

## Student Corner

## Medico-Legal Review of Burns a Retrospective Study in Forensic Department of KEMU Lahore

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### Abstract

**Objective:** To analyze the demography, etiology and clinical features of burns reported at Mayo hospital; Lahore in 2019.

**Methods:** The data of this retrospective study were collected from the records of medicolegal clinic from January 2019 to December 2019, after approval from the institutional review board, and analyzed using SPSS v23. The difference of proportions between variables, was calculated by Pearson Chi-square test and Fischer Exact test at 95% confidence interval.

**Results:** present results showed that males (60%) were more affected. Most of the victims were toddlers and children (50%), followed by young adults (23%) and then elders (17%). Scald burns were the most commonly acquired type (57%), then dry burns (37%), and lastly electrocuted burns (6%). 70% of the cases had 10%-50% body surface area involved, 23% had less than 10% of the body surface consumed. 2nd degree burns were most prevalent (75.5%). 91% of the victims were conscious and vitally stable, and were presented to the hospital within 1 hour of the injury.

**Conclusion:** In view of the conducted research, it's evident that wet burn is the most prevalent type of burn, especially in children due to their mischievous behavior. Most of the cases are accidental.

**Keywords:** Burn, Medicolegal, Injury, Distribution

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### Introduction

In its medicolegal definition, Injury refers to any harm that is caused to a persons' physical, mental, reputational and financial well-being.<sup>1</sup> Abrasion, bruise, laceration, fracture, dislocation, incised wound, firearm wound, bomb blast wound and burn are common types of injuries.<sup>2</sup> Various types of cases are reported to a medicolegal clinic every day including fire-arm injuries, road traffic accidents, sexual assaults, domestic violence, criminal abortions, poisoning and intoxication, suicidal attempts, etc.<sup>3</sup> One of these is burn, harm to the skin or other body parts brought about by outrageous warmth, fire, contact with overheated objects, or synthetic substances.<sup>4</sup>

Burns are a worldwide general medical issue, representing an approximate mortality rate of 180,000 people per year. Most of these happen in the third-world countries and approximately 66% happen in the WHO African and South-East Asia districts. In well-developed countries, the mortality rate from burns has been diminishing, whilst the rate of pediatric death from burns is still

multiple times higher in under-developed as well as developing countries.<sup>5</sup>

In 1998, India was the only country on the planet where burns were categorized among the top 15 reasons for death.<sup>6</sup> Burns are still considered devastating in emergency medicine leading to physical and psychological disabilities.<sup>7</sup> In 2007, in Esteqlal Hospital of Kabul Afghanistan, burn cases were studied retrospectively through a survey of clinical records. Generally, the death rate was 28% with the pervasiveness of death among females (68%).<sup>8</sup> However, in a study carried out at Mayo Hospital Lahore, in 2018, studied burn cases showed a gender distribution ratio of 1:1. This study lacks the inference on the degrees of burn injuries.<sup>9</sup> According to a study in the UK, there are approximately 13,000 hospital reported burn cases and 300 yearly deaths in the UK, with a mortality rate of 2.31%.<sup>10</sup>

There are different types of burn according to the source that is causing them including thermal burns which are caused by excessively heated objects or fire itself,

chemical burns caused by any synthetic agent that is an irritant to the body tissues, or electrical burns caused by high or low voltage electric current.<sup>11</sup> Burns are also divided into wet burns and dry burns depending upon the causative agent. Wet burns also called scald burns are caused by hot liquids or acids. Over-heated solid objects or fire flames cause dry burns.<sup>12</sup>

Burns are also classified on the basis of the depth of the area consumed: First degree burns involve the burning of the epidermis or only the superficial layer of skin, second-degree burns involve the cases where the dermis or deeper layer of the skin is also burnt, third-degree burns are the most severe. These include injuries to both the layers of skin, sweat glands, hair, and underlying connective tissue.<sup>13</sup> To determine the mortality risk associated with a certain burn injury, the total surface area affected is a major criterion, as it is generally assumed that if 40% of the body surface is involved, death occurs invariably.<sup>14</sup>

The aim of this study is to determine the prevalence and demographic distribution of various medicolegal cases of burns, with a focus on degrees of burn in relation to the offending agents. Aim of this research was to study the prevalence of various types of burn in the year 2019, in the Forensic department of Mayo Hospital, Lahore.

## Methods

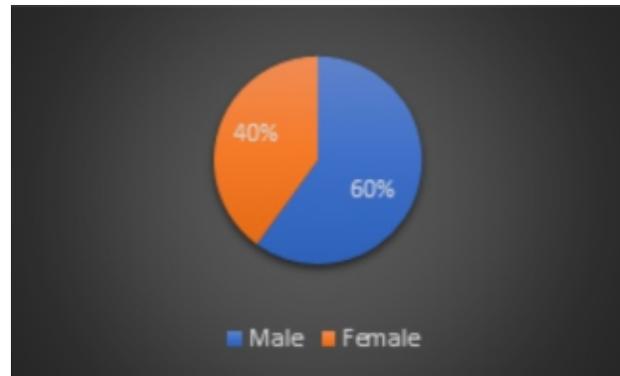
This is a descriptive observational retrospective survey that was carried out at the medicolegal clinic in the emergency department of Mayo Hospital, Lahore. The study includes the selective cases of burn from both genders and all age groups. The data collected is from January 1, 2019, to December 31, 2019. The sample size (n=535) is calculated through non-probability purposive sampling technique. The data is cross-tabulated quantitatively during the analysis. The study was approved by the institutional review board on March 3, 2020 via reference no. 185/RC/KEMU.

The parameters focused while analyzing the data were; gender distribution, age distribution, types of burn, degrees of burn, the general extent of the burn, site of burn on the body, manner of burn, suspected causative agents, the time interval between the incident and examination of the injury, consciousness and orientation status of the victims, and vitals of the patients.

The data was tabulated and then statistically assessed by means of the Statistical Package for Social Sciences (SPSS). Chi-squared test was used to analyze differences in numerical data and correlations are used to analyze the proportions between type, causative agents, and degree of burn.

## Results

A total of 535 medicolegal cases of burn was studied at the Forensic Department of Mayo Hospital Lahore. Majority of the victims were male (60%) and the female victims accounted to the remaining number of cases (40%) [Figure 1]. The ages of the victims were divided into 7 groups. Children (with age up to 16 years) were found to be the majorly affected group [Table 1]. The classification of burn into various types showed wet burn (n=304), dry burn (n=196) and electrocuted (n=35) [Figure 2].



**Figure 1:** Gender Distribution of Burn.



**Figure 2:** Type of Burn.

The distribution of the collected data, according to the degree of burn, showed most of the victims presented with second-degree burn (75.5%). The rest of the cases (22.8%) showed third-degree burns and a small ratio (1.7%) had first-degree burn [Figure 3]. In the studied medicolegal cases of burn, the most frequently burnt sites were extremities and trunk (33%) [Table II]. The causative agent involved in most of the victims (n= 222) was a hot liquid [Figure 4]. Chi-square test was applied between the types of burn and the degrees of burn and it was found significant, (p-value is 0.000 which is less than 0.05) implying that these variables are interdependent [Table III]. As different types of burn present with different depths and each type have strong relation with a particular depth in terms of degree of burns. For example, wet burns mostly present with second-degree, showing blisters and loss of skin function. The general

extent of the burn in the majority of the victims (n=371) was between 10-50%, <10% in 124 victims, and >50% in 38 victims [Figure 5]. A general physical examination of the victims showed that 475 victims (88%) were vitally stable. The rest of the victims were critical. 9% cases were presented in semiconscious state while 91% were conscious at the time of presentation to the clinic. While analyzing the manner of burn, it was observed that 97.8 % (n=524) victims were accidentally burnt, 1.7 % (n=9) were homicidal cases, and less than 1% (n=2) victims committed suicide. The topographical distribution and the socioeconomic status of burn victims identified from the occupation of the victims showed that 16% were reported from the rural areas of Lahore and 66 % were from urban areas of Lahore. While 18% were residents of districts other than Lahore. The time-lapse between the injury and arrival to the hospital in most of the cases was 1 hour, while the remaining victims showed up within an interval of 24 hours [Table IV].

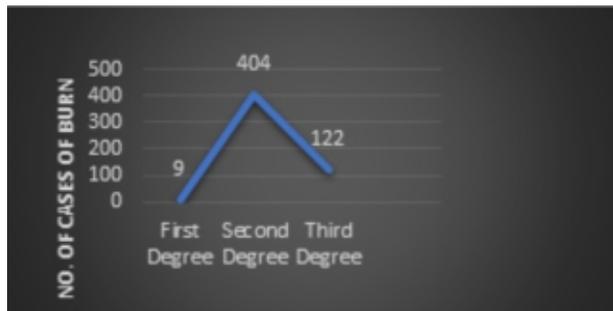


Figure 3: Degree Of Burn.

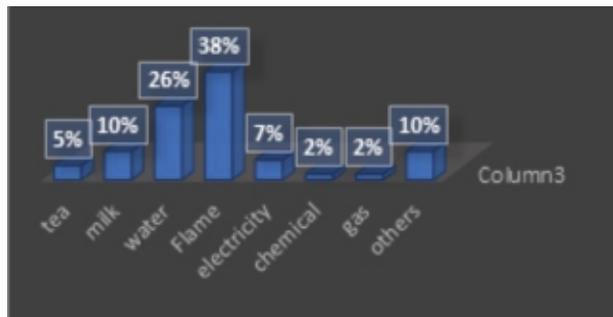


Figure 4: Causative Agents Of Burn

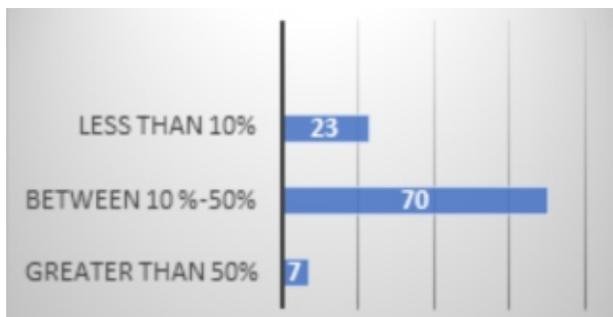


Figure 5: Percentage Distribution Of Burn

Table 1: Distribution of Burn Among Various Age Groups.

| Age group                      | Frequency  | Percentage  |
|--------------------------------|------------|-------------|
| Neonates and Infants (<1 year) | 44         | 8.2         |
| Toddlers (<3 years)            | 136        | 25.4        |
| Children (<16 years)           | 134        | 25.0        |
| Young adults (17-30 years)     | 122        | 22.8        |
| Middle-aged (31-45 years)      | 58         | 10.8        |
| Old-aged (>45 years)           | 33         | 6.2         |
| <b>Total</b>                   | <b>527</b> | <b>98.3</b> |

Table 2: Distribution of Burn on the Body

| The site on the body       | Frequency | %age |
|----------------------------|-----------|------|
| Face                       | 26        | 5    |
| Trunk                      | 32        | 6    |
| Extremities                | 117       | 22   |
| Both face and trunk        | 13        | 2    |
| Both face and extremities  | 74        | 13   |
| Both trunk and extremities | 178       | 33   |
| Whole-body                 | 95        | 19   |

Table 3: Degree Of Burn Cross-tabulated with Type of Burn.

| Type of burn | Degree of burn         |                        |                        | Total      |
|--------------|------------------------|------------------------|------------------------|------------|
|              | 1 <sup>st</sup> Degree | 2 <sup>nd</sup> Degree | 3 <sup>rd</sup> Degree |            |
| Wet          | 7                      | 263                    | 34                     | 304 (57%)  |
| Dry          | 1                      | 123                    | 72                     | 196 (37%)  |
| Electrocuted | 1                      | 18                     | 16                     | 35 (0.06%) |
| <b>Total</b> | <b>9</b>               | <b>404</b>             | <b>122</b>             | <b>535</b> |

Table 4: Interval Between the Incidence and Reporting of Burn Cases.

| Time interval   | Frequency | Percentage |
|-----------------|-----------|------------|
| Within 1 hour   | 424       | 79         |
| Within 6 hours  | 32        | 6          |
| Within 12 hours | 3         | 0.6        |
| Within 24 hours | 48        | 9          |
| After 24 hours  | 28        | 5.4        |

**Discussion**

Burns are one of the most common forms of accidents happening in under-developed as well as in developing countries, yet these are the least described entity. This study conducted at the medicolegal clinic of Mayo Hospital Lahore explains various aspects of burn injuries as well as their intensity as an issue. This study involves the observational analysis of 535 cases of burn, keeping in view different variables extracted from the data. The

prognosis and the mortality in the victims, however, is not known as the data is collected from the medicolegal clinic, not the autopsy lab. The study shows that the overall prevalence of burn has decreased from the last year, a reduction of about 100 cases is seen and most burn cases are presented during the winter season, as there is more use of warm beverages and heaters.<sup>9</sup>

Our study shows that there are more cases of burn among males (60%), most of them being laborers by occupation, burnt by a flame in the factory or at their other occupational sites. Females are 1.5 times less (40%) likely to be burn victims than males and are mostly affected with scald burns indicating the accidental spilling of a hot liquid during an ongoing kitchen activity, as most of the affected females are housewives. This (1.5:1) ratio of males to females is consistent with the studies conducted at the Baghdad Burn Hospital of Iraq in 2019.<sup>13</sup> A study conducted in China including the data from the years 2009-2018 also concluded that males are more inflicted with burns as compared to females.<sup>15</sup> One of the studies carried out at Greater Manchester also showed 1.5 times higher death rate of males than females, due to burn. However, the data of the previous year collected in our set-up showed the male to female ratio of 1:1. It showed that the number of female victims has declined 10% from the previous year.<sup>9</sup> Among children, it is noted that boys contract more burns than girls due to their impudence and hastiness.<sup>16</sup>

According to the data collected, the most commonly burnt age groups are toddlers (25.4%) and children (25%), with less than 16 years of age, these values are consistent with the results of the research conducted in the previous year, which says that more than 60% of the total studied cases consist of population under 10 years of age. (8) Moreover, it is noted that not only there is a greater frequency of childhood burns but also, the intensity of the burns is far greater in children than in adults, this observation is also explained by research conducted in northwestern Tanzania at Bugando medical center.<sup>17</sup> Children are usually burnt due to the carelessness of their guardians as most of the cases are of scald burn i.e., due to the spilling of boiling water, milk, or tea. Another cause may be the inability of the children to ascertain the hazards of playing with hot objects, restlessness, and insisting on carrying things that they cannot handle.<sup>18</sup> Pediatric burn is the most common cause of accidental child death. Burn by the same agent causes deeper and extensive damage in children due to their fragile skin and soft tissues.<sup>17</sup>

Another parameter of our study is the type of burn. Data analysis shows that the most common type of burn presented to the hospital is scald burn (57%). This is also in accordance with the record of the previous study

conducted in our setting that says that the scald burn consists of almost half (48%) of the total cases.<sup>9</sup> Most of them are caused by hot water, hot tea, and boiling milk, majorly victimizing the children and women. Dry burns (37%) are caused by flame and are much more prevalent in males than in females. The higher count of scald burn (56.1%) is also in accordance with the study that took place in Northwestern Tanzania.<sup>17</sup> The third type of burn by electrocution is also reported 6% of the total, which is again more seen in males and that too in children and young adults. The overall lower incidence of electric burns and their high prevalence in males is consistent with the study conducted in Southern Iran.<sup>19</sup>

The depth of burn varies with the type, extent, and source of the burn. 75.5% of the victims were of second-degree burn, which is different from the studies conducted in northern South Arabia where the first-degree burn was much more prevalent (71.1%).<sup>20</sup> The first-degree burn presents least to the hospitals in our environment because they are not severe and seldom need treatment. Victims below 16 years of age usually contract second-degree burns. While examining burn injuries, calculating the total area affected holds greater importance than estimating the depth of the burn. The distribution of burn on the body shows most commonly involved areas are the extremities and trunk (33%). The involvement of these areas is more prominent in toddlers and children. In extremities, hands are almost always involved irrespective of the type of burn, several other studies also support this result.<sup>18</sup> Adult males involve face and extremities as their dominant site of burn on the body, explained by their occupation i.e., labor. Subjects with electric burns show more hand burns than on any other site of the body indicating the contact as the trigger of electrocution.

It is seen that the people with low socioeconomic status are more affected, due to their under-privileged environment and lack of awareness in using preventive measures.<sup>18</sup> (14) Although most of the victims (66%) belong to the urban areas of Lahore, some of them (15%) are from rural backgrounds. Mayo Hospital, the largest hospital in upper Punjab, also receives cases from adjacent cities. Hence, 18% of the burnt subjects are from the neighboring cities of Lahore. Most of the patients (73%) reported to the hospital immediately after the incident. Six percent reported within 1 hour and another 6% reported within 6 hours of burn injury. 5% of the victims presented after 1 day of the injury. The immediate arrival to the hospital shows the awareness in public of the seriousness of the issue. It is also helpful in the treatment as early treatment of burn injury can both save the life and reduce the loss.<sup>21</sup>

## Limitations

This retrospective observational study carried out at the Forensic Department of Mayo Hospital, Lahore involves cases presented only to the emergency department of Mayo Hospital rather than the entire city. The studied cases do not involve the burnt patients from any mass disaster like a bomb blast, etc. Moreover, cases with incomplete information are also excluded. The study does not talk about the prognosis and the death rate of the burnt patients as the data is collected from the medicolegal clinic not from the autopsy suite.

## Conclusion

Burns are one of the most frequently presented complaints at the medicolegal clinic. Children (age < 16 years) are more commonly reported (more than 50%), with males being more affected than females in a ratio of 1.5:1. Scald burns are most prevalent (57%) with hot liquids being the major culprit (60%). Trunk and extremities are the most affected sites on the body (33%). Most burns are of 2nd degree, occupying less than 50% of the body in 70% of cases. Most patients are conscious (91%) and in a vitally stable state (88%) at the time of presentation to the hospital, usually reporting within an hour of injury (79%).

**Conflict of Interest:** None

**Funding Source:** None

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