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Original Article

Investigating the factors affecting the death rate of patients in the burn ward of Rasht city hospital in 2019-2020

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Abstract. Burn is the fourth cause of trauma worldwide (1-3) and as a major health challenges, it is one of the most common health related accidents in different societies (4). Burn is one of the important causes of injury in Iran and it is responsible for 6 percent of deaths in Iran, among all deaths caused by accidents (5). Data was obtained by reviewing the hospital documents of patients attending to Velayat Burn Hospital of Rasht from March 2019 till 2020, regarding the possible factors affecting death among burn patients. Data were then entered in SPSS 26 and the variants were analyzed by one sample t test and chi-square ($p<0.05$). There were 231 females (58.5%) and 326 males (41.5%) in our patients. The most common cause of burn was flame (49.4%). The most common area of burn was the upper limp (59.5%). The average percent of burn in patients was 23.41±19.17 %. Most of the patients (45.8%) were admitted between 5 to 10 days and most burns were in the winter (28.7%). The average blood glucose in patients was 113 mg/dl, average pH was 4.4, average BUN[1] was 19.6 mg/dl and average creatinine was 1.2±0.7 mg/dl. A significant relationship was found between self-immolation and neuropsychiatric diseases. Most common cause of death in patients was respiratory failure (54.1%). Inhalation burn injury was seen in 40 patients (7.2%) and self-immolation was 11 (1.97%) of patients. In the case of place of burn 459 patients were in home, 61 in work and 37 patients in other places. In all the patients, 47 (8.43%) were expired and 510 (91.75%) were rescued. According to current results, the most common cause of burn was flame and most common area was the upper limb. Most of the burns were in winter and a significant relationship exists between self-immolation and neuropsychiatric diseases. Most common cause of death in patients was respiratory failure. Lower pH and higher BUN had a significant relationship with death. Therefore, focusing on burn by hot liquids should be a priority in any of the high risk groups and prevention of burn and education of true usage of incendiary and hot devices and safety precautions, should be noted more than ever.

Keywords: Burn, mortality, cause of death

Introduction

Burn is the fourth cause of trauma worldwide [1-3] and as a major health challenges, it is one of the most common health related accidents in different societies [4]. Burn is one of the important causes of injury in Iran and it is responsible for 6 percent of deaths in Iran, among all deaths caused by accidents [5]. According to statistic in United States of America, in 2011 about 450 thousand patients (70% male, 30% female) visited to medical centers for burn treatment and mortality of thermal burns are 3500 persons annually [6]. Based on statistics of 2006 country report of recorded accidents by office of accident prevention of disease management of Iran Ministry of Health, burn consists 5% of all accidents recorded in country by the number of 56364 persons and is one of the important causes of injury in Iran by the incidence of 1 in 1000 people. Also it is responsible for 6 percent of deaths in Iran, among all deaths caused by accidents [5]. Burn is one of the most costly of diseases and its financial burden on patient, his or her family and the economy of the country has always been notable [7]. Other than the expenses of burn for the patients and the health system, burn is an irreparable event and has many physical mental and social complications; but in half of the cases, this event and its complications are preventable [7, 8]. More than 95% percent of deaths of burn are occurred in low to moderate income countries. In Iran burn is the 13th cause of morbidity in diseases by more than 200 thousand life years annually [9], hence studying the factors effecting the death caused by burn is of great importance. Therefore in this study, we intend to survey the factors, effecting the death of

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patients attending to the Burn ward of Velayat Hospital in Rasht in 2019-2020.

Material and methods:

This study was cross sectional in Velayat Burn Hospital of Rasht from March 2019 to 2020. Data was obtained by reviewing the hospital documents of patients attending with the diagnosis of burn. The documents were surveyed regarding the possible factors effecting on death. Inclusion criteria were patients with burn, attendance in burn wards (men, women, pediatrics, BICU) Velayat Burn Hospital of Rasht. Burn after trauma, incompleteness of documents and inaccessibility to the documents were the exclusion criteria.

Data Gathering

Data gathering was done by the checklist and all the variables including age, gender, level of consciousness at the time of attendance, percentage of burn, area of burn, length of hospital stay, external factor leading to burn and also burns caused by self-immolation, underlying disease, cardiac rhythm disturbance, vital sign disturbance, cause of death, electrolytes disturbance and other blood lab variables such as CBC, level of BUN, creatinine and glucose were obtained from the patients' documents and were recorded in the designed checklist.

Statistical Analysis

Data were entered in SPSS 26. Then for the description of the quantitative data, average and standard deviation and for the qualitative data, tables and charts were used. For the comparison between two groups, one sample t-test was used in quantitative variables and chi-square in qualitative ones. The p-value of less than 0.05 was considered statistically significant.

Results

In this study, 557 documents were surveyed. Demographic and clinical information of patient are included in Table 1. The average age of patients was 31±4.6 years. 326 patients (58.5%) were women and 231 patients (14.5%) were men. Independent t-test did not show significant age difference between men and women ($p>0.05$; Table 1).

The causes of burn are included in Table 2. Most of the burns were caused by flame which consisted 49.4% (n=275) of total burns, in 33.1% (N=184) of patients scald, in 7.5% (n=42) chemicals, in 5.8% (N=32) contact and in 4.2% (n=24) electrocution were the cause of the burn (Table 2).

Of the patients, 59.5% (n=332) had the upper limb burn, 49.1% (n=274) had lower limb, 36.7% (n=205) had head and face, 50.7% (n=283) had trunk, 13.1% (n=73) had genitalia and 7.5% (n=42) had whole body burn. Therefore, the most areas of burn are respectively the upper limb, trunk, lower limb, head and face, genitalia and whole body (Table 2). The average percentage of burn in patients was 23.41±19.17 %. In terms of the degree of burn, the most common type was the 2nd and 3rd degree together after that, 2nd, 3rd and 4th degree respectively (Table 3).

The length of hospital stay in respect to the prevalence were 5 to 10 days, 1 to 5 days, 10 to 15 days and more than 15 days (Table 4). Most of the burns occurred in winter and after that respectively in summer, autumn and spring (Table 2). The average blood glucose in patients was 113 mg/dl, average pH was 4.4, average BUN was 19.6 mg/dl and average creatinine was 1.2±0.7 mg/dl (Table 5).

Inhalation burn injury was seen in 40 patients (7.2%) and self-immolation was 11 (1.97%) of patients. In the case of place of burn 459 patients were in home, 61 in work and 37 patients in other places. In all the patients, 47 (8.43%) were expired and 510 (91.75%) were rescued.

More than half of the patients had some kind of underlying disease such as neuropsychiatric disorders, cardiovascular diseases, hypertension, diabetes, pulmonary diseases and gastrointestinal disorders. Also, from 16 out of 53 self-immolation patients had neuropsychiatric disorders. Ki-square had shown a significant relationship between self-immolation and underlying neuropsychiatric disorder ($p=0.04$; Table 6). The most common cause of death was respiratory failure and after that cardiac arrest, bradycardia and gastrointestinal bleeding respectively (Table 3).

In comparison of patient who died and who did not, the Chi-square analysis showed significant difference in cause of burn and length of hospital stay ($p=0.00$); in rescued patients hot liquid and in expired patients fire was the most important cause of burn. Also, the length of hospital stay in rescued patients was significantly higher in comparison to expired patients. The average percentage of burn in rescued patients was 44.68% and was 66.25% in expired patients, but this difference was not statistically significant ($p=0.31$). Data survey by independent t-test showed that in biochemical variables, lower pH ($p=0.00$) and higher BUN ($p=0.04$) were related to death, but no significant difference were seen in serum creatinine of rescued patient in comparison to expired patients ($p=0.41$). In table 7 comparison of biochemical variables such as blood glucose, pH, creatinine, and BUN, underlying disease, percentage and degree of burn, length of hospital stay, and area and cause of death, by mortality are shown (Table 7).

Discussion

Burn is one the most destructive injuries and is one of the major concerns of global public health [10]. More than 300,000 people die of burn annually and millions of people suffer from handicap and social, mental and economic disabilities of burn [11, 12]. Mortality rate of burn is variable in different age groups. For example, burn caused by fire is the 6th important cause of mortality in 5 to 14 year old people in low income countries [13].

Even though the average age of patients in the study by Abdulwahab [14] and Kadri [15] were 16.5 and 52.9 ± 18.1 years respectively, our findings were more consistent with results of Chorlip [16] which the average age was 35.6 ± 15.72. In our study, the average age of patients were 31 ± 4.6 years. It seems that this age group which is the most active age group and considered as the community's work force are more exposed to burn. Therefore, the immunity in work place in order to lower the burn related to different occupations could be an effective approach in lowering the burn injuries in this age group and could be important from the economic point of view.

In the study of Sharma et al. 46% of burn patients were

male and 54% were female [17]. Tabiee et al. [18] surveyed the epidemiology of burn in attended hospital in burn ward as a descriptive cross sectional study. Document of 342 patients were surveyed. The results of that study suggested that of total burn injured patients attending to the emergency ward, 55.6% were men. In our study, 231 patients (58.5%) were women and 326 patients (41.5%) were men.

In the study by Amani et al. [19], explosion and boiling water were introduced as the most common causes of burn. Statistical analysis of the study by Sharma et al. [17] suggested that burn with boiling water is an important risk factor for mortality. In the study of Kabirzadeh et al. [20], the most common external factor leading to burn (57.9%) were fuels such as oil, petrol and gasoline. Ibrahimian [21] suggested that most patients (32%) were in the age group zero to 9 years old and among them, 20.7% were burned by hot liquids and 52.1% by flaming oil and petrol. Moreover Berry et al. [22] suggested in their study that burning with flammable liquid were effective in mortality. In our study, burning with flame (275 patients (49.4%)) and hot liquids (184 patients (33.1%)) consisted the most common causes of burn. Hence, necessary education of parents and children should be conducted about burning with boiling water which could be due to overthrow of kettle, samovar and pot. Possibly, increasing the safety standards in gas burning devices by production companies and on the other hand, increased precaution of consumers could be effective in reducing the mortality from explosion.

In the study of Bhansali et al. [23], it was reported that whole body burn had a significant relationship with mortality (p=0.000). Also, Tarim et al. [24] studied on the factors influencing the mortality in burn patients attending in intrusive care unit and suggested that whole body burn was more common in expired patients [25]. Yen et al. suggested in their study that patients with whole body burn and inhalation burn injury have higher risk of mortality [26]. Study of Kasenda et al. at 2018 suggested that higher surface of burn and burn with boiling water are consistent with higher mortality [27]. In the current study, the most common areas of burn in patients were respectively upper limb, trunk, and lower limb. Head and face, genital area and whole body; in rescued patients, hot liquids and in expired patients, fire was the most common cause of burn.

Study of Bhansali et al. [23] suggested that the average length of hospital stay in burn patients were 5 days and there was a significant relationship between whole body burn and duration of hospital stay (p<0.001). The study of Kasenda suggested that the higher duration of hospital stay was correlated with higher mortality [27]. By assessing the electronic documents of burn patients, Cheung et al. suggested that duration of hospital stay was an effective factor on predicting mortality [28]. De Macedo et al. [1] suggested that lower hospital stay was consistent with lower mortality. In the current study, the duration of hospital stay was 5 to 10 days, 1 to 5 days, 10 to 15 days and more than 15 days in respect to prevalence.

William et al. [29] conducted a study on mortality of burn patients and reported that having diabetes, pulmonary disease and cardiovascular diseases were related to higher mortality rate. In the current study, expired patients were diagnosed with neuropsychiatric diseases, hypertension, diabetes, cardiovascular diseases, pulmonary disease, gastrointestinal disorders, stroke and cancer. Also, a significant relationship was found between self-immolation and neuropsychiatric diseases. Bolemsma et al. [30] reported in their study that the most common cause of death were multi organ failure (64.9%) and septic shock (45.9%). In our study, the most common cause of death was respiratory failure and after that cardiac arrest, bradycardia, gastrointestinal bleeding, and hypotension. It can be stated that with the underlying disease, the resistance of body in reduced and the mortality was increased.

Conclusion

According to the results of current study, the most common cause of mortality was flame and most common area of burn was upper limb. Most burns were occurred in winter and a significant relationship was found between self-immolation and neuropsychiatric disorders. The most common cause of mortality was respiratory arrest. Lower pH and higher BUN had a signification relationship with mortality. Therefore, focusing on burn by hot liquids should be a priority in any of the mentioned high-risk groups and prevention of burn and education of true usage of incendiary and hot devices and safety precautions, should be noted more than ever.

Conflict of Interest

The authors declare no conflicts of interest.

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