

# Characteristics of Patients Admitted to the Burn and Plastic Surgery Unit: A Tertiary Center Experience in Bahrain

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## ABSTRACT

### BACKGROUND

Plastic surgery is the most diverse specialty. It deals with a wide spectrum of abnormalities in different genders, age groups and body parts. Data on clinical characteristics of patients admitted in the burn and plastic surgery unit have been reported from our center last in 1993.

### METHODS

This retrospective cross-sectional study conducted during 1-year from 2017 to 2018 in the burn and plastic surgery unit, Salmaniya Medical Complex, Bahrain. Seven hundred seventy-four patients (929 admissions) were enrolled. Indications of admissions, demographic data including gender, nationality and age were gathered. Different types of burns were categorized.

### RESULTS

Out of 16,492 surgical admissions, 929 (5.6%) admissions were for burn and plastic surgery. Nine hundred-twelve (98.2%) admissions for 766 patients were included. Burn injuries were the main indication with a total of 345 (37.8%) admissions for 337 (44%) patients. Three hundred eighty-eight (50.7%) patients were males. Five hundred fifty-eight (72.8%) patients were nationals. Most were in the age group of 30-39 years old (24.9%). On comparison, burn injuries were more in males (n=241, 71.5%), nationals (n=175, 51.9%), younger in age (mean age, 23.8±19.6 years) and in pediatric age group (n=122, 36.2%) specifically, (All  $P < 0.0001$ ). Scalded burn was the commonest type (n=184/317, 58%).

### CONCLUSION

Burn and plastic surgery is a significant part of surgical admissions. Burn injuries were the most frequent reason of admissions. Patients with burn injuries were mainly males, nationals and children. Scalded burn was the most frequent type in our center.

### KEYWORDS

Plastic surgery; Indication; Burn; Bahrain

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## INTRODUCTION

In the medical field, plastic surgery is the solitary most diverse specialty<sup>1</sup>. It deals with various medical issues in different genders, age groups and body parts, from the top of the head to the tip of the

toes<sup>1</sup>. A wide spectrum of diseases is included in the plastic surgery field such as burn injuries, congenital malformations, reconstructions and cosmetics<sup>1</sup>.

Several publications reported the experience of burn and plastic surgery centers from neighboring countries to Bahrain and worldwide<sup>2-6</sup>. Only three studies tackling burn injuries came from Bahrain, two were old and one was a new study<sup>7-9</sup>. The first study about burn injuries reported 72 patients in 1980<sup>7</sup>. Four years later, the first specialized burn unit at Salmaniya Medical Complex (SMC) which is the main tertiary hospital in the country was established<sup>7,8</sup>. In 1993, another study was published over a seven years period with a larger number of 1612 patients with burn injuries, with an average total admissions per year of 202 patients, ranging from 183 to 220 patients<sup>8</sup>. Recently, a third study was published from Bahrain reporting 322 patients with burn injuries over a two-year period but it was from a different burn center (Bahrain Defense Force-Royal Medical Services)<sup>9</sup>. Since 1993, no studies have been published to update our knowledge at our center (SMC).

The aim of this study was to review the clinical characteristics of patients admitted to the Burn and Plastic Surgery Unit, at SMC in Bahrain.

## MATERIALS AND METHODS

This study was performed in the Burn and Plastic Surgery Department, Salmaniya Medical Complex, Bahrain. In this retrospective cross-sectional study, the total number of surgical admissions at SMC, Bahrain, between Jan 2017 and Dec 2018 were identified. Admissions to burn and plastic surgery unit were reviewed.

The burn and plastic surgery unit at SMC is the first specialized burn unit treating burn injuries in Bahrain<sup>8</sup>. It accepts referrals of burn injuries from all other health services in Bahrain namely primary healthcare centers, other governmental hospitals and private sectors. The burn unit in our center consists of 19 beds, five of which are isolation, eight for pediatric and the rest are general private room beds. Moreover, it contains an emergency room, dressing room, burn operative theater and a dedicated multi-disciplinary team helping burn care. The plastic surgery care is carried on as part of the surgical department were four wards with 22 beds each, dressing room, two operative theaters

allocated for plastic surgery and a dedicated multi-disciplinary team helping the plastic surgery care.

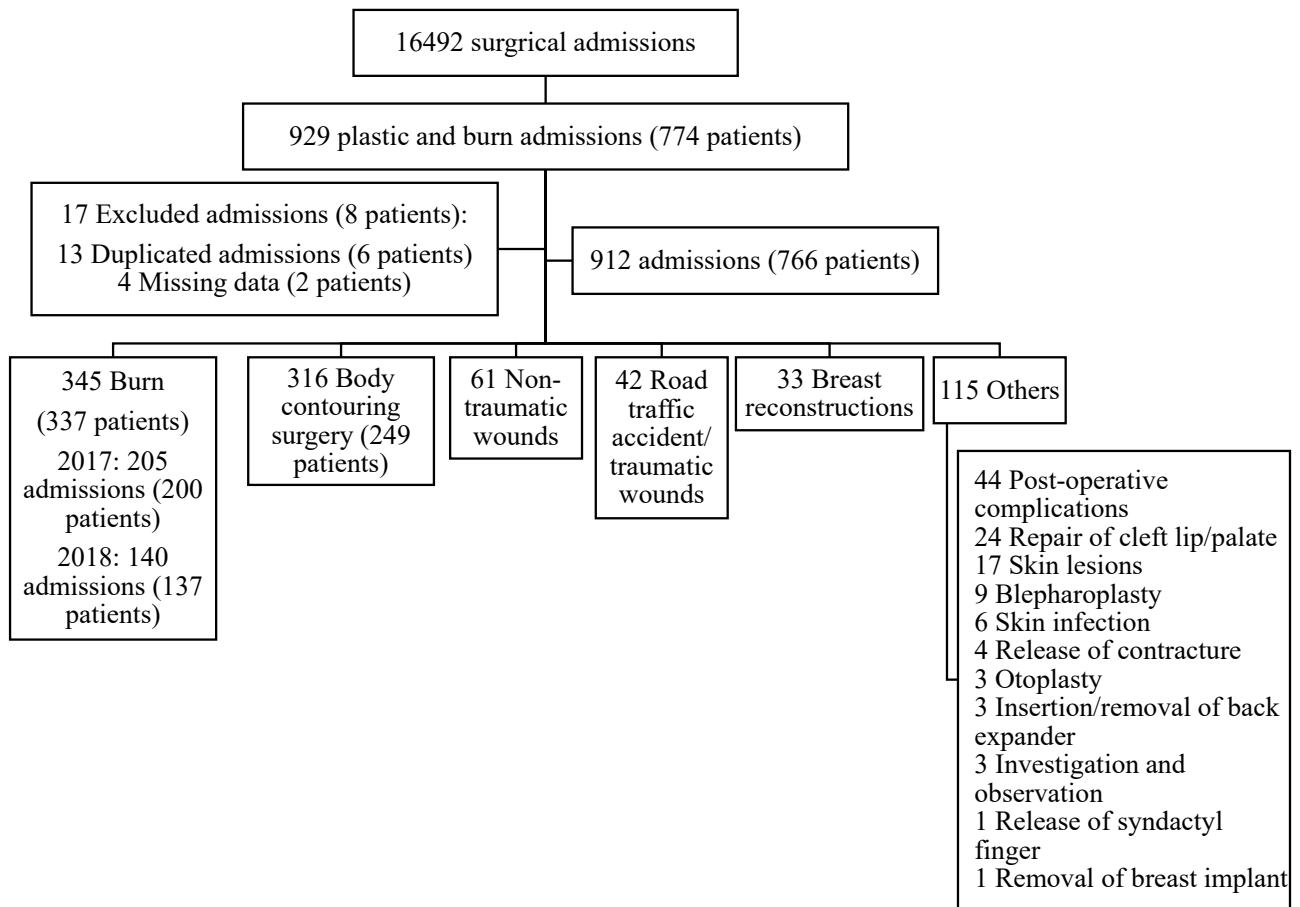
Electronic medical records of all patients admitted to the burn and plastic surgery unit were revised. Any duplicate admissions and those with insufficient important data were excluded. Indications of all admissions were identified and categorized. Admissions due to burn injuries were classified in accordance to the advanced burn life support admission criteria of the American Burn Association<sup>10</sup>. Demographic data including gender, nationality and age were gathered. The age was categorized into groups every ten years including both pediatrics and adults. Types of burn injuries were identified. Comparison of patients with burn injuries versus other indications of admissions was conducted in term of gender, nationality, age at presentation and different age groups.

This study was in accordance to the ethical principles of Helsinki declaration and it was ethically approved by the secondary healthcare research subcommittee at SMC.

Data were collected and entered into Microsoft excel sheet ver. 15.24, and then transferred into IBM SPSS program ver. 21 for statistical analysis. Frequency and percentage of categorical data were calculated. Continuous data was presented as mean and standard deviation (SD) or median and interquartile range (IQR). To compare patients with burn injuries and other reasons of admissions, Fisher exact test and Pearson chi-square were used to compare indications of admissions with different genders, nationalities and age groups. Mann Whitney U test was used to compare age at presentations.  $P < 0.05$  was considered statistically significant.

## RESULTS

During the study period, 16,492 surgical admissions have been identified with a total of 929 (5.6%) admissions were for burn injuries and plastic surgeries. Seventeen admissions (eight patients) were excluded due to 13 duplicate admissions and four for missing data. The remaining 912 admissions for 766 patients were included in the study analysis. The main indications for admissions were for burn injuries followed by body contouring surgeries (BCS) with 345 (37.8%) and 316 (34.6%) admissions, respectively. Study population and indications for admission are shown in Figure 1.



**Fig. 1:** Study population and indications for admission of all patients admitted to the burn and plastic surgery department, Salmaniya Medical Complex, Bahrain from Jan 2017 to Dec 2018

Demographic data of the included 766 patients are shown in Table 1. Three hundred-eighty-eight (50.7%) were males. Five hundred-fifty-eight (72.8%) patients were nationals and 208 (27.2%) patients were non-nationals (45 patients were from India, 30 from Bangladesh, 18 from Pakistan, 12 from the Gulf Cooperation Council countries (GCC), five from Philippine, while patients from Sri Lanka, Iraq, Indonesia, Ethiopia and Nepal were found each in two patients and patient from Morocco, Europe, Kenya, Egypt, Syria, Tunisia, Yemen, Ghana and North America were found each of one patient and the remaining 79 patients were of other non-specified countries). Majority of patients (n=191, 24.9%) were in the age group of 30-39 years old. Most patients (n=666, 87%) needed one admission only.

Out of the 337 (44%) patients admitted for burn injuries, 241 (71.5%) patients were males. One

**Table 1:** Demographic data for 766 patients admitted to the burn and plastic surgery department between 2017 and 2018

	Variable	Patient (n=766)
Gender	Male	388 (50.7)
	Female	378 (49.3)
Age (yr)	0 – 9	162 (21.1)
	10 – 19	38 (5)
	20 – 29	144 (18.8)
	30 – 39	191 (24.9)
	40 – 49	133 (17.4)
	50 – 59	75 (9.8)
Nationality	≥ 60	23 (3)
	Nationals	558 (72.8)
Number of admissions per patient	Non-Nationals	208 (27.2)
	1	666 (87)
	2	66 (8.6)
	3	23 (3)
	4	8.0 (1)
	5	3.0 (0.4)

Data are number (%).

hundred seventy-five (51.9%) were nationals. Age distribution of patients shown in Figure 2. Majority of patients were below nine years of age (n=122, 36.2%). Data about the type of burn injury were available in 317 (94%) patients. The most common type of burn injury was scalded burn (n=184, 58%) followed by direct flame for (n=95, 30%) (Figure 3). Out of the 249 (32.5%) patients admitted for BCS, 181 (72.7%) patients were female and 239 (96%) patients were nationals.

Comparison between patients with burn injuries and other indications of admissions is shown in Table 2. On comparing with other indications, patients with burn injuries were mostly males (n=241, 71.5%), nationals (n=175, 51.9%), younger in age (mean age,  $23.8 \pm 19.6$  years) and in the pediatric age group (n=122, 36.2%) specifically, (All  $P < 0.0001$ ).

## DISCUSSION

In the current study, the main indication for admission in our unit was for burn injuries followed by BCS. Upon literature review, there are no published studies that illustrated the global diverse indications of admissions under any burn and plastic surgery unit in the region or worldwide. However, most of the reported studies were focusing on a single indication for admission mostly burn injuries. As burn injuries are one of the most common causes of morbidity and mortality worldwide, it would be expected to rank the first upon all indications of admissions in the burn and plastic surgery unit<sup>11</sup>. A comparison between patients with burn injuries in our study with local and international literatures shown in Table 3<sup>2-9</sup>.

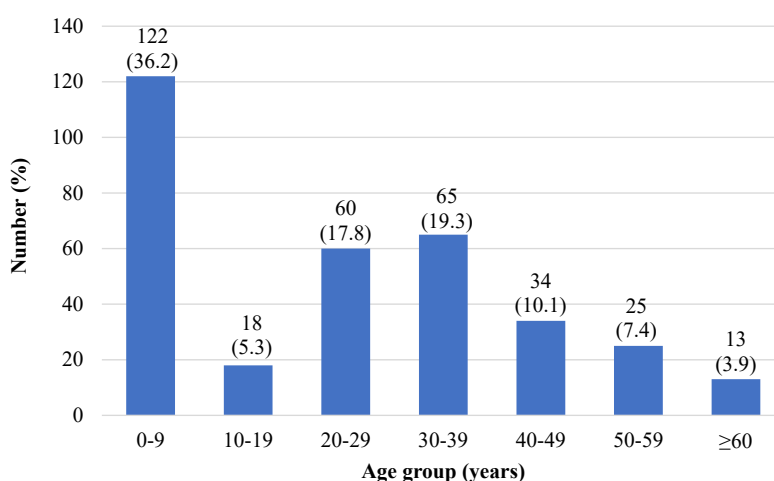


Fig. 2: Distribution of patients with burn per age group

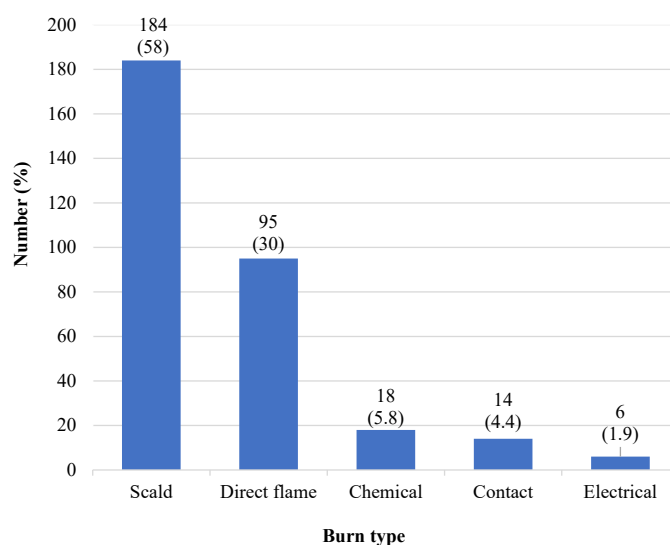


Fig. 3: Number (%) of different types of burns in 317 patients with burn

**Table 2:** Comparison of demographic data in 766 patients admitted with burn injury and other reasons of admission

Variable		Burn injuries	Others	Total	P value
Gender	Male	241 (71.5)	147 (34.3)	388 (50.7)	<0.0001*
	Female	96 (28.5)	282 (65.7)	378 (49.3)	
Nationality	Nationals	175 (51.9)	383 (89.3)	558 (72.8)	<0.0001*
	Non-Nationals	162 (48.1)	46 (10.7)	208 (27.2)	
Age (years), mean $\pm$ SD		23.8 $\pm$ 19.6	33.9 $\pm$ 14.8	766 (100)	<0.0001†
Age group (years)	0 – 9	122 (36.2)	40 (9.3)	162 (21.1)	<0.0001‡
	10 – 19	18 (5.3)	20 (4.7)	38 (5.0)	
	20 – 29	60 (17.8)	84 (19.6)	144 (18.8)	
	30 – 39	65 (19.3)	126 (29.4)	191 (24.9)	
	40 – 49	34 (10.1)	99 (23.1)	133 (17.4)	
	50 – 59	25 (7.4)	50 (11.6)	75 (9.8)	
	$\geq$ 60	13 (3.9)	10 (2.3)	23 (3.0)	
Total		337 (44)	429 (56)	766 (100)	

Data are number (%).

SD: Standard Deviation.

\*Fisher's exact test, †Mann-Whitney U test, ‡Pearson chi-square.

**Table 3:** Comparison of burn admissions in Bahrain, neighboring countries and worldwide

Country	Study	Period	n	Gender	Age (year)			Type of burn
					Most common	Least common	$\leq$ 5 years	
Bahrain	Current Study	2017-2018	337	M > F	0-9: 122 (36.2)	$\geq$ 60: 13 (3.9)	107 (31.8)	Scald 184 (58) Flame 95 (30)
Bahrain	Hamza et al <sup>7</sup>	1979 -1980	72	M > F	0-9: 30 (41)	$\geq$ 60: 1 (1.4)	27 (37.5)	Flame (48.61) Scald (41.67)
Bahrain	Hamza et al <sup>8</sup>	1984-1991	1612	M > F	0-5: 710 (44)	6-12: 97 (6)	710 (44)	NA
Bahrain	Louri et al <sup>9</sup>	2015 - 2016	322	M > F	NA	NA	NA	NA
Kuwait	Khashaba et al <sup>2</sup>	2006-2010	1702	M > F	17-45: 924 (54)	>65: 42 (2)	396 (23)	Flame (60) Scald (29)
Saudi	Al-Hoqaïl et al <sup>3</sup>	1997-2003	240	M > F	0-9: 85 (37.4)	50-59: 2 (0.9)	NA	Scald (16.3) Flame (6.98)
Iran	Karimi et al <sup>4</sup>	2009-2011	1721	M > F	<5: 418 (24.3)	>65: 77 (4.5)	418 (24.3)	Flame (49.8) Scald (35.7)
North America	Jeschke et al <sup>5</sup>	NA	573	M > F	16-65: 324 (57)	>65: 23 (4)	NA	Flame (80) Scald (12)
Germany	Schiefer et al <sup>6</sup>	1983-2013	1508	NA	30-39: 235 (15.5)	90-99: 8 (0.5)	NA	NA

Data are number (%), NA= not available.

Despite that the estimation of burn injuries prevalence was not the aim of our study, we noticed a decline in the total number of admissions over the studied two years period compared to the three previous studies published in Bahrain<sup>7-9</sup>. This can be attributed to the improved primary healthcare system and better public educational health campaigns coupled with strict laws such as implementation of child protection law<sup>7,8,12</sup>.

Body contouring Procedures were the second indication for admissions in our center. To ensure a long-term weight control, a high rate of BCS can be attributed to the upsurge in bariatric surgery (BS) frequency over the past few years due to the increase in obesity worldwide<sup>13-15</sup>.

The present study showed an overall male predominance in patients admitted to our unit, and also observed in patient admitted with burn injuries specifically. This observation was in consistent with earlier studies from Bahrain and several regional and international studies<sup>2-5,7-9</sup>. The study finding might be due to the higher risk of occupational related hazards in males. In contrary, female predominance was noted in patient with BCS in the current study. This could be related to the high global rate of obesity among females which necessitates undergoing BS<sup>13,14,16</sup>. In addition, females have their own critical evaluation of their body image, proper fitting clothing concerns and the important concept of female beauty in specific body regions<sup>14,16</sup>.

In this study, nationals had more admissions for burn injuries and plastic surgeries than non-nationals. This can be explained by the presence of more children among nationals, which are known to be more exposed to burn injuries as supported by several studies<sup>3,4,7-9</sup>. Moreover, admissions for BCS were found to be more among nationals. This is a reflection to the fact that our hospital is a governmental hospital where body contouring procedures are performed for free for nationals and GCC patients while other patients must pay part of the expenses.

Despite that most of the admitted patients were adults in the age groups of 30-39 years, most of burn admissions were in the pediatric age group. Likewise, children were also the most frequent victims of burn injuries in several studies<sup>3,4,7,8</sup>. These results might be explained by the higher risk of burn among pediatric patients before school age due to their long hours of home stay especially if left unsupervised. In contrast, the age group below nine years has contributed to a low percentage of burn admissions<sup>6</sup>. On the other hand, the young adults are also higher risk takers and ambitious due to high productivity at this age group.

Scalded burn was the highest to be documented in our center followed by direct flame. Similarly, scalded burns had higher percentage than flame burns in a neighboring country to Bahrain. Yet, other regional and international studies showed that direct flame rated the first followed by scalded burns<sup>2,4,5</sup>.

Our study was limited by missing some data such as descriptive report on how the burn happened due to its retrospective nature. It was also a single center study which might not provide an accurate representation of the actual total prevalence rate of burn injuries in the whole country (i.e. burn cases treated at home or private sectors, in the primary care setting, in the general hospital setting or burns treated on an out-patient basis). Despite these limitations, the results of our study are very important with a relative large sample size. It offers guidance for health system policy makers and establishes a foundation for future researches.

## CONCLUSION

Burn and plastic surgery represents a significant portion of the surgical admissions. Burn injuries and body contouring surgeries were the most

common indications of admission. Patients with burn injuries were mainly males, nationals and children. Scalded and flame burns were the most frequent types of burn injuries. Further studies are required to tackle details of patient's outcomes and surgical complications.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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