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Original Article

Factors affecting mortality in burn patients in the poorest region of Iran; a case control study

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Abstract: Background: Burns is one of the most important health issues as well as the most expensive injuries that take place at all ages. It also considers a disaster for society, family, and person. The aim of the study was to examining fatal burns and associated factors' in burn unit patients in Iran. Methods: A case-control study was carried out in the poorest region of Iran. The research population consisted of all patients in a burn unit in Zahedan public hospital during 2013-2018. Using systematic random sampling method, 430 persons (215 dead persons, 215 released persons) were entered into the study. The data form and SPSS software were used for data gathering and the data analyzing, respectively. Results: About 41.4% of dead patients were at the age of 25-44 and 60.5% of dead patients were women. Also, 96.3% of expired patients were on level 3 burns. The cause of the burns in 46% of death was flame, oil, and gasoline. Moreover, there is a significant relationship between burns and the age, gender, residence place, history of the previous disease, the cause of burns, burns percentage and the burn level in both case and control group. Conclusion: In the poorest region of Iran, younger (as the labor force) and women were at high risk of death due to burn. Developing gas infrastructures in this region could decrease the incidence and severity of burns.

Keywords: Mortality, burns, iran

Introduction

Burns is a type of skin injury caused by heat, chemical, friction or radiation and is considered as a beginning of a disaster for society, family and person [1, 2]. Burns and injuries resulting from it are one of the most important health issues as well as one of the most expensive injuries that take place at all ages [3, 4]. This complication is one of the most causes of death and disability in the world which leads to the increasing death in the world and has increased from 280000 in 1990 to 338000 in 2010 [5, 6]. Burns in the United States are the third cause of death after accidents and drowning as well as the sixth cause of death in Iran [7]. According to the statistics in the United States, there are about 2 million burns incident takes place annually from which 3000 persons die and in Iran, there are about 724000 burns from which 2920 die [8, 9].

Everyday burns threaten humans in different forms; in such a way that the most important of them in terms of incident causes consist of thermal, chemical or electrical burns, burns with boiling water, oil, steam, and hot thing, respectively [10, 11]. The results of different studies have shown that factors such as age, social support, and education, social, emotional and economic status are effective in the incident of this injury [12]. Factors that increase burns mortality include self-burning, burning rate, and inhalation waste; in such a way that the considerable number of burns and the death resulted from it are related to fire [13, 14]. The existed data of burns inpatient in all over the world show that the incidence of burns due to fire and boiling water was about 0.1 to 0.3 and for self-burning with fire and boiling water is 3 to 10 percent. The average level of the burned body in the fire attack or boiling water is about 20 percent [15]. In general, 95

percent of deaths resulted from burns took place in low and moderate income countries which because of lack of access to specialized care, more complications, disability and mortality of the victims in these regions threaten the victims [13]. In developed countries, smoking and alcohol are the main cause of conflagration in homes. For example, smoking alone is responsible for 28 percent of fatal burns in the United States [16].

So, for proper and successful planning, in order to prevent burns and reduce its complications and mortality resulted from it, it is essential to have accurate information about burns epidemiology. By having required and enough information, it is possible to allocate the material and human resources as well as make more effective efforts to improve the situation [13].

It is necessary to identify the factors associated with fatal burns and also present it in order to improve the performance of burn unit of hospitals as well as take preventive measures to prevent or reduce the death of these patients in the society. And since so far a study with this title has not been conducted in Zahedan, a study was carried out with the aim of examining epidemiological fatal burns and factors associated with it in burn unit patients in a public hospital in Zahedan during 2013-2018.

Methods

A case-control study was done on burned patient between 2013-2018 in a hospital in Sistan and Baluchestan province (as the poorest region of Iran). In this study, the entry criterion was the medical profile of the patients who were afflicted with burns at all ages and the exit criterion was an incomplete medical profile of the patients who were afflicted with burns and had no complete access to the information they needed.

The required sampling size was determined using the following formula and considering a confidence level of 95 percent. Thus, 215 dead persons were estimated for the case group and 228 released persons were calculated for the control group (the difference in the number had been due to the use of systematic random sampling method). Considering that the frequency of self-burning in the study carried out by Amir Alavi et al. under the title of "Epidemiology and burns consequences in patients afflicted with burns in Gilan Province" was about 0.5, it was used as the considered p in the sampling size formula.

$$n = (z_{1-\alpha/2}+z_{1-\beta})[p_1(1-p_1)+p_2(1-p_2)]/(p_1-p_2)^2$$

$$n = 7.8*[.21+.2059]/(.7-.29)^2 = 200$$

$\alpha = .05$; $Z_{1-\alpha/2} = 1.96$; $\beta = .2$; $Z_{1-\beta} = .84$; $P_1 = .7$; $P_2 = 0.29$.

In this study, the medical profile of patients was studied by systematic random sampling. Out of 2062 cases of burns patients, 1631 patients were released and 431 of patients died. Considering that the sampling size was 200 persons in each group, the released and dead persons in each year separately were identified with the fitness table. In order to select the profiles of dead patients, the ratio of the number of the dead persons in each year was used on the obtained sampling size for the dead persons in the same year which the ratio for the dead persons was estimated to 2. And the profiles were selected every two in a randomly systematic way and the data were extracted. Furthermore, to select the profiles of the released patients the ratio of the number of released patients in every year was used on the obtained sampling size for the released patients in the same year which was estimated 8 for the released patients. Thus the profiles were selected every eight and the data were extracted and SPSS software and chi-square test were used.

Results

In this study, 41.4% of the dead burn patients were at the age of 25-44. Most of the dead patients were women (60.5%) and married (53%). Most of the dead patients lived in the urban area (76.3%) and had previous disease history (89.3%). According to the results, there is a meaningful relationship between burns and the variable of age and gender of the studied patients in case and control group ($P = 0.000$). There is also a meaningful relationship between burns and patients' residence place in case and control group ($P=0.048$). There is a meaningful relationship between burns and the history of the patient's previous disease in case and control group ($P=0.034$) (**Table 1**).

In this study, 60.5% of the dead burned patients had burn percentage of more than 80. Most of

Table 1. Frequency distribution of burns according to the demographic variables in case and control case groups at burn unit patients in a public hospital at Sistan and Baluchestan

Variables		Discharge		Dead		Total		*P*-value
		Number	Percent	Number	Percent	Number	Percent	
Age	≤5 years	54	23/7	8	3/7	62	14	0/000
	6-14 years	22	9/6	13	6	35	7/9	
	15-24 years	44	19/3	85	39/5	129	29/1	
	25-44 years	88	38/6	89	41/4	177	40	
	≥45 years	20	8/8	20	9/3	40	9	
Gender	Male	135	59/2	85	39/5	220	49/7	0/000
	Female	93	40/8	130	60/5	223	50/3	
Marital Status	Single	127	55/7	101	47	228	51/5	0/066
	Married	101	44/3	114	53	218	48/5	
Place of resistance	Town	191	83/8	164	76/3	355	80/1	0/048
	Village	37	16/2	51	23/7	88	19/9	
Previous disease history	Yes	216	94/7	192	89/3	408	92/1	0/034
	No	12	5/3	23	10/7	35	7/9	

Table 2. Frequency distribution of burns according to burn variables in case and control case groups at burn unit patients in a public hospital at Sistan and Baluchestan

Variables		Discharge		Dead		Total		*P*-value
		Number	Percent	Number	Percent	Number	Percent	
Burn percent	19 per ≥	105	46/1	4	1/9	109	24/6	0/000
	20-39 per	73	32	7	3/3	80	18/1	
	40-59 per	29	12/7	30	14	59	13/3	
	60-79 per	12	5/3	44	20/5	56	12/6	
	80 per ≤	9	3/9	130	60/5	139	31/4	
Burn level	Level 2	127	55/7	8	3/7	135	30/5	0/000
	Level 3	101	44/3	207	96/3	308	69/5	
Burn type	Thermal	207	90/8	191	88/8	398	89/8	0/497
	Non-thermal	21	9/2	24	11/2	45	10/2	
Burn reason	Gas explosion	76	33/3	52	24/2	128	28/9	0/000
	Self-immolation	9	3/9	55	25/6	64	14/4	
	Flame, oil and gasoline	77	33/8	99	46	176	39/7	
	Boiling water	53	23/2	4	1/9	57	12/9	
	Others (electricity, acid, etc.)	13	7/5	5	2/3	18	4/1	

the dead patients were on level 3 burns (96.3%). Most of the dead burn patients had a thermal burn (88.8%). Besides, most of the dead patients had afflicted with burns by flame, oil, and gasoline (46.0%). According to the results, there is a meaningful relationship between the cause of burns and the variable of burns percentage, burns level and the cause of burn (P = 0.000) (**Table 2**).

Discussion

The findings showed that most of the dead burn patients were at the age of 25-45. According to the results, there is a meaningful relationship between age and burns in case and control group. 41.4% of dead burn patients were at the age of 25-44. This issue may be due to the high risk occupations and their risk taking activities in this age group. Although, Asfhan Sharqi in his study has demonstrated that people under the age of 10 years had the most mortality rate [17], in Vasei et al.'s study in the United States, children and young adults were more afflicted with burns than the other age groups [48]. While in the group et al.'s study in Kurdistan, children, and adolescents accounted for 58 percent of the injured people [45] and most of

the mortality rates in Gilan in the study done by Amir Alavi was reported in elderly [32].

According to finding, most of the dead patients were women (60.5%). According to the results, there is a meaningful relationship between gender and burns in case and control group. Furthermore, in the studies done in Kurdistan [45], Shiraz [46], Pakistan [47], Zimbabwe [48] women had included most of the burn patients, too. This may be due to the fact that women are at more exposure to flammable factors than men, they also do not have enough information about the proper use of oil products, there is no protection of petroleum products, as well as most families resident in Zahedan, do not have gas pipelines; and since a capsule is used in most homes to cook, these factors can be a risk factor for women. Sheikh Azadi in Tehran [13], Kai Yung in Chia [49] and Amir Alavi in Gilan [32] reported burns ratio in men more than women. While in the study of Amir Alavi et al., there was not found any statically meaningful relationship between gender and consequences of burns injuries.

Most of the dead patients were resident in the urban area (23.7%). According to the results, there is a meaningful relationship between the location of the residence place and burns in case and control group. This may be due to the lack of smoke alarms in homes and workplaces, gas leaks, butts, and safety negligence and in particular the use of non-standard heaters in this province. In the study done by Dr. Afshan Sharqi [17], kooshyar [50] and Kia Yung [49], the frequency of burns deaths in the city was higher than the village, but in the study done by Batra in India [51] and Amir Alavi in Gilan [32] burns mortality in the village was reported more than the city.

Most dead patients were married (53%). In this study, there is no meaningful relationship between burns and the marital status of the studied patients.

According to the findings, most of the dead patients had afflicted with thermal burns (88.8%). In this study, there is no meaningful relationship between burns and type of burn in the studied patients. It may be due to the fact that people are more involved in their daily lives with flammable agents such as flame, oil, gasoline, etc., which leads to thermal burns. Fuel smuggling in this province can be another cause of thermal burns. The results of the study are consistent with the findings of the study of Vasei et al. and the injury resulted from thermal burns is the most common type of burns.

Most of the dead patients had inflicted with burns by flame, oil, and gasoline (46.0%). In this study, there is a meaningful relationship between burns and the cause of burns. It may be due to the fact that burns with flame are deeper and in comparison with other burns they are more deadly. Besides, in Rezaei and et al.'s study, flammable fluids were the most common cause of burns in dead patients and in most cases oil was the cause of self-burning [23]. Although, in the group study in Kurdistan [45] and Sheikh Azadi [13] in Tehran, the fire has been reported as the most common cause of burns. The most common cause of burns in the study done by Afshan Sharqi [17], Kia Yung [49] and Amir Alavi [32] was boiling water and hot liquids.

Results show most of the dead patients had burns percentage of more than 80 (60.5%). In this study, there is a meaningful relationship between burns and burns percentage. According to the results of the previous studies with an increase in burns percentage, dead patient's percentage also increases [17]. Furthermore, in Afshan Sharqi's study, the highest frequency of mortality was due to the rate of more than 80 percent [17]. In the study done by Yavari et al. in Isfahan, the most subjects had burns 30-60 percent [52] and in the study done by Rian et al. the most burns level obtained 31 percent [11].

Also most of the dead patients had burns level 3 (96.3%). In this study, there is a meaningful relationship between burns and burns level. Since burns level 3 is very severe, the skin layers break down and enter into fat and muscle tissues and eliminate it. Besides, in the study done by Afshan Sharqi [17] and Kabirzadeh [18], the most mortality frequency was related to level 3.

Finally, Most of the dead patients had a history of the previous disease (89.3%). In this study, there is a meaningful relationship between burns and the history of the previous disease. This may be due to the fact that the underlying disease itself has been the cause of burns or exacerbation of the resulting consequences.

Conclusion

In the poorest region of Iran, younger (as the labor force) and women were at high risk of death due to burn. Developing gas infrastructures in this region could decrease the incidence and severity of burns. More attention to young burn patients and women at the entrance to hospital can reduce the risk of death. Also, development of specialized and centralized burns center, the use of sufficiently qualified personnel could play an in important role to treat patients and also reduce the complications and mortality.

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Disclosure of conflict of interest

None.

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