as a potential element of considerable development and economic diversification [7]. Saudi Arabia experience significant transformation in industrial landscape, technological advancements, and workforce composition, therefore gaining a comprehensive understanding of occupational injuries patterns and characteristics is essential to inform targeted interventions and cultivate a culture of safety within workplaces [8], especially in terms of occupational burn injuries as there is no previous Saudi study focused on such type of injuries and the available studies focus on occupational injuries in general. Therefore, this study was conducted to identify the patterns and characteristics of occupational burn injuries managed at a plastic surgery unit in Saudi Arabia.

Subjects and Methods

Design and subjects

This was a retrospective study that was conducted at a plastic surgery unit in xxxx hospital between the period from xxxx to xxxx. The study was conducted on individuals who were admitted to the hospital for occupational burn injuries. All eligible patients during the study period were included. The inclusion criteria for the patients were adult patients of both genders and any nationality, patients admitted for occupational injuries, and patients admitted for burns due to occupation. On the other hand, the exclusion criteria were patients younger than 18 years, individuals admitted for burn injuries not related to their work, and patients admitted with occupational injuries other than burns. There was no need for informed consent from patients as it was a retrospective study; however, ethical approval was obtained from xxxx before the implementation of the study.

Data collection and analysis

A pre-designed data sheet was used to collect data on patients from the hospital records. The collected data included demographics of patients such as gender and nationality, characteristics of burns, including depth and site of the burns, and finally the length of stay (LOS) in hospital.

IBM's official documentation identifies the product as IBM SPSS Statistics 26.0, with general availability on 9 April 2019.

SPSS program version 26 was used to analyze the collected data; categorical variables were presented as numbers and frequencies, whereas the numerical data were expressed as median and range. Kruskal–Wallis test was used to compare the median and distribution

Table 1. Demographic characteristics of study group.

		<i>n</i>	%
Gender	Female	10	4.1
	Male	234	95.9
Nationality	Saudi	19	7.8
	Non-Saudi	225	92.2

Table 2. Burn characteristics and length of hospital stay among the study population (*n* = 244).

Variable	Category	<i>n</i> (%)
Burn depth	Partial thickness	157 (64.3)
	Full thickness	37 (15.2)
	Unspecified thickness	50 (20.5)
Burn site	Forearm and elbow	49 (20.1)
	Wrist and hand	41 (16.8)
	Head and neck	41 (16.8)
	Hip and lower limb	32 (13.1)
	Unspecified or multiple sites	22 (9.0)
	Chest wall and/or abdomen	19 (7.8)
	Shoulder and upper limb	16 (6.6)
	Foot and ankle	15 (6.1)
Length of hospital stay (days)	Back	9 (3.7)
	Median (range)	15 (0–428)

Table 3. Length of hospital stay according to gender and nationality.

Variable	Category	Length of stay (days), Median (IQR)	<i>p</i> value
Gender	Female	4 (1–8)	0.011*
	Male	15 (8–29)	
Nationality	Saudi	12 (5–28)	0.69
	Non-Saudi	15 (7–28)	

*significance *p* value.



Patterns and characteristics of occupational burn injuries

of independent groups. p value ≤ 0.05 was considered significant.

Results

A total of 244 patients were enrolled in this study; the large majority were males, 234 (95.9%), and only 10 (4.1%) were females. Also, the large majority were non-Saudi patients 225 (92.2%), whereas only 19 (7.8%) were Saudi, as shown in Table 1.

The characteristics of burn and LOS at the hospital revealed that more than one-half of the patients had partial-thickness burns, 157 (64.3%). Regarding the location of the burn, the most reported sites were

forearm and elbow 49 (20.1%), followed by wrist and hand 41 (16.8%), and head and neck 41 (16.8%), whereas burns in the back were the least reported site 9 (3.7%). The range of LOS was zero to 428 days with a median of 15 days, as shown in Table 2.

The LOS of patients in the hospital was significantly longer among males compared to females ($p = 0.01$), but it did not vary based on nationality ($p = 0.6$), as shown in Table 3.

The LOS of patients was significantly affected by the burn characteristics, where those with full-thickness burns tended to spend longer days in hospital ($p < 0.001$). Also, the burn site significantly affected the LOS

Table 4. Length of hospital stay according to burn depth and anatomical site.

Variable	Category	Length of stay (days), Median (IQR)	p value
Burn depth	Partial-thickness	12 (6-24)	<0.001*
	Full-thickness	29 (15-50)	
	Unspecified thickness	14 (7-24)	
Burn site	Wrist and hand	13 (5-30)	<0.001*
	Shoulder and upper limb	9 (5-12)	
	Hip and lower limb	17 (6-38)	
	Head and neck	11 (6-19)	
	Forearm and elbow	16 (9-26)	
	Chest wall and/or abdomen	21 (9-39)	
	Back	50 (43-56)	
	Foot and ankle	12 (2-34)	
	Unspecified or multiple sites	21 (14-43)	

*Kruskal-Wallis test.

Table 5. Distribution of burn depth and anatomical site according to sex.

Variable	Category	Female (n = 10) n (%)	Male (n = 234) n (%)	p value
Burn depth	Partial thickness	4 (40.0)	153 (65.4)	0.217
	Full thickness	2 (20.0)	35 (15.0)	
	Unspecified thickness	4 (40.0)	46 (19.7)	
Burn site	Forearm and elbow	1 (10.0)	48 (20.5)	–
	Wrist and hand	2 (20.0)	39 (16.7)	
	Head and neck	1 (10.0)	40 (17.1)	
	Hip and lower limb	4 (40.0)	28 (12.0)	
	Unspecified or multiple sites	1 (10.0)	21 (9.0)	
	Chest wall and/or abdomen	1 (10.0)	18 (7.7)	
	Shoulder and upper limb	0 (0.0)	16 (6.8)	
	Foot and ankle	0 (0.0)	15 (6.4)	
	Back	0 (0.0)	9 (3.8)	



Table 6. Distribution of burn depth and anatomical site according to nationality.

Variable	Category	Saudi (n = 19) n (%)	Non-Saudi (n = 225) n (%)	p value
Burn depth	Partial thickness	10 (52.6)	147 (65.3)	0.43
	Full thickness	3 (15.8)	34 (15.1)	
	Unspecified thickness	6 (31.6)	44 (19.6)	
Burn site	Forearm and elbow	4 (21.1)	45 (20.0)	–
	Wrist and hand	4 (21.1)	37 (16.4)	
	Head and neck	2 (10.5)	39 (17.3)	
	Hip and lower limb	2 (10.5)	30 (13.3)	
	Unspecified or multiple sites	1 (5.3)	21 (9.3)	
	Chest wall and/or abdomen	0 (0.0)	19 (8.4)	
	Shoulder and upper limb	2 (10.5)	14 (6.2)	
	Foot and ankle	3 (15.8)	12 (5.3)	

($p < 0.001$), where burns in the back required the longest LOS, followed by burns in the chest and/or abdomen, and those with burns in multiple sites (Table 4).

The characteristics of burns, including burn depth and site, did not display any correlation with the gender of patients ($p = 0.2$), as shown in Table 5.

The characteristics of burns displayed no significant difference in terms of nationality and such characteristics included burn depth ($p = 0.4$), as shown in Table 6.

Discussion

Burn injuries play a potential role in mortality and morbidity and have a significant financial burden on rehabilitation expenditures and hospital costs [2]. Burns related to the workplace are more likely to involve functionally critical sites and extend into deeper structures and have the potential for long-term consequences [2]. However, in Saudi Arabia, there is a lack of literature focusing on occupational burn injuries, and the focus is on occupational injuries in general. So, this study was carried out to identify the patterns and characteristics of occupational burn injuries managed at a plastic surgery unit in Saudi Arabia.

In the present study, males represented the large majority of our participants. Similar to our findings, a previous Saudi study focused on the pattern of occupational injuries revealed that males represented 96.6% of the injured population [7]. However, the study didn't focus on burn injuries, but it focused on occupational injuries generally.

It was stated that females, older adults, and children under the age of five are high-risk populations for burn injuries [9]. However, in the current study, we found that males represented the large majority of the patients (95.9%). In contrast to our findings, a study from

Bangladesh that analyzed hospitalized burn injuries in a burn care unit revealed that females represented more than one-half of the sample (62.05%) [10]. Additionally, it was reported that females were engaged in cooking activities, and 73.6% were affected at home, living, bed, dining, and washroom, whereas only 0.3% were affected in the boiler industry, mine, rice mill, and workshop [10]. Such findings, in combination with ours, can be explained by the fact that studying burn injuries reveals that females are more prone to be affected by such injuries due to practicing activities such as cooking and other home duties, making females more prone to burns. However, in terms of occupational injuries, males are more prone to such injuries due to the nature of the occupational work in which males are involved.

This can be confirmed by the findings from a previous study from Korea, which included 535 subjects with work-related burns, revealed that males represented more than one-half of the subjects (62.2%) with a mean LOS of 27.8 days [11]. Another study from Iran revealed that males represented 87.9% of the patients with work-related burns, with a mean LOS of 10.38 days [2]. However, in contrast to the previous studies [2, 11], we found that the LOS range was long and ranged between zero and 428 days, with a median of 15 days. The wide range of LOS may relate to the variations in burn severity and, in turn, the variations in the time required for management and recovery. It was stated that burns related to work accidents remain one of the leading causes of prolonged hospitalization [6].

Occupational-related burns, in comparison to non-occupational ones, are more prone to involve functionally critical sites such as upper extremities and hands and may extend into deeper structures and often require operative wound coverage [2]. In the current study, we found that the forearm and elbow were the most affected sites, followed by the wrist and



hand and the head and neck. Also, partial thickness was the most common depth of burns. A previous study revealed that burns in the upper limb were the most prevalent (56.4%), followed by lower limbs (55.7%), whereas burns in the trunk represented the least prevalence (19.1%) [11]. Another study included 429 work-related burns and found that the most affected sites of burns were the upper limb (28.7%) and lower limb (21%), whereas head and neck sites were found in 19.3% [2]. We found contrasting findings, with the back being the least affected site. However, the variations in burn characteristics between our study and other studies, even those reporting occupational burns, come from the fact that there are variations in workplaces, causes of injuries, and other factors that influenced the depth and site of burns. Additionally, we couldn't determine the causes of burns and the workplaces of patients due to the design of this study.

The characteristics of burns are affected by various factors such as economic, social, occupational settings, cultural level, industry characteristics, safety regulations, and lifestyle [2]. However, in the current study, we documented only the gender and nationality of the subjects, and we found that gender and nationality did not affect the characteristics of burns.

The extent of the affected total body surface area and the burn depth are considered to be determinants for the outcomes of the patients [12]. This was in agreement with our findings, where the burn depth and sites were linked with LOS; those with full-thickness burns and back burns tended to have longer LOS, which indicates more severe burns that required a longer duration for recovery. A previous study revealed that hospital LOS was greater among those who were classified as major burns, with a mean of 36.5 days [3].

Conclusion

The majorities of admitted cases with occupational injuries were males and tended to be of partial thickness and affecting the upper limb and head and neck. Additionally, LOS of such injuries was associated with gender, depth of burns, and their sites. Occupational burn injuries should be studied separately from general burn injuries as they are different in characteristics from general burns due to the variations in causes, risks, and environment at which burns occurred.

Limitations, Strengths, and Recommendations

The limitations of this study include the small sample size and the retrospective design, which led to a lack of retrieval and study of significant variables such as causes of burns, workplace, and other variables such as total burn surface area, treatment, and clinical outcomes data. Also, a significant proportion of burn depth was classified as unspecified due to lack of adequate data, and this may affect the interpretation of the burn-depth distribution and LOS analysis. Furthermore, the

study was conducted at single-center setting with very small number of female patients and Saudi subgroups. The study also exhibits potential selection bias because only the admitted cases were included, and the study was unable to estimate the prevalence or incidence of such injuries. However, the main strength of this study is that it is a Saudi study focused on burn injuries in occupational settings, and it highlighted the gap in Saudi literature and research regarding this subject. Therefore, further studies are highly recommended, especially those based on a prospective design.

List of Abbreviations

LOS Length of stay

Conflict of interest

None.

Funding

None.

Consent to participate

Participants provided consent before participation.

Ethical approval

This study obtained approval from xxxx with an approval number of xxxx. All data were fully anonymized.

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