

# Burns During Coronavirus Disease 19 Lockdown: a Multi-Center Retrospective Study in Israel

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The coronavirus disease 2019 (COVID-19) pandemic forced many countries into lockdowns to limit the spread of infection. Israel's containment measures included school closures, mobility restrictions, and workforce reductions. Our study evaluated the effect of COVID-19 on the occurrence and patterns of burn injuries. The study data was obtained via retrospective chart review of burn patients treated between March 15, 2020 and April 30, 2020, namely the period of strict national lockdown. This data was compared against data from paralleling periods between 2017 and 2019. A total of 686 patients were treated for burn injuries in the two study periods. Age group analysis revealed an increased ratio of pediatric patients aged 0–3 years during the lockdown (55.91% vs 40.79%,  $P = .002$ ). In contrast, there were fewer patients presenting with burn injuries in the 7–16 and 17–29 age groups (9.66% vs 3.15%,  $P = .017$ ; 16.46% vs 7.09%,  $P = .007$ , respectively). During both study periods, scald injuries were the most common burn etiology and burn injuries occurred most often at home. This predominance was further pronounced during the lockdown (71.65% vs 58.68%,  $P = .007$ ; 90.55% vs 74.60%,  $P = .0001$ , respectively). The lockdown period underlined the danger faced by pediatric patients in their household environment. This danger was possibly compounded by an improper level of adult supervision as parents transitioned to remote work. These findings can educate us about factors that render burn injuries more likely not only during lockdowns, but also during regular times, thus shaping the development of burn prevention practices.

In December 2019, an epidemic of viral pneumonia broke out in Wuhan, China, with rapid spread to other parts of the world. On January 30, 2020, the World Health Organization (WHO) declared it a pandemic.<sup>1,2</sup> The pandemic was caused by a novel coronavirus, named 2019-nCoV by the WHO. The disease associated with it was subsequently named coronavirus disease 2019 (COVID-19). Some of the symptoms more frequently reported include fever, fatigue, and dry cough. The disease may also be fatal.<sup>3</sup> In an effort to minimize social contact and contain the spread of infection, many countries implemented quarantines, lockdowns, and curfews.<sup>4</sup> In Israel, the first patient presenting with coronavirus was diagnosed on February 27, 2020, after having traveled from Italy to Israel. On March 14, 2020, with the number of cases increasing to 195, the Israeli

government declared a strict national lockdown, which included restrictions on movement, reduction of working capacity to 10%–20%, and educational system shutdown for all ages. This lockdown lasted from March 15, 2020 to April 30, 2020. Meanwhile, no restrictions were made with respect to seeking medical services.<sup>5</sup>

Burn injuries represent a major public health concern and are among the leading causes of morbidity and mortality in the East Mediterranean region.<sup>6</sup> In Israel, burns account for approximately 5% of all trauma admissions.<sup>7</sup> The field of burn epidemiology has been thoroughly studied, with multiple publications describing risks and temporal trends that may aid in injury prevention practices and staffing of burn services. And yet, some conclusions remain controversial. Namely, while some studies found correlations between burns and seasonality,<sup>8–12</sup> day of the week,<sup>13,14</sup> time of the day,<sup>15,16</sup> sex,<sup>17,18</sup> age groups,<sup>7,19,20</sup> among other factors,<sup>21,22</sup> others did not.<sup>23,24</sup>

In the present study, we examined temporal variation in cases of burn injuries treated at Israel's trauma centers during the COVID-19 outbreak and the subsequent lockdown. This is a unique situation in that not only did the pediatric population stay at home for extended periods of time, but they were not always supervised by an adult, as many parents had to continue working from home. The lockdown may therefore facilitate our understanding of the different circumstances that render burn injuries more likely, and become instrumental in developing educational and preventive strategies.

## METHODS

Data was obtained and analyzed for all patient admissions consisting of at least 1-day hospitalization at one of twenty

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trauma centers (including all six level I trauma centers) in Israel between March 15, 2020 and April 30, 2020. These dates mark the period during which the Israeli government implemented strict lockdown policies. The data collected from this time period was compared to data from paralleling dates between the years 2017 and 2019.

The data included in the study was retrieved from the Israeli National Trauma Registry (INTR), which is coordinated by the National Center for Trauma and Emergency Medicine Research at the Gertner Institute for Epidemiology and Health Policy Research, at Tel Hashomer. The data is comprised of demographic and clinical information, including etiology, prehospital care, depth and size of burn, emergency management, and acute and surgical interventions performed. Of note, the Registry does not account for patients pronounced to be dead at the scene or dead on arrival at the hospital.

Statistical analysis included a preliminary examination of the relationship between variables. The relationship between the dependent variables and independent variables was analyzed. Chi-square tests were used for group comparisons and binomial proportions test was used for proportions. A *P*-value of  $<.05$  was considered statistically significant. All statistical analysis was performed using the SAS Software version 9.4 (SAS, Cary, NC).

## RESULTS

Between March 15, 2020 and April 30, 2020, 127 burn patients were admitted to one of 20 trauma centers within Israel for at least one day of hospitalization (Table 1).

Male patients were more prone to burn injuries both during the studied and paralleling periods (64.94% vs 60.63%,  $P = .36$ ).

Pediatric patients (ie, under the age of 16) were more susceptible to burn injuries during the lockdown period compared to paralleling periods in 2017–2019 (69.29% vs 57.60%,  $P = .015$ ). Subgroup analysis revealed that children under 3 years of age were particularly susceptible on comparing the lockdown period to similar dates in 2017–2019 (55.91% vs 40.79%,  $P = .002$ ). Meanwhile, patients in the age group of 7 to 16 were less susceptible to burn injuries during the lockdown period compared to the 2017–2019 corresponding periods. (9.66% vs 3.15%,  $P = .017$ ).

Adult patients (ie, aged 17 and above), were less susceptible to burn injuries during the lockdown period compared to paralleling periods in 2017–2019 (30.71% vs 42.40%,  $P = .015$ ), particularly young adults between 17 and 29 years of age (16.46% vs 7.09%,  $P = .007$ ) (plotted in Figure 1).

The majority of hospitalized patients were Jewish, both during the lockdown and paralleling periods (59.93% vs 59.84%,  $P = .56$ ). Based on data from Israel's Central Bureau of Statistics, at the end of 2019, 6,772,000 (74.1%) of the general population were known to be Jewish.<sup>25</sup> Therefore, the ratio of Jews sustaining burn injuries was notably smaller relative to the non-Jewish population. Non-Jewish citizens constituted 40.07% of the burn patients despite constituting only 25.9% of the general population.

In terms of geographic regions, while the total number of patients sustaining burn injuries at the national level decreased,

the fraction of injured patients in Southern Israel increased (15.75% vs 8.77%,  $P = .0182$ ).

During both the lockdown and paralleling dates in 2017–2019, the most common etiology of burn injuries was scald injuries. This predominance increased even further during the lockdown period (71.65% vs 58.68%,  $P = .007$ ). The increase in burns caused by scalding was even more pronounced among women (84% vs 67.86%,  $P = .0245$ ). Meanwhile, the fraction of patients hospitalized due to fire injuries decreased (10.24 vs 17.89,  $P = .036$ ). No statistically significant change was noted as to the cause of burn injuries on subgroup analysis according to age ( $P > .05$ ).

Furthermore, the severity as well as area injured did not vary between the study periods. Namely, more than 76% of all admissions during both periods were burns of up to 9% of total body surface area (TBSA). The most commonly injured area was the torso during both periods (43.83% vs 42.52,  $P = .79$ ), and no change was observed with regard to the pattern of injuries during the studied periods,  $P > .05$  (Table 1).

The most common location where burn injuries were sustained was at home, a finding that was even more pronounced during the lockdown period (90.55% vs 74.60%,  $P = .0001$ ). The kitchen area was a common location of injury during both investigated periods (44.35% vs 46.52%,  $P = .67$ ). Meanwhile, there was no evidence of a statistically significant decline in the number of patients sustaining occupational burn injuries (5.51% vs 9.48%,  $P = .15$ ) (Table 1).

Additionally, the length of hospital stays did not significantly change between the two periods investigated, and most patients were hospitalized for up to 6 days (61.18% vs 59.06%,  $P = .097$ ). Only a minority of patients were admitted to the ICU in both periods (10.02% vs 10.24%,  $P = .94$ ), and most admitted patients did not require surgical interventions (89.8% vs 92.91%,  $P = .28$ ) (Table 1).

## DISCUSSION

Burn injuries are among the most common and devastating yet preventable injuries, placing patients at high risk for morbidity and mortality. Furthermore, these accidents have a large impact on caregivers and healthcare services.<sup>6,7</sup> Enhancing our understanding of and predicting the relationship between specific conditions and their susceptibility to burn injuries are essential to developing burn prevention practices and configuring burn units.

With the onset of the pandemic in December 2019, many countries went into lockdown with the aim of halting the spread of infection. The Israeli government issued strict lockdown measures on March 15, 2020, which included restrictions on mobility, school closures, and reduction in workforce to 10%–20% capacity. This nationwide lockdown, which lasted until April 30, 2020, allowed us to study burn etiologies in real-world settings, especially in a period that found many families unprepared both physically and emotionally. During that time frame, many parents had to adjust to working remotely while their children were at home due to schools being shut down.<sup>26</sup> It is therefore possible that parental supervision was reduced during the lockdown, leading to a rise in burn cases.<sup>27</sup> Perhaps, parents were distracted by the multitude of tasks at hand and struggled to keep track of their

**Table 1.** Characteristics of admitted burn patients

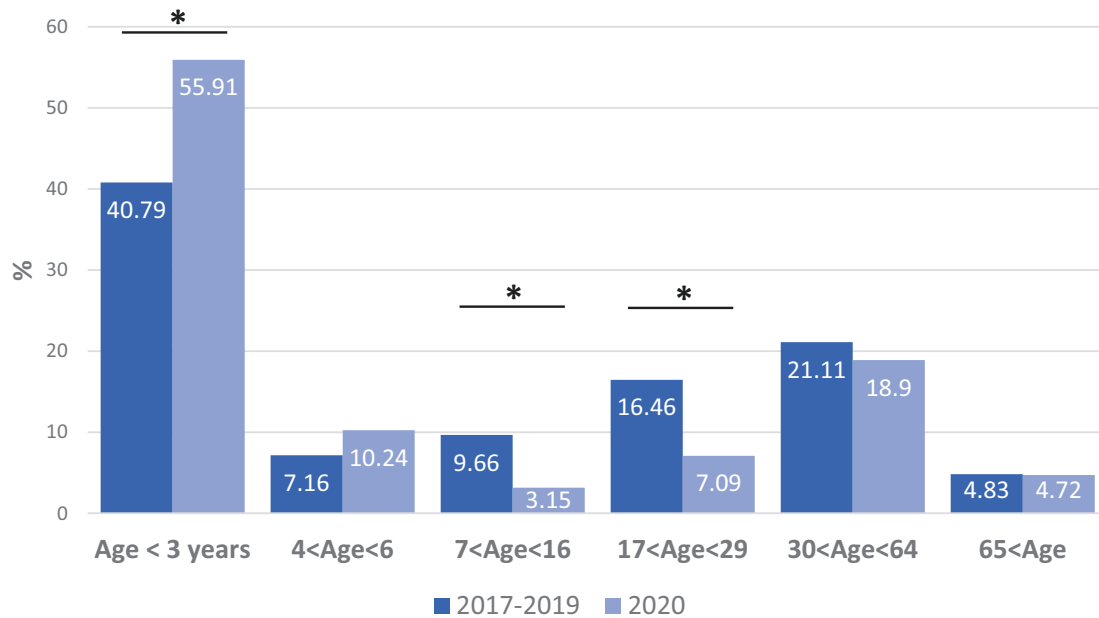
	2017–2019 Parallel Period Mean, N (%)	2020 Lockdown Period N (%)	P
Admissions			
Burn Patients	186 [Range 172–196]	127	
Sex			
Male	121 (64.94)	77 (60.63)	.36
Female	65 (35.06)	50 (39.37)	
Ethnicity			
Jewish	111 (59.93)	76 (59.84)	.559
Non-Jewish	75 (40.07)	51 (40.16)	
Age Groups			.0041
0–3 y	76 (40.79)	71 (55.91)	.002
4–6 y	13 (7.16)	13 (10.24)	.241
7–16 y	18 (9.66)	4 (3.15)	.0173
17–29 y	31 (16.46)	9 (7.09)	.0071
30–64 y	39 (21.11)	24 (18.9)	.5787
65+ y	9 (4.83)	6 (4.72)	.9599
Geographical Region			.0461
Center	106 (56.89)	71 (55.91)	.84
North	64 (34.35)	36 (28.35)	.195
South	16 (8.77)	20 (15.75)	.0182
Location			
Domestic	139 (74.60)	115 (90.55)	.0001
Kitchen	64.66 (46.52)	51 (44.35)	.678
Other Domestic	74.33 (53.48)	64 (55.65)	
Occupational	18 (9.48)	7 (5.51)	.1529
TBSA*, %			.8859
1 DEG	9 (5.01)	8 (6.30)	.5561
2/3 DEG 1–9%	134 (71.74)	91 (71.65)	.9853
2/3 DEG 10–19%	30 (16.10)	18 (14.17)	.5904
2/3 DEG 20+%	13 (7.16)	10 (7.87)	.7786
Injured Area†			
Head and Neck	70 (37.75)	55 (43.31)	.246
Torso	82 (43.83)	54 (42.52)	.788
Upper Limbs	65 (34.70)	50 (39.37)	.3215
Hand	43 (22.90)	27 (21.26)	.6903
Lower Limbs, <i>n</i>	63 (33.99)	38 (29.92)	.3797
Etiology			.0586
Chemical	13 (7.16)	10 (7.87%)	.7786
Contact	12 (6.44)	5 (3.94)	.2827
Fire	33.33 (17.89)	13 (10.24)	.036
Scald	109 (58.68)	91 (71.65)	.007
Other	19 (9.84)	8 (6.3)	
Hospitalization Period			
0–6 d	114 (61.18)	75 (59.06)	.0970
7+ d	72 (38.82)	52 (40.94)	
Operation Required			
Yes	19 (10.20)	9 (7.09)	.2833
No	167 (89.80)	118 (92.91)	

\*TBSA – total body surface area.

†Each patient may be injured in more than one area.

children’s activities and supervise them at all times. Moreover, some families could not afford to hire a babysitter or count on their children’s extracurricular activities since all in-person classes were shut down. Other solutions for childcare that

families used to rely on, such as the support of older relatives became irrelevant, given their age group’s high-risk profile for contracting COVID-19. The abovementioned situation was made even more complicated for parents who were classified



**Figure 1.** Distribution of admitted patients with burn injuries by age. \* $P < .02$ .

as essential workers, as they continued going in to work daily, sometimes without having the means for arranging proper supervision for their children. In some cases, children were left to be supervised by older, yet minor siblings.

During the lockdown period (March 15, 2020–April 30, 2020), 127 burn patients were admitted to one of Israel's 20 trauma centers for at least one day of hospitalization. Evaluation of age group susceptibility to burn injuries between 2017 and 2019 revealed a relatively higher incidence in younger children, especially among patients aged 0 to 3 years (40.79%), as supported by prior studies.<sup>7,19,20,28</sup> Throughout the lockdown, the occurrence of burn injuries in this same age group increased even further, a finding that was statistically significant (55.91% vs 40.79%,  $P = .002$ ). On one hand, this increase may be explained by the higher occurrence of cooking and dining activities during the lockdown period. In most cases, the household kitchen environment is not as well-suited for the prevention of burn injuries as supervised kindergartens, whose layout includes a kitchen area with restricted access as well as safe water temperatures at the basin.

While an increase in activities around the kitchen may represent one component of the increase in burn injuries in children between the ages of 0 and 3 years, an additional component is the developing curiosity that is typical of children in these ages. More importantly, there is an imbalance between the level of curiosity and the level of mental preparedness required for preventing and responding to accidents around the kitchen.<sup>29</sup> As previously reported in the literature, pediatric patients often sustain burn injuries from hot liquids when reaching up to an elevated surface such as the kitchen countertop or stovetop, or coming in contact with hot tap water when using a sink or showering.<sup>30–33</sup> Impetuous behavior or underdeveloped motor skills may render children more susceptible to kitchen-related accidents. All of these factors were further complicated by the need for supervision of children in these age groups, which may have been interrupted during

the lockdown as parents were now juggling multiple tasks, including working from home and looking after their children.

Meanwhile, adults above the age of 17 sustained less burn injuries during the lockdown period when compared to paralleling dates in 2017–2019 (30.71% vs 42.40%,  $P = .015$ ). Within the adult subgroups, young adults between 17 and 29 years of age were particularly less susceptible to burn injuries during the mandatory curfew relative to paralleling periods in 2017–2019 (16.46% vs 7.09%,  $P = .007$ ). As part of the lockdown, many of these individuals, who presumably used to work at places such as restaurants, pubs, stores, or factories, now had to stay home as these places had to close.

Further analysis of the adult and pediatric patient populations according to sex revealed a higher incidence of burn injuries among males during both the lockdown and the paralleling dates between 2017 and 2019 (64.94% vs 60.63%,  $P = .36$ ), a finding that has also been described in previous studies.<sup>17,31,34</sup> Male predominance when it comes to burn injuries is likely influenced by environmental, psychosocial, and socioeconomic factors.<sup>20</sup>

With regard to injury location, the fraction of burns occurring in the domestic environment significantly increased during the lockdown period (90.55% vs 74.60%,  $P = .0001$ ). This finding is consistent with prior studies, which showed that most burns, particularly among the pediatric population, occurred at a domestic environment.<sup>16,30,32</sup> This increase can be attributed to the stay home mandate for most of the population, the school shutdowns, and the workforce reduction during the COVID-19 lockdown.

When examining the different etiologies of burn injuries, we found scalds to represent the most common cause in both the lockdown period and paralleling periods. The fraction of scald injuries was significantly larger during the COVID-19 lockdown compared to the paralleling dates in 2017–2019 (58.68% vs 71.65%,  $P = .007$ ). This, along with the finding that burn injuries were more prevalent at the domestic environment, may underline the trend toward more in-home cooking

and dining activities as a result of the stay-home mandate. This is in contrast to regular times, when many meals take place at school, work, or restaurant. Meanwhile, burn injuries caused by fire decreased during the lockdown period as compared to paralleling periods (17.89% vs 10.24%,  $P = .036$ ). The larger diversity in etiologies of burn injuries identified for the 2017–2019 dates is consistent with previous studies.<sup>17</sup>

Analysis of the data according to geographical location revealed an increase in the fraction of burn patients in southern Israel (15.75% vs 8.77%,  $P = .0182$ ). This finding may be explained by the region's high prevalence of the Bedouin population, some of whom continue to live as semi-nomads to this day. As described in a previous study, this population constitutes approximately half of the burns in southern Israel.<sup>35</sup> The Bedouin population's socio-economic status is limited by their level of education and poor living conditions, which consequently places them at an increased risk for burn injuries. Specifically, their increased predisposition may be explained by the overcrowding that is characteristic of the Bedouin families, as well as the poor organization as it relates to cooking and heating. Of note, most of the daily life happens on the floor, and both hot beverages and cooking over an open fire are mainstays of the Bedouin cuisine, thus exposing children who play near the cooking space to scald injuries or burns caused by fire.<sup>36–38</sup> During the lockdown, this trend has likely been exacerbated since children spent an even larger amount of their time at an environment with numerous hazards for burn injuries.

Despite the difference in etiologies of burn injuries, there was no significant difference in the TBSA burned between the COVID-19 lockdown period and the paralleling periods in 2017–2019 ( $P = .89$ ). Similarly, the ratio of patients who required hospitalization for longer than 7 days (40.94% vs 38.82%,  $P = .0970$ ) and the fraction of patients requiring surgical intervention (7.09% vs 10.2%,  $P = .2833$ ) did not differ between the studied periods.

## STRENGTHS AND LIMITATIONS

This was a retrospective study of data collected from the INTR. Logic tests are built in the data entry software and therefore ensure standardization and uniformity of the data used. Furthermore, quality assurance was independently performed by the Gertner institute. However, data collected in the present study only accounts for hospitalized burns and does not take into consideration non-hospitalized burns. Despite this limitation, we believe that the trends observed in our study provide an important account of the studies phenomenon, as the TBSA burned and the severity of injury were not significantly different between the two study periods.

Despite the evident limitations, this study does provide an overview of burn admissions in Israel during a unique time period. Additionally, it may be used to further elaborate on the epidemiology of burn injuries within this geographical area.

## CONCLUSION

The COVID-19 outbreak and the subsequent lockdown allowed us to investigate the different causes and conditions that predispose to burn injuries during such unique and

unforeseeable circumstances. The present study demonstrated an increase in the ratio of burn injuries among infants and toddlers up to 3 years of age. In contrast, this ratio decreased among children between 7 to 16 years of age and young adults aged 17 to 29. Since younger children are already at an increased risk for burns in the domestic environment during regular times, the COVID-19 lockdown only aggravated this trend.

Furthermore, the study results pointed to a decrease in occupational injuries, which coincided with Israel's mandated workforce reduction. This finding is supported by the observation that adult burns are mostly workplace-related. Among children, particularly toddlers in the age group of 0 to 3, the lockdown period taught us that the domestic environment is not necessarily safe or well-suited for prolonged homestay when parental supervision may be lacking. Overall, the main etiology of burns in both studied periods was scald injuries. This incidence of scald injuries was even more pronounced during the lockdown period, possibly due to cooking and dining activities occurring more frequently. These results may improve our understanding of the inherent susceptibility of various circumstances to burn injuries, and likewise, assist us in developing burn preventive strategies, such as campaigns or guides that will instruct parents in the event of additional lockdowns or similar circumstances in the future.

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