EPIDEMIOLOGY OF SEVERE BURN INJURIES IN A TERTIARY BURN CENTRE IN TEHRAN, IRAN

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SUMMARY. The aim of the study was to examine the epidemiological characteristics of hospitalized burn patients in a tertiary burn centre in Tehran, Iran. A hospital-based cross-sectional study of all hospitalized patients with burn injuries was conducted in Motahari Burn and Reconstruction Center in Tehran from August to December 2010. Medical records of all hospitalized burn patients were reviewed and pertinent information was captured. A total of 135 patients with severe burns requiring hospitalization were identified during the study period (68.9% males, mean age 33 yr). The most common cause of burns was flammable materials/liquids (e.g. kerosene and gasoline) (56/135, 41.5%). Binary logistic regression analysis showed that sex (female) and total body surface area (TBSA) burned were the strongest predictors of survival in this cohort. Our findings showed that burn injury continued to be a significant public health problem in Iran, young people (26-35 yr) being the most affected. TBSA and sex (female) were found to be the most predictive factors of patient survival.

Keywords: epidemiology, burns, hospital, Tehran, Iran

Introduction

Injuries represent one of the most important public health problems in both economically developing and developed countries. Of the major types of injuries, burns cause more than 1% of the global burden of disease.1-3 Burn injury is a main cause of disability and mortality and has severe economic and social consequences. It can also lead to pain and somatic and psychological complications.

Iran has a very high incidence of burn injuries with a considerable related public health problem in terms of mortality, morbidity, and permanent disabilities.4-6 As the treatment of burn injuries may require months to years, with repeated intervening surgical procedures, it is obvious that burn injuries continue to constitute a notable medical, economical, and social challenge for a developing country such as Iran.1-3

The aetiological factors of burns vary in different countries. For planning and implementing prevention programmes, the epidemiological features of burn injuries should be determined country by country.1 Also, in order to be able to plan and evaluate any public health problem such as burn injury, continued surveillance is essential. This study was conducted to investigate epidemiological characteristics of severe burn injuries requiring hospitalization in one of the tertiary burn centres in Iran. The findings of this study will enhance our knowledge of current epidemiological conditions with a view to better planning and to providing more efficient solutions for the reduction of the incidence of this increasing problem.

Materials and methods

Patients and procedures

This is a cross-sectional hospital-based study conducted between August and December 2010 at Motahari Burn and Reconstruction Center, a tertiary burn care centre in Tehran, Iran. Motahari Burn and Reconstruction Centre is one of the few highly equipped tertiary burn centres in Iran, providing care to severely burned patients from the province of Tehran and to complicated cases referred from other centres across the country.

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The medical records of all hospitalized burn patients were reviewed by one of the authors (HMB). A data collection form was developed to capture information pertaining to age, sex, method of burning, dates of admission and discharge, total body surface area (TBSA) burned, degree of burn injury, length of stay (LOS), and patient outcome. The data collection form was first piloted on a small sample of cases and necessary revisions were made before being used in the study.

The study was approved by the Ethics Committee of Tehran University of Medical Sciences in Tehran, Iran.

Statistical analysis
The Statistical Package for the Social Sciences (SPSS) version 15.0 was used to conduct the analysis. The chi-square test was used to compare categorical data. We used the t test and analysis of variance (ANOVA) to compare the mean values of various continuous variables in different groups/categories. Also, a binary logistic regression model was used to examine the association between vital status (alive vs deceased) and other potentially associated factors such as the degree of burns, TBSA, LOS, age, and sex. The odds ratio and 95% confidence intervals were also calculated. The level of significance was set at 0.05.

Results
During the study period, a total number of 135 severely burn patients were hospitalized and treated at Motahari Burn and Reconstruction Center, of whom 93 were males (68.9%). The mean (± SD) and the median age of the patients were 33 (± 19.5) and 31 yr (range, 1-88 yr), respectively. Table I presents the distribution of patients by age and sex. The majority of the patients were in the 26-35 yr age group, followed by 16-25 yr. No statistically significant difference was found between the admission rates of males and females in the various age groups (p = 0.078).

The most common cause of burns was flammable materials/liquids (e.g. kerosene, gasoline, etc.) (56/135, 41.5%) followed by explosions (41/135, 30.4%). A statistically significant difference was found between age groups and the cause of burns, with scald injuries being more common among patients under 15 years (p < 0.001). Table II presents mean (± SD) age, TBSA, and LOS according to the cause of burn. In this study, statistically significant differences were found between mean TBSA and LOS with various causes of burns (p < 0.001).

The percentage TBSA ranged from 3-85%, with a mean and median of 31.2% and 28%, respectively. No statistically significant difference was found between mean TBSA in male and female patients (30% for males vs 33.9% for females, p > 0.05). However, a statistically significant difference was found in the mean value of TBSA in the various age groups (p = 0.005) (Table I). The duration of hospital stay ranged from 4-61 days with mean and median values of 20.2 and 18.0 days, respectively. No statistically significant difference was found in the mean values of LOS in the various age groups (p = 0.16) (Table I).

The case fatality rate in this study, 11.8% (16/135), was significantly higher among females than among males: 21.4% (9/42) vs 7.5% (7/93), p = 0.02. No patient died...
of scald injuries. Table III presents the mean age, TBSA, and LOS of the patients in relation to vital status. A statistically significant difference was found between mean TBSA and the patients’ vital status. Table IV outlines the results of a binary logistic regression analysis which shows that sex (female) and TBSA were the strongest predictors of poor survival in this cohort.

### Discussion

Burn injuries continue to be a major public health challenge in economically developing countries such as Iran.1-5 Previous studies from Iran have shown a male predominance ratio of burn injuries requiring hospitalization, which is consistent with our own findings.1,2 This may be attributed to the fact that men are at greater risk of work-related injuries, although we did not investigate this aspect in our study. It is important to bear in mind that studies focusing solely on suicide by burns in Iran have shown a female predominance, a pattern which is in contrast to the non-suicidal (‘general’) hospitalized burn patients we see in Iran.2,3,8

Our study showed that the frequency of burns was highest among patients aged 26-35 yr, which is consistent with the findings of other studies.1,2,10 The mean TBSA in our study was 31.2%, which is similar to other studies.1,7,9,10 However, it should be noted that some studies reported higher or lower mean values, which may be attributed to the particular institution’s admission policies, population under study, etc.

Our findings showed that children were at greater risk of scald burn injuries while adult-related burns were more likely to be due to flammable liquids, electricity, explosions, etc. These findings are consistent with those of other studies.1,3,7,10 Patients with scald burn had a lower mean TBSA than patients suffering from burns due to explosion and flammable liquids, which demonstrates the relationship between the type of injury and the percentage TBSA.

The case fatality rate in this study was 11.8%, which is higher than other studies from Iran.1,4,5,9,10 Most of the existing literature on burns in economically developed countries has shown that nosocomial infections are among the most common causes of mortality and morbidity among severely burned hospitalized patients.7,10 In Iran, Pseudomonas and Staphylococcus infections have been reported to be the most common micro-organisms. As the setting of our study is one of the largest tertiary burn centres in Iran, the following two factors may have contributed to this study’s high case fatality: 1) the clinically most complicated burn patients are hospitalized and/or transferred from other parts of the country; 2) the high incidence rate of nosocomial infections and antimicrobial resistance in various parts of Iran.9,10

Our binary logistic regression analysis showed that TBSA and sex (female) were the strongest survival predictors among hospitalized burn patients in this study. It is obvious that higher TBSA is associated with an unfavourable outcome among burn patients. Sex (female) was also found to be a poor prognostic survival factor. This may partially be explained by the fact that since the majority of suicide patients in Iran are women,2,3,8 the female sex may be at greater risk of airway burn injuries and of a higher degree of burn, along with higher TBSA (although we did not study this aspect). It is also important to consider that burns in females may be more common in the younger and older age groups, which places these categories to a greater risk of mortality.

This study has a number of limitations. Our findings may not be generalizable to the overall population of patients with burn injuries, given that this is a hospital-based study conducted in a tertiary centre. Also, because this was a retrospective study, some information, such as the mode of injury (suicide vs unintentional), was not captured, which may have limited our ability to explain some of the find-

### Table III - Mean age, TBSA, and LOS of the patients in relation to vital status

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>Mean age (yr) (± SD)</th>
<th>Mean TBSA (percentage) (± SD)</th>
<th>Mean LOS (days) (± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alive</td>
<td>119</td>
<td>32.97 (± 20.07)</td>
<td>26.82 (± 15.05)</td>
<td>20.75 (± 11.31)</td>
</tr>
<tr>
<td>Died</td>
<td>16</td>
<td>33.50 (± 14.53)</td>
<td>63.81 (± 19.68)</td>
<td>16.31 (± 9.35)</td>
</tr>
</tbody>
</table>

### Table IV - Survival predictive factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Wald</th>
<th>Odds ratio</th>
<th>OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>4.243</td>
<td>1.065</td>
<td>0.996-1.130</td>
<td>0.065</td>
</tr>
<tr>
<td>LOS</td>
<td>2.972</td>
<td>0.917</td>
<td>0.831-1.012</td>
<td>0.072</td>
</tr>
<tr>
<td>Cause of burns</td>
<td>0.168</td>
<td>0.752</td>
<td>0.192-2.944</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>3.620</td>
<td>6.477</td>
<td>0.013-0.826</td>
<td>0.032</td>
</tr>
<tr>
<td>Burns degree</td>
<td>0.005</td>
<td>1.021</td>
<td>0.568-1.837</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>TBSA</td>
<td>13.948</td>
<td>1.140</td>
<td>1.064-1.222</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
ings. Finally, in view of the rather small sample size, our findings should be interpreted with caution.

Conclusion

Our study showed that burn injury was still a significant public health problem in Iran and that people aged 26-35 yr were the most affected. TBSA and sex (female) were found to be the most predictive factors of patient survival. We believe that epidemiological studies such as this play an important role in the surveillance and monitoring of burn injuries in Iran. This kind of information will enable decision makers to plan and evaluate preventive measures.

L’ÉPIDÉMIOLOGIE DES BRÛLURES GRAVES DANS UN CENTRE TERTIAIRE DES BRÛLÉS À TÉHÉRAN, IRAN.

RÉSUMÉ. Dans cette étude les auteurs se sont proposés d’examiner les caractéristiques épidémiologiques des patients brûlés hospitalisés dans un centre tertiaire des brûlés à Téhéran, Iran. Dans un milieu hospitalier ils ont effectué une étude en coupe transversale de tous les patients atteints de brûlures hospitalisés auprès du Centre des Brûlés et de la Reconstruction de Téhéran d’août à décembre 2010. Les dossiers médicaux de tous les patients brûlés hospitalisés ont été examinés et les informations pertinentes ont été saisies. Au total, 135 patients atteints de brûlures graves nécessitant l’hospitalisation ont été individués et considérés au cours de la période d’étude (dont 68,9% hommes, âge moyen 33 ans). La cause la plus fréquente des brûlures a été matériaux / liquides inflammables, par exemple, le kérosène et l’essence (56/135, 41,5%). L’analyse de la régression logistique binaire a montré que le sexe (féminin) et le pourcentage de la surface corporelle brûlée (SCB) ont été les plus forts prédicteurs de survie chez cette cohorte. Nos résultats ont montré que les brûlures continuaient à constituer un important problème de santé publique en Iran et que les jeunes (26-35 ans) étaient les plus touchés. Les auteurs ont donc constaté que les facteurs qui offraient la prévisibilité la plus élevée pour ce qui concerne la survie des patients étaient le pourcentage de la surface corporelle brûlée et le sexe (féminin).

Mots-clés: épidémiologie, brûlures, hôpital, Téhéran, Iran

BIBLIOGRAPHY