

# Epidemiologic and clinical characteristics and outcomes of burn patients in Kurdistan Region: a one-decade large retrospective cross-sectional study

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## Abstract

Globally, burns are the most devastating injuries, causing more than 120,000 deaths annually, particularly in low- and middle-income countries. This study investigated the epidemiologic and clinical characteristics and outcomes of burn patients. This

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Ethics approval: the Ethics Committee of Duhok General Directorate of Health approved this study (reference number 26072023-6-5). The study conforms with the Helsinki Declaration of 1964, as revised in 2013, concerning human and animal rights.

Informed consent: This study was conducted retrospectively, therefore, the written consents were not taken for the study purpose. Instead, the administrative consent of the hospital was obtained in this study.

Patient consent for publication: this study was performed retrospectively, therefore, it was not possible to obtain the patient consent for publication. We obtained the required information from the medical records of the patients. In this regard, we obtained the consent of the hospital for data collection and publication.

Availability of data and materials: the data of the study are available for the justified reasons.

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retrospective study was conducted at the Duhok Burn and Plastic Surgery Hospital between 2014 and 2023. The data collected included demographic characteristics of the patients, burn etiology, location of burn, degree of burn, and hospitalization duration. The study included 713 cases, with the majority (41.37%) in the 0-17 age group. Mortality increased with age, and housewives had the highest mortality rate (54.91%). Urban residents had a higher mortality rate (40.81%) than rural residents (28.80%). Winter and spring had higher rates of burn patients (31.84% and 29.17%). Most burns occurred at home (90.88%), with flame (70.97%) and scald (25.11%) as the primary causes. Hospitalizations were mostly 1-14 days (83.73%), and second and third-degree burns were common (47.27% and 50.07%). About 75.74% of patients suffered upper limb injuries. In 2023, there was a slightly higher burn rate (16.27%) compared to previous years. Burns were most frequently suffered by children, particularly during winter and spring at home. The primary causes were flame and scald injuries. Females were more prone to flame injuries, while males experienced a higher incidence of scald injuries. Among the affected groups, housewives had the highest mortality rate, and this elevated risk was linked to their advancing age.

## Introduction

Globally, burns are devastating traumas that affect a victim's quality of life, emotional well-being, and ability to support their family and community.<sup>1</sup> Worldwide, burn injuries are one of the leading causes of death, and over 95% of fire-related burns occur, causing more than 120,000 deaths annually, particularly in low- and middle-income countries.<sup>2</sup> This is perhaps due to burn injuries, which are usually associated with different types of complications such as infections, toxic shock syndrome, pulmonary complications, cardiac complications, electrolyte imbalance, and eventually multiple organ failure.<sup>3</sup> Undoubtedly, the costs of managing burns are high and impose remarkable economic and social consequences.<sup>4,5</sup> Burn mortality remains high, particularly in underdeveloped nations, despite advancements in clinical therapies such as aggressive surgery, early enteral feeding, and fluid resuscitation.<sup>6</sup>

Despite a lack of epidemiological studies, according to reports, burn injuries rank second in Iraq's emergency room visits, after gunfire. This is because of using domestic appliances, inflammable agents at home, and clothing burns. Even though the majority of these injuries are avoidable.<sup>7</sup> Moreover, published data on the extent of burn injuries and their epidemiology in the Kurdistan Region (north of Iraq) are scarce, and there is not enough data to direct and carry out efficient preventive measures against burns.<sup>8,9</sup> Therefore, investigating the epidemiologic and

clinical characteristics and outcomes of burn patients is crucial to creating a consistent collection of national burn data, as well as to better understand the issue and develop preventive measures. Therefore, we aimed to explore the epidemiologic and clinical characteristics and outcomes of burn patients for one decade in the Kurdistan Region.

## Materials and Methods

### Research design

In this retrospective cross-sectional study, patients who were either admitted or not admitted to Duhok Burn and Plastic Surgery Hospital were eligible for inclusion. Accordingly, the medical records of patients treated at the hospital were screened for this purpose. The necessary characteristics for this study were extracted from the medical records of the patients.

### Population, setting, and sampling

The patients included in this study were from Duhok Burn and Plastic Surgery Hospital located in Duhok City. This hospital is the sole facility for the diagnosis and management of burn injuries and plastic surgeries in Duhok Governorate. Consequently, all burn patients from across Duhok Governorate seek treatment at this facility for their injuries. The patients included in this study attended the facility between 2014 and 2023. The hospital was established in 2008. However, medical records from the years 2008 to 2013 were no longer available in the hospital's archives, except for names, outcomes, and a few pieces of information. Therefore, we opted to include medical records from the decade spanning 2014 to 2023. Nonetheless, due to the high population, it was not feasible to include all patients in this study. Consequently, we decided to sample a fraction of the population.

### Sampling technique

We employed a systematic technique for sampling in this study. The required sample size for a large population, based on the Cochran Formula, is 385. Since we utilized a non-random approach, we aimed to incorporate more cases in this study to account for missing information and the sampling technique. We resolved to include one case from every five medical records stored in the Archive Unit of the hospital. If the fifth case had excessive missing information or was empty for an unknown reason, the sixth case was included in the study. Ultimately, we included 717 cases were selected in this study. Out of 717 cases, four cases had too many missing information, therefore, we included 713 cases in the final analysis. The Syrian refugees and internally displaced persons were not included in this study as they did not give us a clear picture of the socio-demographic and cultural perspectives of Duhok Governorate.

### Study measures

The following information was gathered from the medical records of the burn patients: age, gender, employment status, education level, residency status, marital status, reason of burn injuries, location of the burn incident, etiology of the burn, duration of hospitalization, degree of burn, sites of injury, and outcome.

The patients who had two degrees of burn were located in the higher burn degree. The patients who had first and second, second and third, and third and fourth were located in the second, third, and fourth degrees, respectively.

## Statistical analyses

The prevalence of burn-related information such as site and etiology of burn and outcome of the disease was identified in number and percentage. The association of the etiology of the burn and demographic characteristics and burn seasons was examined in a Pearson chi-squared test. The mortality rates of burn injuries over a time period were examined in number and percentage and its associated factors were examined in a Pearson chi-squared test. The statistical calculations were performed using JMP Pro 14.3.0. (JMP®, Version 14.3.0. SAS Institute Inc., Cary, NC, 1989–2023).

## Ethical considerations

The ethical and administrative approval was taken from the Duhok General Directorate of Health and Duhok Burn and Plastic Surgery Hospital. The protocol of this study was registered in 26 July 2023 as reference number 26072023-6-5. The confidentiality of the personal information of the patients was protected and not included in the collection data file.

## Results

The burn patients admitted to the burn hospital in Duhok Governorate between 2014 and 2023 were predominantly children aged 0-5 years old (24.54%) and middle-aged individuals (18-59 years old: 55.82%). The majority of patients fell into the age group of 0-17 years old (41.37%), followed by unemployed individuals (22.44%). The patients comprised both males and females from various geographic areas. They ranged from preschoolers to high school students, with diverse marital statuses, and 3.46% were pregnant. The study revealed a significant increase in the mortality rate with advancing age. Housewives exhibited the highest mortality rate (54.91%), followed by unemployed patients (33.75%), females (44.39%), singles (45.45%), and married patients (41.99%), compared to children (25.42%), illiterate individuals (45.05%), and high school graduates (40.0%) compared to preschoolers and those under high school. Additionally, urban residents showed a higher mortality rate (40.81%) compared to their rural counterparts (28.80%;  $p < 0.0001$ ; see Table 1).

The study revealed that winter and spring had higher percentages of burn patients (31.84% and 29.17%, respectively) compared to summer (19.35%) and autumn (19.64%). The majority of burn injuries occurred at home (90.88%), followed by work (8.70%). Flame (70.97%) and scald (25.11%) were the most prevalent causes of burns, while a small percentage resulted from chemical materials (1.54%), electricity (1.26%), or explosions (1.12%). Most patients were hospitalized for a duration of 1 to 14 days (83.73%), and the majority had second and third-degree burns (47.27% and 50.07%, respectively). About 23.84% of patients experienced burn injuries covering their entire bodies. Additionally, 52.03% had burns on the head and neck, 62.69% on the trunk, 75.74% on the upper limbs, and 67.74% on the lower limbs. In 2023, there was a slightly higher burn rate (16.27%) compared to other years (Table 2). Mortality rates did not show significant differences based on the season and location of the burn. Patients burned by flame exhibited a significantly higher mortality rate (42.89%), especially those with shorter hospital stays. Mortality rates increased with the severity of burn degrees. Patients with burns covering the entire body (92.35%), head and neck (56.60%), or trunk (52.57%) were more likely to die compared to those with burns on the upper and lower limbs. Patients admitted in 2020 had the highest mortality rate (65.91%), followed by 2017 (46.06%), 2016 (41.38%), 2014

(42.86%), and 2015 (40.00%; see Table 2, Figure 1).

The study revealed that flame injuries were more common among females (79.30%) and males (60.26%), whereas scald injuries were more prevalent in males (31.73%) compared to females (19.95%;  $p < 0.0001$ ). The etiology of burns did not differ based on the season of occurrence and the residency of patients. The findings indicated that flame injuries were more common in adults (88.94%), while scald injuries were predominant in children (62.14%;  $p < 0.0001$ ). Third and fourth-degree burns were more likely to be associated with flame and scald injuries across all sites (Table 3).

The study showed that most of the patients had TBSA of 10-19% (22%) followed by 20-29% (17%), and 90-100 (15%) as shown in Figure 2.

The adult patients, females, and those who were burnt by flame, and died had higher TBSA as shown in Table 4.

## Discussion

A glance at the present data shows that the majority of patients who fell into the preschool and high school age groups occurred at home in the winter and spring and were mostly caused by flames

and scalds. Flame injuries were more common among females and males, whereas scald injuries were more prevalent in males. Housewives exhibited the highest mortality rate and a higher mortality rate was associated with advancing age.

## Age and gender

This study showed that the majority of patients were children under the age of 5. This may be because children receive less attention from their parents as they grow up; furthermore, they do not have adequate self-protection abilities.<sup>10</sup> In the majority of studies, an overall predominance of children among burn injuries has been observed.<sup>10,11</sup> A systematic review revealed that nearly half of the population with severe burn injuries are children.<sup>12</sup> In this study, women, especially housewives, exhibited the highest burn injuries and mortality rates. These results are contrary to what has been documented in the literature. A systematic review of 76 studies and more than 186,500 patients by Brusselsaers *et al.*<sup>12</sup> found in most studies, an overall male predominance among burn injuries, because these injuries in adults are often work-related. It could be argued that almost all included studies were conducted in Europe; hence, the situation might differ in low- and middle-income countries. A study by Peck *et al.*<sup>13</sup> investigated the source of burn injuries in low- and middle-income countries. They found that the

**Table 1.** General characteristics of burn patients in Duhok Governorate between 2014 and 2023.

General characteristics (n=713)	Statistics No (%)	Outcomes no (%)			p
		Dead 253 (35.48%)	Recovered with disability 44 (6.17%)	Recovered with minor effects 416 (58.35%)	
Age groups					<0.0001
0-5	175 (24.54)	34 (19.43)	3 (1.71)	138 (78.86)	
6-14	68 (9.54)	13 (19.12)	2 (2.94)	53 (77.94)	
15-17	52 (7.29)	28 (53.85)	1 (1.92)	23 (44.23)	
18-29	229 (32.12)	106 (46.29)	21 (9.17)	102 (44.54)	
30-59	169 (23.70)	58 (34.32)	17 (10.06)	94 (55.62)	
60 and over	20 (2.81)	14 (70.00)	0 (0.00)	6 (30.00)	
Employment					<0.0001
Child	295 (41.37)	75 (25.42)	6 (2.03)	214 (72.54)	
Unemployed	160 (22.44)	54 (33.75)	13 (8.13)	93 (58.13)	
Housewife	173 (24.26)	95 (54.91)	15 (8.67)	63 (36.42)	
Employee	21 (2.95)	5 (23.81)	4 (19.05)	12 (57.14)	
Free busyness	64 (8.98)	24 (37.50)	6 (9.38)	34 (53.13)	
Gender					<0.0001
Male	312 (43.76)	75 (24.04)	17 (5.45)	220 (70.51)	
Female	401 (56.24)	178 (44.39)	27 (6.73)	196 (48.88)	
Pregnancy					0.9386
No	223 (96.54)	112 (50.22)	20 (8.97)	91 (40.81)	
Pregnant	8 (3.46)	4 (50.00)	1 (12.50)	3 (37.50)	
Marital status					<0.0001
Child	295 (41.37)	75 (25.42)	6 (2.03)	214 (72.54)	
Single	55 (7.71)	25 (45.45)	4 (7.27)	26 (47.27)	
Divorced/separated	1 (0.14)	1 (100)	0 (0.00)	0 (0.00)	
Married	362 (50.77)	152 (41.99)	34 (9.39)	176 (48.62)	
Education					<0.0001
Preschooler	175 (24.54)	34 (19.43)	3 (1.71)	138 (78.86)	
Illiterate	364 (51.05)	164 (45.05)	31 (8.52)	169 (46.43)	
Under-high school	144 (20.20)	43 (29.86)	8 (5.56)	93 (64.58)	
High school	30 (4.21)	12 (40.00)	2 (6.67)	16 (53.33)	
Residency					0.0008
Rural	316 (44.32)	91 (28.80)	16 (5.06)	209 (66.14)	
Urban	397 (55.68)	162 (40.81)	28 (7.05)	207 (52.14)	

Chi-squared test was performed for statistical analyses.

majority of the patients were adult women, as they use non-electric domestic appliances, mainly kerosene, for cooking, lighting, heating, or all three. On the contrary, although Iran is a neighboring country of the Kurdistan Region, most studies showed that the highest percentage of burns occurred in men; women are more likely to burn at home and in the kitchen, while men are more likely to be burned in the workplace, despite a high mortality rate among women.<sup>14-16</sup> Similarly, a Saudi Arabian systematic review found that in terms of burn injuries, men outweighed women.<sup>17</sup> This could be because data about the prevalence of occupational

burn injuries varies significantly between nations; here, for example, we believe that a lack of occupational hazards might be related to shortages in factories and industry in the Kurdistan Region.

### Season of injury and location of burn

The present study revealed that winter and spring had higher percentages of burn patients compared to summer and autumn. The majority of burn injuries occurred at home, followed by work. Flame and scald were the most prevalent causes of burns. Kurdistan Region has a cold winter climate, and the main heat

**Table 2.** Burn related information of burn patients in Duhok Governorate during 2014-2023.

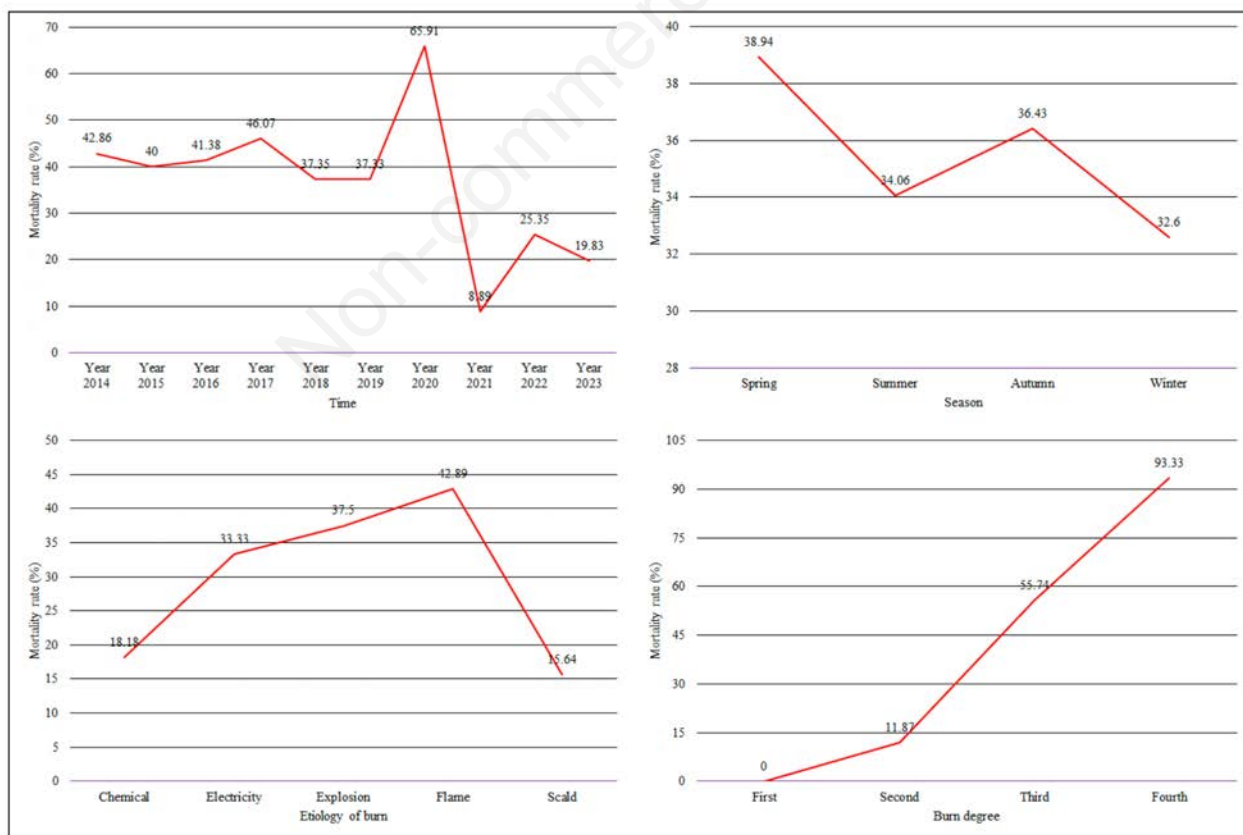
Burn-related information (n=713)	Statistics No (%)	Outcomes no (%)			p
		Dead 253 (35.48%)	Recovered with disability 44 (6.17%)	Recovered with minor effects 416 (58.35%)	
<b>Season</b>					0.6508
Spring	208 (29.17)	81 (38.94)	11 (5.29)	116 (55.77)	
Summer	138 (19.35)	47 (34.06)	12 (8.70)	79 (57.25)	
Autumn	140 (19.64)	51 (36.43)	9 (6.43)	80 (57.14)	
Winter	227 (31.84)	74 (32.60)	12 (5.29)	141 (62.11)	
<b>Location of burn</b>					0.6274
Home	648 (90.88)	229 (35.34)	40 (6.17)	379 (58.49)	
Industry	2 (0.28)	2 (100)	0 (0.00)	0 (0.00)	
Public building	1 (0.14)	0 (0.00)	0 (0.00)	1 (100)	
Work	62 (8.70)	22 (35.48)	4 (6.45)	36 (58.06)	
<b>Etiology of burn</b>					<0.0001
Chemical	11 (1.54)	2 (18.18)	0 (0.00)	9 (81.82)	
Electricity	9 (1.26)	3 (33.33)	2 (22.22)	4 (44.44)	
Explosion	8 (1.12)	3 (37.50)	1 (12.50)	4 (50.00)	
Flame	506 (70.97)	217 (42.89)	36 (7.11)	253 (50.00)	
Scald	179 (25.11)	28 (15.64)	5 (2.79)	146 (81.56)	
<b>Hospitalization (days)</b>					<0.0001
1-3	234 (32.82)	93 (39.74)	6 (2.56)	135 (57.69)	
4-7	216 (30.29)	98 (45.37)	7 (3.24)	111 (51.39)	
8-14	147 (20.62)	36 (24.49)	7 (4.76)	104 (70.75)	
15-21	54 (7.57)	12 (22.22)	5 (9.26)	37 (68.52)	
22-29	17 (2.38)	5 (29.41)	1 (5.88)	11 (64.71)	
30 and longer	45 (6.31)	9 (20.00)	18 (40.00)	18 (40.00)	
<b>Degree category</b>					<0.0001
First	4 (0.56)	0 (0.00)	0 (0.00)	4 (100)	
Second	337 (47.27)	40 (11.87)	8 (2.37)	289 (85.76)	
Third	357 (50.07)	199 (55.74)	35 (9.80)	123 (34.45)	
Fourth	15 (2.10)	14 (93.33)	1 (6.67)	0 (0.00)	
<b>Body location</b>					
All body	170 (23.84)	157 (92.35)	10 (5.88)	3 (1.76)	<0.0001
Head & neck	371 (52.03)	210 (56.60)	26 (7.01)	135 (36.39)	<0.0001
Trunk	447 (62.69)	235 (52.57)	28 (6.26)	184 (41.16)	<0.0001
Upper limbs	540 (75.74)	236 (43.70)	37 (6.85)	267 (49.44)	<0.0001
Lower limbs	483 (67.74)	228 (47.20)	32 (6.63)	223 (46.17)	<0.0001
<b>Year</b>					<0.0001
2014	77 (10.80)	33 (42.86)	8 (10.39)	36 (46.75)	
2015	55 (7.71)	22 (40.00)	0 (0.00)	33 (60.00)	
2016	58 (8.13)	24 (41.38)	5 (8.62)	29 (50.00)	
2017	89 (12.48)	41 (46.07)	6 (6.74)	42 (47.19)	
2018	83 (11.64)	31 (37.35)	0 (0.00)	52 (62.65)	
2019	75 (10.52)	28 (37.33)	1 (1.33)	46 (61.33)	
2020	44 (6.17)	29 (65.91)	2 (4.55)	13 (29.55)	
2021	45 (6.31)	4 (8.89)	6 (13.33)	35 (77.78)	
2022	71 (9.96)	18 (25.35)	9 (12.68)	44 (61.97)	
2023	116 (16.27)	23 (19.83)	7 (6.03)	86 (74.14)	

Chi-squared test was performed for statistical analyses.

**Table 3.** Etiology of burn by season in burn patients in Duhok Governorate (Kurdistan Region) between 2014 and 2023.

	Chemical (n=11)	Electricity (n=9)	Etiology of burn Explosion (n=8)	Flame (n=506)	Scald (n=179)	p
Gender						<0.0001
Male	8 (2.56)	9 (2.88)	8 (2.56)	188 (60.26)	99 (31.73)	
Female	3 (0.75)	0 (0.00)	0 (0.00)	318 (79.30)	80 (19.95)	
Season						0.2448
Autumn	2 (1.43)	2 (1.43)	1 (0.71)	101 (72.14)	34 (24.29)	
Spring	7 (3.37)	2 (0.96)	3 (1.44)	152 (73.08)	44 (21.15)	
Summer	1 (0.72)	4 (2.90)	2 (1.45)	91 (65.94)	40 (28.99)	
Winter	1 (0.44)	1 (0.44)	2 (0.88)	162 (71.37)	61 (26.87)	
Age group						<0.0001
0-14 yr	3 (1.23)	1 (0.41)	0 (0.00)	88 (36.21)	151 (62.14)	
15 yr or older	8 (1.70)	8 (1.70)	8 (1.70)	418 (88.94)	28 (5.96)	
Residency						0.1195
Rural	8 (2.53)	4 (1.27)	1 (0.32)	220 (69.62)	83 (26.27)	
Urban	3 (0.76)	5 (1.26)	7 (1.76)	286 (72.04)	96 (24.18)	
Burn degree						<0.0001
First	0 (0.00)	1 (25.00)	0 (0.00)	2 (50.00)	1 (25.00)	
Second	9 (2.67)	3 (0.89)	4 (1.19)	196 (58.16)	125 (37.09)	
Third	1 (0.28)	5 (1.40)	2 (0.56)	296 (82.91)	53 (14.85)	
Fourth	1 (6.67)	0 (0.00)	2 (13.33)	12 (80.00)	0 (0.00)	
Body location						
All body	0 (0.00)	2 (1.18)	1 (0.59)	155 (91.18)	12 (7.06)	<0.0001
Head & neck	8 (2.16)	5 (1.35)	6 (1.62)	308 (83.02)	44 (11.86)	<0.0001
Trunk	3 (0.67)	2 (0.45)	3 (0.67)	351 (78.52)	88 (19.69)	<0.0001
Upper limbs	7 (1.30)	7 (1.30)	6 (1.11)	420 (77.78)	100 (18.52)	<0.0001
Lower limbs	8 (1.66)	4 (0.83)	5 (1.04)	356 (73.71)	110 (22.77)	0.1216

Chi-squared test was performed for statistical analyses.



**Figure 1.** Mortality rate of patients over time, season, etiology of burn, and burn degree.

sources in this area are flammable fuels and electric heating. In addition, cooking at home with a gas cylinder is a common accidental indoor cause of burns among residents in daily life. These results are consistent with studies conducted in China, in which most cases of burns were flame burns and occurred in the winter.<sup>10,18,19</sup>

### The length of hospitalization

Most of the patients in this study were typically kept in hospitals until their wounds had nearly healed. The majority of patients were hospitalized for a duration of 1 to 14 days. While the mean duration of hospitalization worldwide is between 7 and 33 days.<sup>12</sup> In this study was shorter because of the high mortality rate. A similar study<sup>10</sup> stated that the declining trend of the mean length of hospitalization was linked to increasing age and total body surface area (TBSA), which led to increased mortality.

### Degree of burns and burn size

The majority of patients had second and third-degree burns, and nearly one-third of patients experienced burn injuries covering their entire bodies. This might be a strong reason for the high mortality rate among patients. A study conducted in Iraq showed that nearly two-thirds of patients died as a complication of second- and third-degree burns.<sup>7</sup> According to the literature, deaths from burns are 7 to 11 times higher in low-income countries than in high-income countries.<sup>20</sup> In our opinion, this is a serious issue that has to be carefully considered to decrease the mortality rate among burn survivors. It has been reported that large-area burns mainly occur in working-age adults.<sup>10</sup> In this study, most of the patients had a TBSA of 22%, and burns mostly occurred at home due to the daily use of flammable materials such as liquefied petroleum gas. These results are consistent with the study of Lami and Al Naser<sup>7</sup> conducted in Iraq, in which two-thirds of the burn patients had 20% TBSA. Burns of less than 20% of TBSA may not represent a large proportion of severe burns.<sup>10</sup> On the other hand, it has been stated that a burn injury involving more than 20% of the TBSA might result in hypermetabolic, inflammatory, and stress reactions that are in some aspects as profound as in patients with over 40% TBSA burns.<sup>21</sup> This might correlate with a high mortality rate, despite the low involvement of TBSA.

### Burn sites and etiology

Data from 2023 records showed a slightly higher burn rate compared to other years. The majority of patients experienced burn injuries on the trunk, upper limbs, lower limbs, head, and neck, respectively. A possible explanation for that is that when individuals suddenly face burns, they may subconsciously protect the important parts of their body, such as their heads. Moreover, burn injuries to the extremities are paramount and should be taken into consideration. This is because they can lead to not only deformities and cicatrix but also functional losses, which decrease the quality of life for the patients.<sup>22,23</sup>

Nearly one-quarter of patients experienced burn injuries covering their entire bodies. Since the majority of them had burns on the trunk and upper limbs, this might explain the high mortality rate among patients. These findings are comparable with the findings of a study done in Sulaymaniyah Province, Iraq,<sup>9</sup> and a study in China.<sup>10</sup>

Contrary to previously reported epidemiologic findings, this study showed that flame burns, rather than scald burns, were the most common cause of burn injuries.<sup>10</sup> However, findings from the current study are inconsistent with those conducted in Saudi Arabia, China, Iran, and Turkey, where scalding was the most fre-

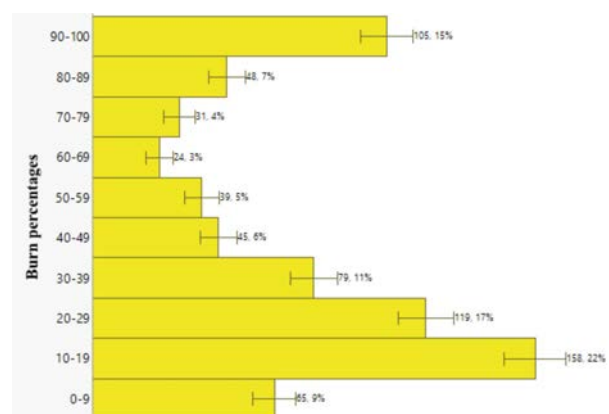
quent etiology of all burns.<sup>15,17,24,25</sup>

The flame injuries in our study were more common among females, whereas scald injuries were more prevalent in males. Scald injuries, on the other hand, were predominant in children. Our findings are comparable with the published studies in which the majority of burn injuries were in the under-fives and were scalds.<sup>26,27</sup> It is estimated that scald burns in pediatric populations account for 81% of all burns that need hospitalization. Burning by boiling water, accidental spillage, or falling into hot gravy is more likely to occur in young children.<sup>10,28</sup> This could be because, as children grow up, parents give them less attention, and they also lack self-protection abilities. It should not be forgotten that in the Kurdistan Region, there are still thousands of families living in camps and tents as refugees and displaced. They suffer from a lack of safety measures concerning fire accidents, including scalded injuries. Many of these families use kerosene for cooking and boiling water, which may create a great risk of scale injuries among children. Thus, to lower the number of scalds, education and home

**Table 4.** TBSA by age, gender, etiology of burn, and outcomes.

	Burn (%)		p
	Median	Interquartile range	
Age group			<0.001
0-14 yr.	15	20	
15 yr. or older	40	65	
Gender			<0.001
Male	20	26	
Female	40	65	
Etiology of burn			<0.001
Chemical	35	30	
Electricity	25	64	
Explosion	22.5	77.75	
Flame	40	60	
Scald	15	15	
Outcome			<0.001
Recovered with minor effects	17.5	15	
Recovered with disability	42.5	35	
Dead	85	40	

Wilcoxon / Kruskal-Wallis Tests (Rank Sums) was performed for statistical analyses.



**Figure 2.** Distribution of TBSA in burn patients in Duhok Governorate between 2014 and 2023 (the values are in number, percentage. The bars are Std. Errors).

safety checks, along with thermometers or thermostatic mixing valves, should be promoted to reduce tap water scalds.<sup>29</sup>

## Mortality

The mortality rate was closely related to the TBSA, severity of burn degrees, advancing in age, and burning by flame. Patients with burns covering the entire body were more likely to die especially those with shorter hospital stays. These findings are consistent with other published epidemiological studies. They demonstrated that advancing in age, increasing TBSA, and flame burns are the major risk factors for mortality among burn patients.<sup>10,12,30-32</sup> Moreover, our findings were also consistent with the literature, in which the mortality rate is high among high-risk groups, including the elderly and females. The age-related declines in motor function, cognitive function, and judgment make the elderly more vulnerable to burns. In the present study, female patients who were burned by flame and died had a higher TBSA. Due to the lacunae in the data, it was difficult to obtain the true cause of flame injuries among females because patients' relatives usually conceal and provide misleading information under the term ashamed of society; nevertheless, we believe that it might be related to self-immolation. Many studies have been published on this concern and found that self-inflicted burns were noted, especially among young women. Although this type of burn is rare in developed countries,<sup>33</sup> conversely is common among women of Iraqi Kurdistan.<sup>34</sup> This may be due to many factors, such as social pressures and social interactions in their own right.<sup>35</sup> Moreover, it has been reported that numerous Kurdish women and girls resort to different methods of suicide, primarily self-immolation, as a means of escaping the discrimination they face due to their gender, social status, or tribe.<sup>34</sup> Therefore, women who have made suicide attempts should be given special interventions and support by providing them with educational programs about the harmful nature of burns.

In this study, we found that patients admitted in 2020 had the highest mortality rate of burn injuries compared to other years of the last decade. This might be related to staying at home during the COVID-19 pandemic, which increases indoor accidents. These results are similar to those of several studies conducted in this regard.<sup>36,37</sup>

Overall, burn injuries are critical and fatal; they impose a burden not only on the government but also on families. Surprisingly, while we were writing this piece of work, a big fire broke out in a building in one of the cities of the Kurdistan Region, killing 14 people by suffocation and wounding five others. This was a result of a lack of safety regulations for burning, including a lack of a fire extinguisher bottle and a lock on the door of the fire exit.<sup>38</sup> Thus, every effort should be made in collaboration with the community to adopt preventive measures. Furthermore, providing public education related to the prevention of burn injuries is crucial to minimizing the risk of burns and their consequences. To the best of our knowledge, this study is one of the more recent epidemiologic studies to study the characteristics of burn injuries in the Kurdistan Region. However, the findings of the study were obtained from a single institution; accordingly, the generalization of the findings should be considered with caution.

## Conclusions

The study aimed to update information on burns in the Kurdistan Region, focusing on epidemiological and clinical aspects. Key findings include a higher incidence of burns in chil-

dren, with most incidents happening at home during winter and spring, caused mainly by flame and scald. Females were more prone to flame injuries, while males experienced more scald injuries. Housewives had the highest mortality rate, and advancing age was linked to increased mortality.

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