Original Article

An epidemiologic study of burns: Standards of care and patients' outcomes

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Abstract

Background: Many people suffer from burn injuries every year, and burns make the patients undergo surgeries and years of rehabilitation. Burns lead to more years of disability, compared to cancer or heart diseases. Epidemiologic studies are needed to reveal the span, impact, and related factors of burns to help take appropriate efforts to reduce its mortality and morbidity.

Materials and Methods: This study was conducted in two phases. The first phase was a descriptive retrospective study conducted on 836 burn patients who were admitted to the main special burn hospital of Isfahan, Iran. Data were collected from archived patients' files using a checklist approved by the faculties of epidemiology and nursing. In the second phase, a survey was done based on the professional task checklist of burn ward nurses to assess the fulfillment of each task by the nurses.

Results: Burns were found to occur more among those in the age groups of 20-30 (26.2%) and 0-10 years (22.9%). The most common causes of burns were flammables and gas explosions due to imprudence at home and workplaces, or self-infliction. Mortality rate was 21.7% due to sepsis, shock, and inhalation injuries, respectively. Nurses gave 19.78 out of 50 points (39.56%) to their performance in the prevention of sepsis.

Conclusions: Based on the findings of this study, it can be concluded that there is still an increasing need for safety education and using environmental safety measures, as well as developing high-quality methods to transport burn patients and administer care to decrease the mortality and morbidity associated with burns.

Key words: Burns, epidemiology, Iran, nurses, sepsis, shock

Introduction

In today's life, despite the recent advancements, notable risks yet threaten human beings, like the risk of burns which accounts for a high mortality in developed countries and leaves several people disabled.[1] Burn is an event that injures a huge number of victims each year and imposes irreplaceable physical, psychological, mental, economic, and social consequences, and even death. Burn patients need years of rehabilitation, surgery, and mental and psychological support.[2] They are affected by disability for a longer period, compared to those with cancer and cardiovascular diseases.[3] Generally, 19,500 cases of burn events occur annually in the world, of which over 95% happen in less-developed countries.[4] Burns are the sixth cause of mortality in Iran, as about 50,000 people suffer from burns in a year of whom 2600 develop acute complications and need critical care.[5] Therefore, burn injuries are among the most important hazardous events for health system in Iran.

There are five basic and important key points in the management of hazardous events, including epidemiological studies, prevention, injury biomechanism, treatment, and rehabilitation. Measurement of distribution and frequency of the events and diseases is among the most important parts of an event or disease epidemiology as through interpretation of epidemiological data, the etiological factors of a hazard or disease and the individuals exposed to them are detected. In this way, the health status of a society is determined and preventive strategies are developed. Consequently, the needed programs are planned to achieve the final goal of public health promotion. In recent years, numerous efforts have been made to prevent burns, such as conducting epidemiological studies, by which necessary interventions are purposefully administered in the treatment of burns.[6,7] Precise epidemiological information is needed for provision and equipment of burn centers, as well as

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for proper planning to prevent burns and reduce their complications and mortality.

Through adequate necessary information, the financial and human resources that are required are specified and a more effective effort is made to improve the condition. This study aimed to analyze epidemiological data of burns in Isfahan province. It includes measurement of distribution and frequency of various factors related to burns, such as etiological causes of burns, and detection of the resulting mortality. As nurses play a major role in this part, the second part of the present study investigates the level of administration of nursing professional tasks in relation to burn patients to detect the existing defects in patients' care, as well as nurses' educational needs. As Imam Mosa Kazem burn hospital is the only center in Isfahan province and many other neighboring provinces, the data of the present study can be an appropriate source for detection of burn problems. Due to the relatively high mortality associated with burns, our obtained results can play a role in prevention of such a problem and its complications, as well as in the establishment of burn care centers.

Materials and methods

This is a two-part study. The first part is a descriptive retrospective study that was conducted on all hospitalized patients in pediatric, men, and women burn wards, and ICU1 and ICU2 burn wards of Imam Mosa Kazem burn hospital from April 2009 to April 2010. There were 2355 hospitalized patients. After reviewing their medical files regarding their etiology and related ward, those referring to the reconstructive surgery ward or those with no etiology of burns were excluded. Finally, 836 patients' files with burns as the chief complaint were reviewed by census sampling. Associated variables of the study were extracted from patients' files through a checklist whose content was modified and confirmed by experts of burns and epidemiology in Isfahan University of Medical Sciences. All patients' files contained similar forms and notes for measurement of patients' burns through rule of nines.[8]

Finally, the data were analyzed by SPSS and the results were extracted in the form of chart and diagrams. The second part of the study used a questionnaire, which, based on a checklist of nurses' professional tasks in burn wards, introduces 27 duties of nurses concerning primary assessment, hypovolemic shock, inhalatory burns, sepsis, pain, psychological problems, nutrition, rehabilitation, team work, and information records. It has been prepared by the nursing association and approved by the Ministry of Health, and is the only existing reference for burns standard care in Iran. It was designed through search of related resources.[9] The questionnaires were distributed among 50 hospital nurses to score each item of care from 1 to 10. Then, the care was categorized into 10 general domains and the mean of each domain score was calculated, and the level of administration was investigated for each item of care.

Results

About 59.69% of the patients were male and 40.31% were female, and 50.40% were married and 49.60% were single. The highest percentage of patients were in the age groups 20-30 years (20-26%), 0-10 years (22.90%), and 10-20 years (17.50%). About 25.64% were homemakers. Children and workers had the highest hospitalization rates (16.93% and 16.32%, respectively). The patients were referred from 16 provinces in Iran, with the highest number of patients from the provinces of Isfahan, Charmahal Bakhtiari, Lorestan, Khozestan, Kermanshah, and Ilam. About 0.12% of the patients were referred from Iraq. About 28.98% of the patients were from rural areas and the rest of them were from urban areas. About 88-99% of the patients were Iranians and 0.12% were non-Iranians. The highest percentage of medical insurance programs covered by the patients was for rural area insurance (28.98%) and social security (28.86%), and 15.96% of the patients had no medical insurance coverage. The highest number of burns occurred in winter (29.11%), summer (26.57%), spring (23.31%), and fall (21.01%), and in the months of July (10.87%), February (10.39%), January (9.42%), and March (9.30%). The lowest number of burns occurred in November (6.04%), April (6.52%), and September (7%). Numerous factors caused burns, including inflammable materials (24.06%), gas explosion (23.94%), and scalds (21.02%).

Concerning the etiology of burns, 59.33% of the burns occurred at home due to neglect, which had the highest frequency. This was followed by occupational burns (23.85%) and self-inflicted burns (9.09%). The upper limbs, lower limbs, trunk, face, and genital area were the most burned body parts. Hospitalization period in the ward varied from 1 to 101 days. About 73.92% of the patients were discharged after a recovery period, 21.77% expired, 4.19% left the hospital without a discharge order, and 0.12% were transferred to other medical centers for further medical interventions. The highest mortality occurred among the individuals with burn percentages of 80-90%, 60-70%, and 40-50%, respectively. All the patients with 100% burns expired. The major cause of morality in women and men burn wards and ICU1 and ICU2 was septicemia, and in the pediatric burn ward, it was hypovolemic shock. In women and men burn wards, inhalation burns were the second cause of mortality after septicemia, while in ICU1 and ICU2, hypovolemic shock was the cause of mortality after septicemia [Figure 1].

In the second part of the study, the level of nursing professional task administration was investigated in the burn wards and its results have been presented in Table 1. Based on the results presented in the table, the lowest percentage of professional physical care was administered for sepsis. Psychological problems were the least cared.

Discussion

Most of the burns in the present study had occurred in subjects less than 30 years of age, which is consistent with the report of Koushyar *et al.*, in which 60% of the burns were reported in individuals less than 30 years of age,[2] and Sotoodehnejad *et al.*, in which over 90% of the burns had occurred in people over 40 years of age.[10] In a study conducted in the Eastern Mediterranean region in 1997-2007, one-third of the burns had occurred in people less than 5 years of age.[11] This reveals that most of the burns had occurred in children, adolescents, and young adults, which is consistent with the present study. The present study revealed that burns are more prevalent in female homemakers, children, and workers, which agrees with the findings of Samimi *et al.*, who reported most of the burns in children,[12] and Pishnamazi, who reported burns to be more prevalent in female homemakers and workers.[5] It can be concluded that children, female homemakers, and workers in the Iranian society are at a higher risk of burns.

The present study showed that burns occur commonly in people from urban areas than from rural areas, which is consistent with a study conducted in Sari that reported the incidence of burns to be more in urban areas.[13] Meanwhile, our obtained results are not in line with the studies conducted in Yasouj and Zimbabwe which reported the burns to be more prevalent in rustic people.[14,15] After all, it seems that the incidence of burns in rural and urban areas is different in different societies, which needs further studies, but may be due to the difference between rural and urban areas. In the present study, the incidence of burns was found to be more in summer and winter as well as in the months of July and February, compared to other seasons and months of the year. The prevalence of burns was also found to be less in fall, which is not in line with another study conducted in Iran that reported the highest prevalence of burns in fall.[1] Therefore, it can be concluded that acute burns, which result in hospitalization, have almost the same prevalence in all months and seasons of the year and are not associated with a specific month or season.

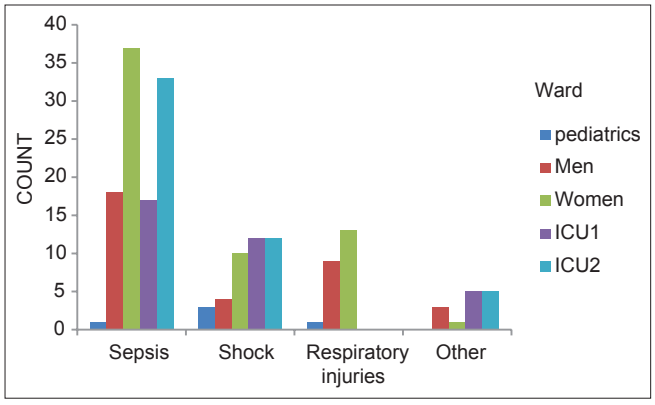

Figure 1: Causes of death in various wards

Concerning the etiology of the burns, the most reported causes were flammable materials (kerosene, gasoline, gas oil, thinner, and alcohol), gas explosion, scalds, and flame, which is consistent with the results of two Iranian studies reporting the most prevalent causes of burns in men as oil and its products, in children as scalds, and in women as flame.[8,16] A literature review of South Asian countries has reported the use of kerosene as the most prevalent cause of burns in these countries, which was also reported in the present study as one among the main factors.[17] With regard to the findings of the present study and other studies, it can be concluded that although the causes of burns are known and several, the people are not cautious and ignore the safety instructions and standards in the use of flammable and explosive materials. Unintentional burns at home and work, and self-inflicted burns were the most prevalent causes of burns in the present study. Other studies in Iran reported almost similar results, which include a study conducted in Kerman that reported 85% of burn cases occurred at home of which 4% were self-inflicted.[8] Another study in Mashhad reported at-home and self-inflicted burns to be the most prevalent causes of burns (57%).[2]

In the present study, the mean percentage of the burned area was found to be 31% and the mean percentage of

Table 1: Mean scores of various aspects of burn care, maximum possible score of each aspect, and percentage of implementation (based on nurses' answers)

	Shock	Respiratory injuries	Primary assessment	Teamwork	Sepsis	Pain	Psychological problems	Nutrition	Rehabilitation	Documentation
Mean score	40	11.68	22.38	9.86	19.78	6.3	2.28	18.96	8.3	5.16
Maximum possible score	70	20	30	20	50	10	10	30	20	10
Percentage of implementation	57.14	58.40	74.60	79.30	39.56	63	22.8	63.20	41.50	51.60

the burns that resulted in patients' expiry was found to be 51.3%, and patients' mortality was 21%. In a study conducted in Tehran, Iran, the mean percentage of burns resulting in death was reported as 52.3%.[18] In Isfahan, the mean percentage of burns was reported as 33.9% and the mean percentage of burns leading to death was reported to be 69.5%.[19] In studies conducted in France and Turkey, the mean percentages of burns were reported to be 30% and 31.2%, respectively, and the mortalities were reported as 39% and 33.5%, respectively.[20,21] These findings showed that mean burn percentages are almost the same in the studied countries, but the mortalities are different, which is possibly due to the difference in care, treatment, and following the standards. High mortality rate of burns can be due to resistance of bacteria, septicemia, and inappropriate routine care. The most prevalent causes of mortality were septicemia and hypovolemic shock in the present study. Studies conducted in Urmia and Rasht also reported septicemia as the most prevalent cause of mortality due to burns. The causes that ranked second were burn severity and inhalation burns in these two cities, respectively.[22,23]

In the second part of the present study, the nurses themselves reported that they do their tasks concerned with septicemia more carelessly than the other tasks. In this regard, more education and managerial interventions are needed. Therefore, by following sterile techniques while conducting procedures, detecting the bacteria that are resistant to antibiotics and disinfecting the environment, isolating the patients, and following standards in patients' transfer and care, the mortality due to septicemia and even early complications of burns can be prevented to a large extent.

The results of the second part of the study showed that in the viewpoints of nurses, the interventions associated with prevention of hypovolemic shock formed the second major care that was not administered properly in the care of acute burns. One of these important interventions in the burn patients is fluid therapy during their transfer, which, if conducted appropriately, can lower mortality and complications in these patients.[24] Reports have suggested that the process of transfer of burn patients should be performed by trained staff with appropriate equipments through an efficient coordination between the cent ers in such a way that the center admits the patient in less than 4 h after burn to prevent complications like hypovolemia, hypoxia, and hypothermia.[6] As hypovolemic shock was the most common cause of death in pediatric age group in the present study, it can be concluded that children are more vulnerable to dehydration.

So, the treatment team should administer precise fluid therapy, and in the first few days after burn, give more intensive care to these patients. Patients' transfer from distant areas to the hospital in the first few hours after burn and losing the golden time for fluid therapy can be the other causes of hypovolemic shock.

Conclusion

Based on the findings of the present study, with an emphasis on prevention, public education and increasing public knowledge about burns can be achieved through Iranian national TV and radio. Education and training ministry, with the cooperation of fire brigade organization can conduct firefighting and other related workshops.

In addition, the Ministry of Oil and Gas and the National Standards Organizations can reduce the burn events by improving the quality and supervising the safety of the products under their coverage. Burn patients are hospitalized for a long time which leads to their disappointment and high financial burden. They also need reconstructive and plastic surgeries, rehabilitation, and physiotherapy due to the deformity of their limbs and face, which are all costly for both the patients and the hospital. Therefore, the government, authorities, and the charities stakeholders should help these patients with their treatment costs, like in the case of an organization helping patients with chronic disease s. As already mentioned, one of the determining factors in prognosis of burns is infection.

Therefore, the committees of periodic infection control assessment in the hospital are suggested to inspect the bacteria that are resistant to routine antibiotics. With regard to the results of the second part of the study, it is suggested that the burn ward nurses be taught continuous educational courses on the prevention of septicemia and psychiatric nursing care given to the burn patients. We hope the present study can help the Ministry of Health, and treatment and burn clinics and hospitals.

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