

Admission Pattern of Burn Patients of Various Aetiologies in the Burn Unit of a Tertiary Care Hospital in COVID-19 and Pre-COVID-19 Period: A Retrospective Study

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ABSTRACT

Introduction: Worldwide the Coronavirus Disease-2019 (COVID-19) pandemic has brought with it many changes and challenges in the healthcare scenario. While restricted movement during the lockdown period had its effect in the reduction of outdoor burn incident such as industrial burn, overcrowding at residential units led to an increase in domestic burns.

Aim: To evaluate various changes in acute burns reflected in the admission pattern in a tertiary care hospital during pre-COVID-19 and COVID-19 period.

Materials and Methods: The present study was a retrospective observational study conducted in the burn unit of a tertiary care teaching hospital in Kolkata, West Bengal, India, from September 2018 to February 2020 (Pre-COVID-19) and March 2020 to August 2021 (COVID-19). Data of burns patients such as age, sex, aetiology of burn, mode of burn injury, percentage of body surface area involved, duration of hospital stay, number of patients undergoing surgical management, discharge, and death were reviewed and analysed using MS Excel and Z-test.

Results: There was a decrease in the admission rates in the COVID-19 period (462 v/s 317). Flame burn 43.51% v/s 48.26% ($p=0.67$); scald burn 38.10% v/s 41.01% ($p=0.19$); electric burn 15.8% v/s 4.73% ($p=0.00001$); chemical burn 2.59% v/s 5.99% ($p=0.0173$) for pre-COVID-19 v/s COVID-19 periods, respectively. The proportion of accidental burn injuries remained the same because of overcrowding at home (50.22% v/s 47.63%) ($p=0.477$) which was compensated by a decrease in workplace accidental burns during the lockdown period. The percentage of suicidal injuries had increased during the COVID-19 period (35.06% v/s 48.27%) ($p=0.00022$). The percentage of homicidal burn injuries had significantly reduced during COVID-19 time (14.72% v/s 4.1%) ($p=0.00001$). There was a statistically significant increase in the paediatric population of burn injuries during COVID-19 (35% v/s 62.7%) ($p=0.00001$).

Conclusion: Decrease in admission rates and comparable accidental flame and scald burn injuries and a drop in workplace burn injuries with women and children being the most vulnerable population.

Keywords: Coronavirus Disease-2019, Epidemiology, Pandemic

INTRODUCTION

The COVID-19 has been a global-scale pandemic that had an impact on the lives of every individual. It has impacted the health, lifestyle, social, and economic equilibrium of all nations. The hospitals and healthcare centres were affected in multiple aspects. The healthcare workers and administration had to find the balance between handling the massive load of individuals affected by the coronavirus while managing patients with other ailments and diseases. During the lockdown in the initial phase, hospital departments handling emergency cases such as burn unit were also affected. In India, from 3rd January 2020 to 9th December 2022, there have been 44,674,439 confirmed cases of COVID-19 with 530,653 deaths, reported to WHO [1]. In West Bengal, India, the first positive case of coronavirus infection was detected on 17th March 2020 when a student returned from the United Kingdom (Anandabazar Patrika, 17th March 2020) [2]. As on 15th January 2021, West Bengal had 564,032 COVID-19 cases and 10,023 deaths. COVID-19 cases and deaths were seen to be highly skewed in the spatial distribution in West Bengal, India [2]. This might have been due to population density, climate, exposure to malaria, and a weaker strain of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus [3]. West Bengal's population in 2022 is estimated to be 98.7 Million (9.87 Crores). The state is the fourth largest state according to population density with 1100 people per sq.km [4]. The assumption could be made that because of the overcrowding and cramped up

living conditions in West Bengal the lockdown period could have presented the unique situation of increased vulnerability to domestic burn injuries.

There had been four lockdowns periods in India from 25th March 2020 to 31st May 2020 [5]. The West Bengal government had decided to extend the coronavirus-induced restrictions till August 15, 2021 [6].

While the work place or industrial burn injuries might have reduced in incidence because of lockdown, demographics and the clinical pattern could also have changed in the pre-COVID-19 and COVID-19 period of the burn patients. This study attempts to compare these parameters in the burn patients that were admitted in the Burn Unit, IPGME&R, Kolkata in the Pre-COVID-19 time and during the lockdown COVID-19 period. While all the major government as well corporate Hospitals had turned into full-time COVID-19 care centres, IPGME&R, Kolkata had been the major Government Tertiary Care Centre to cater to the patients with other diseases, especially emergency burn unit. Therefore, this retrospective study was an attempt to evaluate the impact, COVID-19 had on the incidence and demographics and clinical profile of burn patients in West Bengal and the eastern zone of India as IPGME&R is the major tertiary care centre catering to the majority of burn patients in and around the region. The aim of the present study was to compare the admission rates and pattern of burn patients between pre-COVID-19 period

(September 2018 to February 2020) and COVID-19 period (March 2020 to August 2021).

MATERIALS AND METHODS

A single institute retrospective observational study was conducted where the medical records of the burn patients admitted to burn Unit, Department of Plastic and Reconstructive Surgery, IPGME&R, Kolkata were reviewed from periods of September 2018 to February 2020 (Pre-COVID-19) and March 2020 to August 2021 (COVID-19). The analysis of the data was done within two months after collecting medical record of the patients. Institutional Ethical Committee (IEC) approval was obtained (IPGME&R)/IEC/2022/290.

Inclusion criteria: Data of all the patients of acute burn injury of all ages admitted in Burn Unit, IPGME&R, Kolkata were included in the study.

Exclusion criteria: Records of patients with chronic and old burn injuries and chronic burn sequelae were excluded from the study.

The parameters assessed were age, special observation of proportion of the paediatric population, sex, number of admission in total between the two periods, aetiology of burn injuries, mechanism of injury, Percentage of Total Body Surface Area (%TBSA) involved, following conventional rule of 9, total number of patients discharged, mortality, hospital stay duration and the number of patients who underwent surgical procedures.

STATISTICAL ANALYSIS

All the quantifiable parameters were calculated as mean values. Statistical Analysis Software (SAS 9.4M7) was used. Z-test was used to determine the statistical significance while the confidence interval was placed at 95%. A p-value <0.05 was considered to be statistically significant.

RESULTS

A total of 779 patients' data was analysed from the periods of Sept 2018 to August 2021.

Of these, the total admissions in the pre-COVID-19 period were 462 burn patients and 317 patients were admitted in the COVID-19 period registering a drastic fall in admission in COVID-19 phase.

Aetiology of burn	Mean age in Pre-COVID-19 phase (in years)	Mean age in COVID-19 phase (in years)	p-value
Flame Burn	35.5±2.6	42.5±4.3	0.56
Scald	8.5±0.34	10.2±0.26	0.78
Electric	37.2±3.65	33.3±4.2	0.77
Chemical	7.8±0.53	6.5±0.38	0.52
All	17.8±4.36	22.5±3.30	0.50

[Table/Fig-1]: Distribution of mean age as per aetiology in pre-COVID-19 and COVID-19 period. (p-value was calculated using 'Z-test'. p<0.05 was considered significant)

Mean age of patients admitted during pre-COVID-19 time was 17.8 years as opposed to COVID-19 period was 22.5 years [Table/Fig-1].

There was a 17% increase in the percentage of female burn patients during COVID-19. The male v/s female patients in pre-COVID-19 times were N=197 v/s 265 and during COVID-19 it was N=79 v/s 238, respectively (p=0.00001). In pre-COVID-19 period 35% (N=160) of the burn patients were paediatric age group in and 62.7% (N=199) were found to be of paediatric age group in the COVID-19 period. This was statistically significant (p<0.00001).

There was no observable difference in the incidence of flame and scald burn aetiologies, incidence of electrical burn had significantly gone down during COVID-19 period [Table/Fig-2].

Aetiology	Pre-COVID-19 (n=462)	COVID-19 (n=317)	p-value
Flame burn	201 (43.51%)	153 (48.26%)	0.67
Scald burn	176 (38.10%)	130 (41.01%)	0.19
Electric burn	73 (15.80%)	15 (4.73%)	0.001
Chemical burn	12 (2.59%)	19 (5.99%)	0.0173

[Table/Fig-2]: Distribution of proportion of patients according to burn aetiology. (p-value calculated using Z-test. p<0.05 significant)

Mode of injury was analysed and it was found that while the proportion of accidental burns were similar in both COVID-19 and pre-COVID-19 period, the proportion of suicidal burn had

Mode of burn injury	Pre-COVID-19 (N=462)	COVID-19 (N=317)	p-value
Accidental	232 (50.22%)	151 (47.63%)	0.477
Suicidal	162 (35.06%)	153 (48.27%)	0.00022
Homicidal	68 (14.72%)	13 (4.1%)	0.00001

[Table/Fig-3]: Proportion of two populations based on mode of burn injury. (p-value calculated using Z-test. p<0.05 significant)

significantly increased during COVID-19 period. The proportion of homicidal burns had significantly reduced during COVID-19 period [Table/Fig-3].

Distribution of % TBSA	Pre-COVID-19 (Flame n=201) (Scald n=176)	Proportion of patients (%)	COVID-19 (Flame n=153) (Scald n=130)	Proportion of patients (%)	p-value
<40% TBSA	Flame 72 (35%) Scald 85 (48%)	41.6%	Flame 62 (40.5%) Scald 93 (71.5%)	54.8%	0.00084
40-60% TBSA	Flame 66 (32.8%) Scald 72 (40.9%)	36.6%	Flame 60 (39.2%) Scald 30 (23%)	31.8%	0.20054
>60% TBSA	Flame 63 (31.3%) Scald 19 (10.7%)	21.8%	Flame 31 (20.2%) Scald 7 (5.3%)	13.4%	0.00614

[Table/Fig-4]: Distribution of patients according to %TBSA burn in Pre-COVID-19 and COVID-19 Period. (p-value calculated using Z-test. p <0.05 significant)

The mean percentage TBSA of burn injury was 64.8% during pre-COVID-19 time and 53.5% during COVID-19 period. There was statistically significant decrease in the major >60% TBSA burn injury during COVID-19 period [Table/Fig-4].

Variables	Pre-COVID-19 (n)	COVID-19 (n)	p-value
Discharges	267 (57%)	169 (53.3%)	0.21
Deaths	195 (41.7%)	148 (46.6%)	0.214
Mean duration of hospital stay (days)	42.5±3.5	28.2±10.8	0.001
Surgical management (debridement and/or STSG)	197 (42.6%)	137 (43.2%)	0.872

[Table/Fig-5]: Proportion of discharge, mortality, surgical management, hospital stay. (p-value calculated using Z-test. p<0.05 significant)

It was found that the patients who underwent surgical management, discharge and deaths were comparable between the two periods. However, the mean duration of stay was found to be significantly less in the COVID-19 period (p<0.05) [Table/Fig-5].

DISCUSSION

The IPGME&R, Kolkata is a premier tertiary care centre that accommodates a high volume of burn patients of not just West

Bengal but also the surrounding territories. During the COVID-19 pandemic especially during the intense lockdown phase, there had been a dip in overall admission rates to the burn unit. The majority of burn patients come from remote areas, thus it can be assumed many might have not been able to reach the centre in time. The actual incidence may have been masked during COVID-19. As the result suggests, the number of patients admitted during the COVID-19 period were lesser (317) as compared to (462) pre-COVID-19 period. The incidence of chemical burn increased during COVID-19 (2.59% v/s 5.99%) ($p=0.0173$) due to carbolic acid which is commonly found in the rural household as a snake repellent. Operation theatres were fully functional during COVID-19. But the mean duration of hospital stay did significantly decrease during COVID-19 (28.2 days vs 42.5 days) as unnecessary overstay of patients was curtailed and many patients who turned COVID-19 positive had to be shifted to a COVID-19 facility.

In other similar studies, in the Vall d'Hebron University Hospital Burn Center in Spain the emergency department visits had decreased [7]. But the admission rates had increased during the COVID-19 period. No differences were found between the two periods in the proportion of patients that underwent surgical treatment. A statistically significant increase was noted in the rate of paediatric (aged 0-16-year-old) admissions during the COVID-19 period [7].

According to a study conducted in the current Institute by the Community Medicine Department in July-Aug 2008 it was found that the majority of the burn cases (61.4%) were accidental whereas suicidal and homicidal cases were 18.1% and 20.5%, respectively. According to the size 25.3% patients had 20%-39% of body surface burns and 21.7% had 80% or more burns [8]. These results are comparable with the pattern seen in the current study period of the pre-COVID-19 timeline as well as the COVID-19 period.

In another study carried out in Brazil, from December 2019 to June 2020, showed an increase in self-inflicted burn injuries during the pandemic period [9]. This was reflected in the current study also though statistically insignificant. The mean TBSA burned in the pre-pandemic period was 10.99% (from 1 to 65%), and 12.4% in the pandemic period (from 1 to 47%) [9].

In a study conducted in Turkey, it was determined that burn cases were reduced by half during COVID-19 compared to the previous two years. Despite the increase in the number of third-degree burns and surgeries, it was determined that the length of hospital stay decreased by an average of two-thirds [10].

A retrospective cohort study examined how the COVID-19 pandemic affected burn volumes and time to presentation. Admission volumes were 403 patients in the COVID-19 pandemic group compared to a mean of 429 patients in the non-pandemic group, which correlated to a 5.8% decrease in volume during the pandemic. The pandemic group showed an increase in time to presentation. There were higher rates of second/third-degree burns [11].

A 66% decrease in the number of adult burn patients ($p<0.0001$) was seen in another study. Among the paediatric population, no significant decrease was observed. Nonetheless, subgroups with higher susceptibility to burn injuries included children aged 2-5 years (56.3% vs 23.8%, $p=0.016$) and female patients from all paediatric age groups (57.1% vs 25%, $p=0.027$) [12].

Based on the Tokyo Burn Unit Registry it was found that there were fewer patients during the pandemic than in previous years. There were also more scald/contact burns in the upper extremity, fewer intended and assault injuries, shorter length of hospital stay, and lower in-hospital mortality. During the stay-at-home order, there

was an increased incidence of flame burns, inhalation injuries, and in-hospital mortality, as well as a higher TBSA of full-thickness burns [13].

In Galveston, Texas Medical Centre it was found that there was no significant increase in mortality between groups during the study period. However, there was a significant increase in infections, pneumonia, respiratory failure and sepsis in those with SARS-CoV infection ($p<0.05$), but there was no significant increase in ventilator management days ($p>0.05$). In terms of wound healing, patients with COVID-19 also experienced significantly more excision and grafting procedures and had a higher incidence of hypertrophic scarring ($p<0.05$) [14].

In Ankara Training and Research Hospital Burn Centre, Turkey the study suggested that gender, age, causes of burns, affected anatomical areas and application times did not differ before and after the COVID-19 pandemic [15].

The strength of this study was that though it is a single institute study, this institute was practically only major tertiary care Burn Unit catering to all burn patients of the region. Thus, this study sample is representative of the region.

Limitation(s)

This study took into consideration of the admitted burn patients only. Patients having minor burns injury who were treated at home or Outpatient Department (OPD) basis were not accounted in this study.

CONCLUSION(S)

COVID-19 had a profound effect on burn incidence in women and children. Through the COVID-19 lockdown phase, it was proved that overcrowded housing exacerbates the vulnerability to burn injuries. As for the future application of this study, findings should be able to guide further the Burn Prevention and Treatment Programs and to have a Central Burn Registry to keep track of burn patients, especially from the rural and far interior territories.

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