Received: 27 March 2023 | Revised: 6 April 2023 | Accepted: 7 April 2023

DOI: 10.1111/iwj.14199

ORIGINAL ARTICLE

IWJ WILEY

Acute burns during the COVID-19 pandemic: A one-year retrospective study of 611 patients at a referral burn centre in northern Iran

Mohammadreza Mobayen[1] | **Hossein Torabi**[2] | **Parissa Bagheri Toolaroud**[3] | **Mohammad Tolouei**[4] | **Anoush Dehnadi Moghadam**[5] | **Mohammad Saadatmand**[6] | **Habib EslamiKenarsari**[7] | **Alireza Feizkhah**[1,8] | **Mohammad Javad Ghazanfari**[1,9] | **Joseph Osuji**[10] | **Pooyan Ghorbani Vajargah**[1,11] | **Samad Karkhah**[1,11]

[1]Burn and Regenerative Medicine Research Center, Guilan University of Medical Sciences, Rasht, Iran

[2]Department of General Surgery, Poursina Medical & Educational Center, Guilan University of Medical Sciences, Rasht, Iran

[3]Health Information Management Research Center, Kashan University of Medical Sciences, Kashan, Iran

[4]Department of General Surgery, Faculty of Medicine, Guilan University of Medical Sciences, Rasht, Iran

[5]Anesthesiology Research Center, Guilan University of Medical Sciences, Rasht, Iran

[6]Clinical Research Development Unit of Poursina Hospital, Guilan University of Medical Sciences, Rasht, Iran

[7]Poursina Clinical Research Development Unit, Guilan University of Medical Sciences, Rasht, Iran

[8]Department of Medical Physics, School of Medicine, Guilan University of Medical Sciences, Rasht, Iran

[9]Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

[10]School of Nursing and Midwifery, Faculty of Health, Community, and

Abstract

Patients with acute burns are more vulnerable to COVID-19 because of physiologically weak immune systems. This study aimed to assess and compare individual characteristics, clinical features, and clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients. A retrospective study, with data collected from 611 acute burn patients with or without a COVID-19 diagnosis referred to a burn centre in Iran. Data were collected from April 2020 to 2021. The mean age of acute burns patients with COVID-19 was higher compared with acute burns patients with non-COVID-19 (47.82 vs. 32.59 years, $P < .001$). Acute burns occurred more frequently in COVID-19 patients with comorbidities compared with non-COVID-19 patients (48.72% vs. 26.92%, $P = .003$). 58.97% of COVID-19 patients and 55.42% of non-COVID-19 patients had grade II & III and II burns, respectively ($P < .001$). The mean total body surface area of the burn was higher in COVID-19 patients compared with non-COVID-19 patients (32.69% vs. 16.22%, $P < .001$). Hospitalisation in the intensive care unit (ICU) was higher in COVID-19 patients than in non-COVID-19 patients (76.92% vs. 15.73%, $P < .001$). Length of stay in hospital and ICU, the cost of hospitalisation, and waiting time for the operating room was higher in COVID-19 patients compared with non-COVID-19 patients (15.30 vs. 3.88 days, $P < .001$; 9.61 vs. 0.75 days, $P < .001$; 30 430 628.717 vs. 10 219 192.44 rials, $P = .011$; 0.84 vs. 0.24 min, $P < .001$, respectively). Intubation and mortality in-hospital were higher in COVID-19 patients compared with non-COVID-19 patients (41.02% vs. 6.99%, $P < .001$; 35.90% vs. 6.12%, $P < .001$, respectively). Therefore, it is recommended that health

Education, Mount Royal University, Calgary, Alberta, Canada

[11]Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran

Correspondence
Samad Karkhah MSc and Pooyan Ghorbani Vajargah, Nursing and Midwifery School of Shahid Dr Beheshti, Hamidyan Shahrak, Shahid Dr Beheshti Ave., Rasht, Guilan 41469-39841, Iran.
Email: sami.karkhah@yahoo.com, poyan.ghorbani@gmail.com

managers and policymakers develop a care plan to provide high-quality care to acute burns patients with COVID-19, especially in low-income countries.

KEYWORDS
burn injury, burns, COVID-19, Iran, mortality

Key Messages

- the mean age of acute burns patients with COVID-19 was higher compared with acute burns patients with non-COVID-19 (47.82 vs. 32.59 years, $P < .001$). Acute burns occurred more frequently in COVID-19 patients with comorbidities compared with non-COVID-19 patients (48.72% vs. 26.92%, $P = .003$)
- 58.97% of COVID-19 patients and 55.42% of non-COVID-19 patients had grade II & III and II burns, respectively ($P < .001$). The mean total body surface area of the burn was higher in COVID-19 patients compared with non-COVID-19 patients (32.69% vs. 16.22%, $P < .001$)
- hospitalisation in the intensive care unit (ICU) was higher in COVID-19 patients than non-COVID-19 patients (76.92% vs. 15.73%, $P < .001$). Length of stay in hospital and ICU, the cost of hospitalisation, and waiting time for the operating room was higher in COVID-19 patients compared with non-COVID-19 patients (15.30 vs. 3.88 days, $P < .001$; 9.61 vs. 0.75 days, $P < .001$; 30 430 628.717 vs. 10 219 192.44 rials, $P = .011$; 0.84 vs. 0.24 min, $P < .001$, respectively)
- intubation and mortality in-hospital was higher in COVID-19 patients compared with non-COVID-19 patients (41.02% vs. 6.99%, $P < .001$; 35.90% vs. 6.12%, $P < .001$, respectively)
- therefore, it is recommended that health managers and policymakers develop a care plan to provide high-quality care to acute burns patients with COVID-19, especially in low-income countries

1 | INTRODUCTION

Since December 2019, the COVID-19 pandemic has led to adverse consequences for individuals and health care systems worldwide.[1-9] Previous evidence in Iran shows that some elective surgical procedures were cancelled at the beginning of the COVID-19 pandemic, and non-COVID-19 patients were prevented from being admitted because of inappropriate policies and fears of a widespread pandemic.[10,11] Comorbidities are one of the main predictors of acute morbidity and high mortality in COVID-19 patients.[12-14] In particular, burn patients are high-risk groups exposed to the acute complications and negative consequences of COVID-19.[15] Therefore, it is essential to pay attention to high-risk patients with COVID-19. In recent years, with the industrialisation and development of societies and countries, burns have been recognised as one of the most common injuries in the world.[16-26] Burn injuries produce some of the most painful patient experiences.[27-45] Therefore, effective pain management can raise the standard of care because pain can hinder recovery.[46-50] Acute burn is a medical emergency that requires immediate initiation of treatment without delay. Patients with acute burns are predisposed to systemic inflammatory response syndrome, multiple organ failure, hypotension, thrombocytopenia, respiratory failure, and death because of lack of immediate treatment.[51] In addition, patients with acute burns are more vulnerable to COVID-19 because of physiologically weak immune systems.[52] A study in Brazil[53] found that burn patients with complex conditions are more prone to the complications and mortality associated with COVID-19. However, a retrospective study in the UK[54] found no COVID-19-related mortality in burn patients with surgery/no surgery. Official data from Iranian burn centres on this issue are limited[55]; therefore, the limited and contradictory evidence makes comparing individual characteristics, clinical features, and clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients important.

2 | RESEARCH QUESTIONS

The study aimed to answer the following research questions:

- What are the differences between the individual characteristics of acute burn among COVID-19 and non-COVID-19 patients?
- What are the differences between the clinical features of acute burn among COVID-19 and non-COVID-19 patients?
- What are the differences between the clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients?

2.1 | Aim

The present study aimed to assess and compare individual characteristics, clinical features, and clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients.

3 | METHODS

3.1 | Study design and subjects

Using a retrospective study approach, 611 acute burn patients with or without COVID-19 diagnosis referred to a burn centre in northern Iran were enrolled. Data were collected from April 2020 to April 2021. Patients with incomplete medical records were excluded from the present study. The Ethics Committee of Guilan University of Medical Sciences approved the study.

3.2 | Data collection

Data collection focused on information such as age, sex, smoking, addiction, comorbidity, burn season, the primary cause of burns, burns grade, total body surface area (TBSA) of the burn, graft, length of stay in hospital and intensive care unit (ICU), the cost of hospitalisation, waiting time for the operating room, intubation, and in-hospital mortality. Patients' medical records served as an additional source of data for analysis.

3.3 | Statistical analysis

The SPSS software package (version 16.0, SPSS Inc., Chicago, IL, USA) was used to analyse the data. Quantitative and qualitative variables were presented using mean (standard deviation) and number (percentage). The normality of the data was assessed using the Kolmogorov–Smirnov test. As a result of the normal distribution of data, ANOVA and independent *t*-tests were used to compare individual characteristics, clinical features, and clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients. The significance level was considered less than 0.05.

4 | RESULTS

4.1 | Participants

A total of 611 patients with acute burns participated in the present study. Of the participants, 67.76% were male, 13.42% were smokers, 7.86% were addicts, 28.31% had comorbidities, 53.36% had grade II burns, and 95.25% had a graft. Patients' mean age and TBSA were 33.56 (SD = 21.52) years and 17.27% (SD = 19.01), respectively. 49.75% of acute burns were because of scalding, while 41.24% of acute burns occurred in winter (Table 1).

4.2 | Comparison of individual characteristics, clinical features, and clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients

As presented in Table 1, the mean age of acute burns patients with COVID-19 was higher compared with acute burns patients with non-COVID-19 (47.82 vs. 32.59 years, $P < .001$). Acute burns occurred more frequently in COVID-19 patients with comorbidities compared with non-COVID-19 patients (48.72% vs. 26.92%, $P = .003$). Acute burns occurred more frequently in COVID-19 patients during the summer and autumn months (33.33%) but in non-COVID-19 patients in the winter (42.83%) ($P < .001$). 58.97% of COVID-19 patients and 55.42% of non-COVID-19 patients had grade II & III and II burns, respectively ($P < .001$). Mean TBSA of the burn was higher in COVID-19 patients compared with non-COVID-19 patients (32.69% vs. 16.22%, $P < .001$). Hospitalisation in the ICU was higher in COVID-19 patients compared with non-COVID-19 patients (76.92% vs. 15.73%, $P < .001$). Length of stay in hospital and ICU, the cost of hospitalisation, and waiting time for the operating room was higher in COVID-19 patients compared with non-COVID-19 patients (15.30 vs. 3.88 days, $P < .001$; 9.61 vs. 0.75 days, $P < .001$; 30 430 628.717 vs. 10 219 192.44 rials, $P = .011$; 0.84 vs. 0.24 min, $P < .001$, respectively). Intubation and mortality in-hospital were higher among COVID-19 patients compared with non-COVID-19 patients (41.02% vs. 6.99%, $P < 0.001$; 35.90% vs. 6.12%, $P < 0.001$, respectively).

TABLE 1 Comparison of individual characteristics, clinical features, and clinical outcomes of acute burn among COVID-19 and non-COVID-19 patients (n = 611).

	Total (n = 611)	COVID-19 (n = 39)	Non-COVID-19 (n = 572)	*P*-value
Individual characteristics				
Age (y)	33.56 (SD = 21.52)	47.82 (SD = 20.52)	32.59 (SD = 21.37)	<.001*
Sex				.206**
Male	414 (67.76)	30 (76.92)	384 (67.13)	
Female	197 (32.24)	9 (23.08)	188 (32.87)	
Smoking				.391**
Yes	82 (13.42)	7 (17.95)	75 (13.11)	
No	529 (86.58)	32 (82.05)	497 (86.89)	
Addicted				.40**
Yes	48 (7.86)	3 (7.69)	45 (7.87)	
No	563 (92.14)	36 (92.31)	527 (92.13)	
Comorbidity				.003**
Yes	173 (28.31)	19 (48.72)	154 (26.92)	
No	438 (71.69)	20 (51.28)	418 (73.08)	
Clinical features				
Burn season				<.001*
Spring	160 (26.19)	6 (15.39)	154 (26.92)	
Summer	22 (3.60)	13 (33.33)	9 (1.58)	
Autumn	177 (28.97)	13 (33.33)	164 (28.67)	
Winter	252 (41.24)	7 (17.95)	245 (42.83)	
Primary cause of burns				.183*
Flame	251 (41.09)	21 (53.84)	230 (40.21)	
Scald	304 (49.75)	14 (35.90)	290 (50.70)	
Chemical	9 (1.47)	0 (0)	9 (1.58)	
Contact	20 (3.27)	2 (5.13)	18 (3.14)	
Electrical	27 (4.42)	2 (5.13)	25 (4.37)	
Burns grade				<.001*
II	326 (53.36)	9 (23.08)	317 (55.42)	
III	144 (23.57)	5 (12.82)	139 (24.30)	
II & III	124 (20.29)	23 (58.97)	101 (17.66)	
III & IV	17 (2.78)	2 (5.13)	15 (2.62)	
TBSA of the burn (%)	17.27 (SD = 19.01)	32.69 (SD = 17.56)	16.22 (SD = 19.11)	<.001*
Graft				.707**
Yes	582 (95.25)	37 (94.87)	545 (95.28)	
No	29 (4.75)	2 (5.13)	27 (4.72)	
Clinical outcomes				
Length of stay in hospital (day)	8.97 (SD = 8.79)	15.30 (SD = 12.64)	3.88 (SD = 4.56)	<.001*
Hospitalisation in the ICU				<.001**
Yes	120 (19.64)	30 (76.92)	90 (15.73)	
No	491 (80.36)	9 (23.08)	482 (84.27)	
Length of stay in ICU (day)	4.10 (SD = 5.58)	9.61 (SD = 12.29)	0.75 (SD = 2.40)	<.001*

TABLE 1 (Continued)

	Total (n = 611)	COVID-19 (n = 39)	Non-COVID-19 (n = 572)	*P*-value
The cost of hospitalisation (rial)	4.10 (SD = 5.58)	30 430 628.717	10 219 192.44	.011*
Waiting time for the operating room (min)	0.84 (SD = 0.70)	0.84 (SD = 0.70)	0.24 (SD = 0.50)	<.001*
Intubation		3.61 (SD = 8.29)	0.29 (SD = 1.31)	<.001**
Yes	56 (9.16)	16 (41.02)	40 (6.99)	
No	555 (90.84)	23 (58.98)	532 (93.01)	
Mortality in-hospital				<.001**
Yes	49 (8.02)	14 (35.90)	35 (6.12)	
No	562 (91.98)	25 (64.10)	537 (93.88)	

Note: Data are presented as number (percentage) and mean (standard deviation).
Abbreviations: ICU, Intensive Care Unit; SD, Standard Deviation.
**P*-values were obtained with ANOVA tests.
***P*-values were obtained with independent *t*-tests.

5 | DISCUSSION

The present study results demonstrate that the mean age of acute burns patients with COVID-19 was higher compared with acute burns patients with non-COVID-19. Acute burns occurred more frequently in COVID-19 patients with comorbidities compared with non-COVID-19 patients. Acute burns occurred more frequently in COVID-19 patients in summer and autumn but in non-COVID-19 patients in winter. 58.97% of COVID-19 patients and 55.42% of non-COVID-19 patients had grade II & III and II burns, respectively. TBSA of the burn, hospitalisation in the ICU, length of stay in hospital and ICU, the cost of hospitalisation, waiting time for the operating room, intubation, and mortality in-hospital were higher in COVID-19 patients compared with non-COVID-19 patients.

Findings indicate that the mean age of acute burns patients with COVID-19 was higher compared with acute burns patients with non-COVID-19. Also, acute burns occurred more frequently in COVID-19 patients with comorbidities compared with non-COVID-19 patients. Older patients were more likely to have acute burns, and it is clear that comorbidities were more common in them than in younger people. Previous evidence has shown that older people are more prone to burns than younger people.[56-58] Therefore, it is recommended to pay special attention to acute burn patients with COVID-19 who were older adults and those with comorbidities.

The present study results showed that acute burns occurred more frequently in COVID-19 patients in summer and autumn but in non-COVID-19 patients in winter. Previous evidence in this area is contradictory. A study in the USA[59] found that most burns occur in the spring. On the other hand, more burns can be expected in autumn because of drier climatic conditions in autumn. A study in Turkey[60] found that burns in military personnel were higher in the spring and summer because of the extended military training period on military fields, which can be associated with sunburn in soldiers. Discrepancies in the burn pattern in different seasons may be because of differences in climatic conditions, the amount of fuel used, the type of heating equipment and the fuel used, and the safety of heating devices in different countries.[59-61]

As presented in this study, 58.97% of COVID-19 patients and 55.42% of non-COVID-19 patients had grade II & III, and II burns, respectively. In general, the degree of a burn can vary based on variables such as type and severity of the burn, burn site, and demographic characteristics of patients such as age, sex, and comorbidity in different countries.[16,62-64] In the present study, TBSA of the burn, hospitalisation in the ICU, length of stay in hospital and ICU, the cost of hospitalisation, waiting time for the operating room, intubation, and mortality in-hospital was higher in COVID-19 patients compared with non-COVID-19 patients. However, previous evidence in this area was limited and contradictory.[65-69] Inconsistent with the present study's findings, a UK study[54] showed that no COVID-19-related mortality was reported in burn patients. Another study in Japan[70] found that in-hospital mortality rates were lower in burn patients with COVID-19 than in burn patients with non-COVID-19 (8.90% vs. 11.90%). Therefore, more studies are recommended to assess and compare acute burn patients' clinical features and outcomes with COVID-19 and non-COVID-19.

6 | LIMITATIONS

The present study had several limitations. In this study, the details of burn injury management, such as fluid administration and surgery, and adherence to suggested treatment were not examined. No hypotheses were developed before the study; therefore, the statistical significance and generalisability of the present study should be interpreted with extreme caution.

7 | CONCLUSION

Overall, the present study results delineate that acute burns occurred more frequently in older adult COVID-19 patients and those with comorbidities than in non-COVID-19 patients. Acute burns occurred more frequently in COVID-19 patients in the summer and autumn months but in non-COVID-19 patients in the winter. 58.97% of COVID-19 patients and 55.42% of non-COVID-19 patients had grade II & III and II burns, respectively. TBSA of the burn, hospitalisation in the ICU, length of stay in hospital and ICU, the cost of hospitalisation, waiting time for the operating room, intubation, and mortality in-hospital were higher in COVID-19 patients compared with non-COVID-19 patients. Therefore, it is recommended that health managers and policymakers develop a care plan to provide high-quality care to acute burns patients with COVID-19 in low-income countries.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the idea for the review, study selection, data extraction, interpretation of results, and writing of the manuscript. All authors read and approved the final manuscript.

FUNDING INFORMATION

There was no source of funding for this systematic review study.

CONFLICT OF INTEREST STATEMENT

The authors do not have potential conflicts of interest with respect to the research, authorship, and publication of this article.

DATA AVAILABILITY STATEMENT

The datasets used during the current study are available from the corresponding author on request.

ETHICS STATEMENT

The research was approved by the ethics committee of Guilan University of Medical Sciences, Iran.

ORCID

Mohammadreza Mobayen https://orcid.org/0000-0001-9317-4955
Hossein Torabi https://orcid.org/0000-0003-3600-4014
Parissa Bagheri Toolaroud https://orcid.org/0000-0002-3742-4021
Anoush Dehnadi Moghadam https://orcid.org/0000-0002-8408-2909
Mohammad Saadatmand https://orcid.org/0000-0003-3389-8374
Habib EslamiKenarsari https://orcid.org/0000-0002-7420-1994
Alireza Feizkhah https://orcid.org/0000-0003-0333-894X
Mohammad Javad Ghazanfari https://orcid.org/0000-0003-3555-6044
Joseph Osuji https://orcid.org/0000-0002-4916-1679
Pooyan Ghorbani Vajargah https://orcid.org/0000-0003-3365-2681
Samad Karkhah https://orcid.org/0000-0001-9193-9176

REFERENCES

1. Zeydi AE, Ghazanfari MJ, Panahi R, et al. Coronavirus disease 2019 (COVID-19): a literature review from a nursing perspective. *Biomedicine*. 2021;11(3):5-14.
2. Karkhah S, Ghazanfari MJ, Shamshirian A, Panahi L, Molai M, Zeydi AE. Clinical features of patients with probable 2019 novel coronavirus infected pneumonia in Rasht, Iran: a retrospective case series. *Open Access Maced J Med Sci*. 2020;8(T1):16-22.
3. Javadi-Pashaki N, Ghazanfari MJ, Miri S, Karkhah S. Decreased life expectancy among older people during the COVID-19 pandemic: a public health issue. *Jorjani Biomed J*. 2021;9(4):62-64.
4. Mobayen M, Ghazanfari MJ, Feizkhah A, Mobayen M, Zeydi AE, Karkhah S. Effects of COVID-19 pandemic on burns care. *Burns*. 2022;48:1020-1021.
5. Javadi-Pashaki N, Ghazanfari MJ, Karkhah S. COVID-19 pandemic: an opportunity to promote e-learning in the nursing profession. *J Clin Nurs*. 2021.
6. Ghorbani Vajargah P, Miri S, Ghazanfari MJ, et al. Effects of corona virus-2019 (COVID-19) pandemic on older people. *Gerontol Geriatr Med*. 2022;8:23337214221109822.
7. Ghazanfari MJ, Esmaeili S, Zeydi AE, Karkhah S. Moral distress among nurses during COVID-19 pandemic: challenges and coping strategies. *Nurs Open*. 2022;9(4):2227-2228.
8. Ghazanfari MJ, Karkhah S, Taghadosi M. Potential interactions between cardiovascular and Covid-19 medication regimens among patients with heart failure. *Pak Heart J*. 2022;55(1):92-93.
9. Miri S, Karkhah S, Ghorbani Vajargah P, et al. Ethical challenges and coping strategies about issues related to the healthcare system and social issues during the COVID-19 pandemic: a narrative review. *Jorjani Biomed J*. 2022;10(1):84-95.
10. Salimi R, Gomar R, Heshmati B. The COVID-19 outbreak in Iran. *J Glob Health*. 2020;10(1):010365.

11. Mahmoodpoor A, Sanaie S, Hosseini M-S. COVID-19 outbreak in Iran: lessons to learn, measures to take. *Disaster Med Public Health Prep*. 2021;1-2:1309-1310.
12. Burn E, Tebé C, Fernandez-Bertolin S, et al. The natural history of symptomatic COVID-19 during the first wave in Catalonia. *Nat Commun*. 2021;12(1):1-12.
13. Cho SI, Yoon S, Lee H-J. Impact of comorbidity burden on mortality in patients with COVID-19 using the Korean health insurance database. *Sci Rep*. 2021;11(1):1-9.
14. Lee SC, Son KJ, Han CH, Jung JY, Park SC. Impact of comorbid asthma on severity of coronavirus disease (COVID-19). *Sci Rep*. 2020;10(1):1-9.
15. Azzena B, Perozzo FAG, de Lazzari A, Valotto G, Pontini A. Burn unit admission and management protocol during COVID-19 pandemic. *Burns*. 2021;47(1):52-57.
16. Toppi J, Cleland H, Gabbe B. Severe burns in Australian and New Zealand adults: epidemiology and burn Centre care. *Burns*. 2019;45(6):1456-1461.
17. Mehrabi A, Falakdami A, Mollaei A, et al. A systematic review of self-esteem and related factors among burns patients. *Ann Med Surg*. 2022;84:104811.
18. Hosseini SJ, Firooz M, Norouzkhani N, et al. Age group as a predictor of the effect of virtual reality on pain management in burn retain-->patientsretain-->. *Burns*. 2022;49(3):730-732.
19. Miri S, Hosseini SJ, Takasi P, et al. Effects of breathing exercise techniques on the pain and anxiety of burn patients: a systematic review and meta-analysis. *Int Wound J*. 2022; n/a(n/a).
20. Farzan R, Moeinian M, Abdollahi A, et al. Effects of amniotic membrane extract and deferoxamine on angiogenesis in wound healing: an in vivo model. *J Wound Care*. 2018;27(Sup6):S26-S32.
21. Haddadi S, Parvizi A, Niknama R, Nemati S, Farzan R, Kazemnejad E. Baseline characteristics and outcomes of patients with head and neck burn injuries; a cross-sectional study of 2181 cases. *Arch Acad Emerg Med*. 2021;9(1):e8.
22. Kazemzadeh J, Vaghardoost R, Dahmardehei M, et al. Retrospective epidemiological study of burn injuries in 1717 pediatric patients: 10 years analysis of hospital data in Iran. *Iran J Public Health*. 2018;47(4):584-590.
23. Tolouie M, Farzan R. A six-year study on epidemiology of electrical burns in northern Iran: is it time to pay attention? *World J Plast Surg*. 2019;8(3):365.
24. Vaghardoost R, Kazemzadeh J, Dahmardehei M, et al. Epidemiology of acid-burns in a major referral hospital in Tehran. *Iran World J Plast Surg*. 2017;6(2):170-175.
25. Mobayen M, Farzan R, Dadashi A, Rimaz S, Aghebati R. Effect of early grafting on improvement of lethal area index (la50) in burn patients: a 7-year investigation in a burn referral Centre in the north of Iran. *Ann Burns Fire Disasters*. 2017;30(3):189-192.
26. Parvizi A, Haddadi S, Atrkar Roshan Z, Kafash P. Haemoglobin changes before and after packed red blood cells transfusion in burn patients: a retrospective cross-sectional study. *Int Wound J*. 2023; n/a(n/a).
27. Jafarizadeh H, Lotfi M, Ajoudani F, Kiani A, Alinejad V. Hypnosis for reduction of background pain and pain anxiety in men with burns: a blinded, randomised, placebo-controlled study. *Burns*. 2018;44(1):108-117.
28. Akhoondian M, Zabihi MR, Yavari S, et al. Radiation burns and fertility: a negative correlation. *Burns*. 2022;48(8):2017-2019.
29. Ghazanfari M, Mazloum S, Rahimzadeh N, et al. Burns and pregnancy during the COVID-19 pandemic. *Burns*. 2022;48:2015-2017.
30. Akhoondian M, Zabihi MR, Yavari S, et al. Identification of TGF-β1 expression pathway in the improvement of burn wound healing. *Burns*. 2022;48(8):2007-2010.
31. Akhoondian M, Zabihi MR, Yavari S, et al. Burns may be a risk factor for endometriosis. *Burns*. 2022;49:476-480.
32. Asadi K, Aris A, Fouladpour A, Ghazanfari MJ, Karkhah S, Salari A. Is the assessment of sympathetic skin response valuable for bone damage management of severe electrical burns? *Burns*. 2022;48(8):2013-2014.
33. Salari A, Fouladpour A, Aris A, Ghazanfari MJ, Karkhah S, Asadi K. Osteoporosis in electrical burn injuries. *Burns*. 2022;48(7):1769-1770.
34. Takasi P, Falakdami A, Vajargah PG, et al. Dissatisfaction or slight satisfaction with life in burn patients: a rising cause for concern of the world's burn community. *Burns*. 2022;48:2000-2002.
35. Zabihi MR, Akhoondian M, Tajik MH, Mastalizadeh A, Mobayen M, Karkhah S. Burns as a risk factor for glioblastoma. *Burns*. 2022;49:236-241.
36. Farzan R, Parvizi A, Takasi P, et al. Caregivers' knowledge with burned children and related factors towards burn first aid: a systematic review. *Int Wound J*. 2023.
37. Parvizi A, Haddadi S, Ghorbani Vajargah P, et al. A systematic review of life satisfaction and related factors among burns patients. *Int Wound J*. 2023.
38. Farzan R, Firooz M, Ghorbani Vajargah P, et al. Effects of aromatherapy with Rosa damascene and lavender on pain and anxiety of burn patients: a systematic review and meta-analysis. *Int Wound J*. 2023.
39. Miri S, Hosseini SJ, Ghorbani Vajargah P, et al. Effects of massage therapy on pain and anxiety intensity in patients with burns: a systematic review and meta-analysis. *Int Wound J*. 2023.
40. Farzan R, Ghorbani Vajargah P, Mollaei A, et al. A systematic review of social support and related factors among burns patients. *Int Wound J*. 2023; n/a(n/a).
41. Farzan R, Parvizi A, Haddadi S, et al. Effects of non-pharmacological interventions on pain intensity of children with burns: a systematic review and meta-analysis. *Int Wound J*. 2023.
42. Eftekhari H, Sadeghi M, Mobayen M, et al. Epidemiology of chemical burns: an 11-year retrospective study of 126 patients at a referral burn Centre in the north of Iran. *Int Wound J*. 2023; n/a(n/a).
43. Toolaroud PB, Nabovati E, Mobayen M, et al. Design and usability evaluation of a mobile-based-self-management application for caregivers of children with severe burns. *Int Wound J*. 2023; n/a(n/a).
44. Alizadeh Otaghvar H, Parvizi A, Ghorbani Vajargah P, et al. A systematic review of medical science students' knowledge and related factors towards burns first aids. *Int Wound J*. 2023; n/a(n/a).
45. Farzan R, Hosseini SJ, Firooz M, et al. Perceived stigmatisation and reliability of questionnaire in the survivors with burns wound: a systematic review and meta-analysis. *Int Wound J*. 2023; n/a(n/a).
46. Burns-Nader S, Joe L, Pinion K. Computer tablet distraction reduces pain and anxiety in pediatric burn patients undergoing hydrotherapy: a randomized trial. *Burns*. 2017;43(6):1203-1211.

47. van der Heijden MJ, de Jong A, Rode H, Martinez R, van Dijk M. Assessing and addressing the problem of pain and distress during wound care procedures in paediatric patients with burns. *Burns*. 2018;44(1):175-182.
48. Norouzkhani N, Arani RC, Mehrabi H, et al. Effect of virtual reality-based interventions on pain during wound Care in Burn Patients; a systematic review and meta-analysis. *Arch Acad Emerg Med*. 2022;10(1):e84.
49. Norouzkhani N, Ghazanfari MJ, Falakdami A, et al. Implementation of telemedicine for burns management: challenges & opportunities. *Burns*. 2022;49:482-484.
50. Yarali M, Parvizi A, Ghorbani Vajargah P, et al. A systematic review of health care workers' knowledge and related factors towards burn first aid. *Int Wound J*. 2023; n/a(n/a).
51. Al-Benna S. Inflammatory and coagulative pathophysiology for the management of burn patients with COVID-19: systematic review of the evidence. *Ann Burns Fire Disasters*. 2021;34(1):3-9.
52. Wrafter PF, Murphy D, Nolan P, Shelley O. Timing of COVID-19 vaccination in the major burns patient. *Burns*. 2021;47:1213.
53. Valente TM, Tiraboschi FA, Santos ÍSO, de Brito MEM, Valente TM, da Silva GPF. Burns and patients infected with COVID-19 at a burn treatment Centre in Brazil: a series of case-reports. *Int J Burn Trauma*. 2021;11(5):412-417.
54. Smith A, Miranda B, Strong B, et al. St Andrew's COVID-19 surgery safety (StACS) study: the Burns Centre experience. *Burns*. 2021;47:1547-1555.
55. Hesamirostami M, Nazarian R, Asghari H, et al. A case series of concomitant burn and COVID-19. *Burns Open*. 2021;5(1):34-38.
56. Albornoz CR, Villegas J, Sylvester M, Peña V, Bravo I. Burns are more aggressive in the elderly: proportion of deep burn area/total burn area might have a role in mortality. *Burns*. 2011;37(6):1058-1061.
57. Jeschke MG, Peck MD. Burn care of the elderly. *J Burn Care Res*. 2017;38(3):e625-e628.
58. Wang W, Zhang J, Lv Y, Zhang P, Huang Y, Xiang F. Epidemiological investigation of elderly patients with severe burns at a major burn center in Southwest China. *Med Sci Monit*. 2020;26:e918537-e918531.
59. Striplin R, McAfee SA, Safford HD, Papa MJ. Retrospective analysis of burn windows for fire and fuels management: an example from the Lake Tahoe Basin, California, USA. *Fire Ecol*. 2020;16:1-16.
60. Şengezer M, Selmanpakoğlu N, Duman H, Çetin C. Epidemiological analysis of burn injuries in Gülhane military medical academy Burn Center. *Turk J Plast Surg*. 2018;3(2):74-78.
61. Chang EJ, Edelman LS, Morris SE, Saffle JR. Gender influences on burn outcomes in the elderly. *Burns*. 2005;31(1):31-35.
62. Bailey M, Sagiraju H, Mashreky S, Alamgir H. Epidemiology and outcomes of burn injuries at a tertiary burn care center in Bangladesh. *Burns*. 2019;45(4):957-963.
63. Cheng W, Wang S, Shen C, Zhao D, Li D, Shang Y. Epidemiology of hospitalized burn patients in China: a systematic review. *Burns Open*. 2018;2(1):8-16.
64. McInnes JA, Cleland HJ, Cameron PA, et al. Epidemiology of burn-related fatalities in Australia and New Zealand, 2009–2015. *Burns*. 2019;45(7):1553-1561.
65. Demircan M. Increased admissions and hospitalizations to pediatric burn center during COVID-19 pandemic. *Burns*. 2021;47(2):487-488.
66. D'Asta F, Choong J, Thomas C, et al. Paediatric burns epidemiology during COVID-19 pandemic and 'stay home' era. *Burns*. 2020;46(6):1471-1472.
67. Farroha A. Effects of COVID-19 pandemic on burns epidemiology. *Burns*. 2020;46(6):1466.
68. Sethuraman U, Stankovic C, Singer A, et al. Burn visits to a pediatric burn center during the COVID-19 pandemic and 'stay at home' period. *Burns*. 2021;47(2):491-492.
69. Kruchevsky D, Arraf M, Levanon S, Capucha T, Ramon Y, Ullmann Y. Trends in burn injuries in northern Israel during the COVID-19 lockdown. *J Burn Care Res*. 2021;42(2):135-140.
70. Yamamoto R, Sato Y, Matsumura K, Sasaki J. Characteristics of burn injury during COVID-19 pandemic in Tokyo: a descriptive study. *Burns Open*. 2021;5(4):40-45.

How to cite this article: Mobayen M, Torabi H, Bagheri Toolaroud P, et al. Acute burns during the COVID-19 pandemic: A one-year retrospective study of 611 patients at a referral burn centre in northern Iran. *Int Wound J*. 2023;1-8. doi:10.1111/iwj.14199