Epidemiological aspects of burning in both outpatient and hospitalization settings; a cross-sectional study

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Introduction
Burn injury is a unique trauma with life-threatening events with high morbidity. Burn injury has been identified as an important public health problem (1,2). The overall incidence of burning has been estimated to be about 1% of burden of disorders and ranked as the fourth disabling injuries (3). It also consists of a majority of attendances to emergency wards (1). Burning not only can physically disable the patient in daily activities, but also may lead to severely impaired psychological conditions and social relationships (5-7). Several factors have been introduced to increase in the prevalence of burning and its severity including low socioeconomic level, illiteracy, and overcrowding (8-10). Regarding its related mortality and morbidity, the main factor predisposing the injured patients to death is infections by different bacterial species (11-15).

Objectives
Unfortunately the reported studies had been limited in terms of different epidemiological aspects of burning because of collecting data were retrospective or they are short-term studies with small sample sizes, or they are studies from industrialized populations (16-18). Therefore, data from the available studies cannot be extrapolated to whole of the world. Hence, the present study aimed to assess the epidemiological aspects of burn injuries in patients attended as outpatient or inpatient in an Iranian referral center.

Patients and Methods
Study design
This cross-sectional study retrospectively reviewed 1000 records of burn injuries including 890 outpatient records and 110 inpatient cases from April 2015 to March
2017. The study checklist was completed by reviewing the baseline characteristics including demographics (gender, age, education level and occupational status) and the information on burning injuries (zone of burning, degree and percentage of burning, etiology of burning, and time of burning).

**Ethical issues**

The research followed the tenets of the Declaration of Helsinki. To keeping ethical principles, names of the patients were not pointed in the checklists. Ethics approval was also obtained from Iran University of Medical Sciences and ethics committee (# IR.IUMS.REC.1394.9311223005). This study was conducted as a residential thesis of Mohammad Saeed Taheri in Iran University of Medical Sciences (Thesis# 2259).

**Statistical analysis**

For statistical analysis, results were presented as mean ± standard deviation (SD) for quantitative variables and were summarized by absolute frequencies and percentages for categorical variables. Normality of data was analyzed using the Kolmogorov-Smirnoff test. Categorical variables were compared using chi-square test or Fisher's exact test when more than 20% of cells with an expected count of less than 5 were observed. Quantitative variables were also compared with t test or Mann-Whitney U test. For the statistical analysis, the statistical software SPSS version 16.0 for Windows (SPSS Inc., Chicago, IL) was used. Accordingly, P values of 0.05 or less were considered statistically significant.

**Results**

The mean age of patients attended as outpatient and those who were inpatients was 31.15 ± 21.14 (range from 1 to 93 years) and 21.81 ± 20.94 years (range from 1 to 81 years) respectively. Half of the patients in both groups (52.1% and 55.6% respectively) were in the age range of 20 to 50 years. Regarding gender distribution, 55.1% in the first group and 51.0% in hospitalized patients groups were male.

In patients who attended as outpatient, the most common causes for burning was burning with boiling water followed by hot materials and hot foods (Table 1). In this group, the majority of burn injuries were categorized in second-degree burnings accounted for 89.6% of cases that mostly occurred at home. The frequency of first, second and third-degree of burning was 1.5%, 88.6% and 2.4% in men and 3.1%, 87.4%, and 3.6% in women without difference between the two genders (P = 0.95). Additionally, first, second and third-degree of burning were found in 1.7%, 88.5% and 2.1% in patients younger than 20 years, 3.3%, 89.4% and 2.1% in those patients ranged 20 to 50 years and 1.1%, 84% and 5.3% in those who older than 50 years with no difference between age subgroups (Table 2).

The mean percentage of burning was 2.95 ± 2.92% (2.87 ± 2.51%) in the patients younger than 20 years and 3.16 ± 3.35% in those who ranged 20 to 50 years that was the highest in the age range of 20 to 50 years. Additionally, the percentage of burning was 3.20 ± 3.17% in men and 2.64 ± 2.49% in women that was higher in men than in women (P = 0.002) (Table 3).

The most frequent zones of the body suffered from burning include upper and lower extremities (Table 1). In both genders, burning occurred mostly at home (75.6% in men and 89.2% in women, P = 0.001). Additionally, in all age subgroups, burning occurred mainly at home without difference between different age groups (Table 4). Burning also mostly occurred in the months of August (16.3%) and September (10.4%) (Figure 1).

In patients who were inpatient, the percentage of burnings were categorized as 1 to 9% in 34.0%, 10 to 19% in 31% and 20 to 29% in 12% of cases. The burning mostly involved upper extremities to wrist in 20.0% and then hands in 17.2% of patients. Burnings in hospitalized group occurred mostly in the months of March (14.0%) and June (11.0%) (Figure 2).

**Discussion**

Burning injuries are the common forms of trauma leading disabilities, morbidity and even mortality along with high financial load as well as psychological and behavioral problems (19). Establishing professional centers for
Epidemiological aspects of burning

Table 2. Mean degree of burning in outpatient condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>First-degree</th>
<th>Second-degree</th>
<th>Third-degree</th>
<th>First and second-degree</th>
<th>Second and third-degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>1.7%</td>
<td>88.5%</td>
<td>2.1%</td>
<td>4.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>20-50</td>
<td>3.3%</td>
<td>89.4%</td>
<td>1.9%</td>
<td>2.1%</td>
<td>2.1%</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>1.1%</td>
<td>84.0%</td>
<td>5.3%</td>
<td>4.8%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>3.6%</td>
<td>87.4%</td>
<td>3.1%</td>
<td>3.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Women</td>
<td>1.5%</td>
<td>88.6%</td>
<td>2.4%</td>
<td>3.3%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Table 3. Mean of burning in outpatient condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>2.87 ± 2.51</td>
<td>0.20</td>
<td>16</td>
</tr>
<tr>
<td>20-50</td>
<td>3.16 ± 3.35</td>
<td>0.20</td>
<td>39</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>2.49 ± 2.07</td>
<td>0.25</td>
<td>11</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>2.64 ± 2.49</td>
<td>0.25</td>
<td>25</td>
</tr>
<tr>
<td>Women</td>
<td>3.20 ± 3.17</td>
<td>0.20</td>
<td>39</td>
</tr>
</tbody>
</table>

Table 4. Place of burning in outpatient condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>Home (%)</th>
<th>Workplace (%)</th>
<th>Street (%)</th>
<th>Clinic (%)</th>
<th>Playground (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>91.6</td>
<td>2.1</td>
<td>5.2</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>20-50</td>
<td>75.0</td>
<td>12.0</td>
<td>8.7</td>
<td>0.4</td>
<td>3.1</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>86.2</td>
<td>2.1</td>
<td>8.0</td>
<td>2.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>75.6</td>
<td>11.4</td>
<td>9.7</td>
<td>0.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Women</td>
<td>89.2</td>
<td>2.2</td>
<td>4.9</td>
<td>0.9</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Another point in our study was the place of burning that was mostly happened at home which was comparable with a study conducted in northern Iran (21). In a similar study conducted in Bangladesh, 93% of burnings occurred at home especially among young children (33). Therefore, training the mothers for preventing these burnings among children to stay away from heating devices is very necessary for reducing the prevalence of burning among children.

In our study, the dominant cause for burning among outpatient settings was hot water and in hospitalized settings was acid-induced burning. In various studies, burning by hot water is the prominent cause among children in eastern regions of Iran (20,25,34). However the most common reason for burning among children in western Iran was burning with flames (35,36). In some countries such as Turkey, Bangladesh, and Southern Africa, the dominant cause for burning was flaming (37,38). It seems that the cause for burning is different in men and women while burning with hot water was more frequent in Turkish men (39), which was contrary with people of western Iran (40).
In our study, higher percentage of burning was found in middle ages when compared to older ones. Moreover, a direct association between age and degree of burning was found. In a similar study in Egypt (41), third-degree of burning was rarely found in children. Furthermore, among those who referred in outpatient settings, more appearance burnings were revealed in warm months. However, in hospitalized patients, burning occurred more in cold months. Interestingly, in some countries such as China, Hong Kong, or Egypt, burning was more seen in the cold season (42).

Regarding organs involved by burning, the extremities were more affected especially among children. However this predominance remained in higher ages. It was also found in other similar studies from different regions (43).

Conclusion
The efficiency of these findings can create opportunities for reducing the prevalence of burning and also control potential risk factors for burning leading decrease in costs of the management of burning. Moreover, our findings could be potentially influenced by cultural, social, economic, and geographical characteristics of each region.

Limitations of the study
Our study has several limitations; 1) having no intervention; 2) the type of cross-sectional study and 3) these results might not be valid for patients throughout the world.

Acknowledgements
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Authors’ contribution
MST and MV conceived the study and contributed reagents and tools. MST and KA performed the experiments. AM and AMJF analyzed the data and drafted the final manuscript. All authors read, revised, and approved the final manuscript.

Conflicts of interest
There were no points of conflicts.

Ethical considerations
Ethical issues (including plagiarism, data fabrication, double publication) have been completely by the authors.

Funding/Support
This study was conducted as a residential thesis of Mohammad Saeed Taheri in Iran University of Medical Sciences (Thesis# 2259).

References
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