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CLINICAL STUDY

Epidemiology and cost of burns in emergency department during Syrian civil war

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ABSTRACT
BACKGROUND: We aimed to emphasize the importance of regional hospitals' capacities and emergency services for burn patients in war and disaster situations, in addition to assessing the costs and clinical situations of seriously burned patients who have come to the emergency service due to the bomb and heater burst during the Syrian civil war.
METHODS: In this study, we analyzed these 217 burn patients and analyzed these patients' data for retrospective analysis.
RESULTS: Burn patients were more often seen during the winter months. The majority of the patients were children, young adults and male (1–16 age, 95 % burn, 44 %,17–40 age 94 % burn, 44 %, ≥ 41–65 age, 28 % burn, 12 %). The most common body surface burns ≥ 20 % body surface in surviving patients n = 184, 78 % were determined. 14 of the burned patients died within the first 24 hours. The total cost of the burned patients in the emergency unit was observed to be 33.4 ± 25.9 Turkish Lira (10.2–6813.2).
CONCLUSION: The present study showed that burn patients need much longer treatment time. The need for trained personnel in case of mass disasters and warfare, the identification of burn intensive care units and hospitals to be referred is important *(Tab. 2, Fig. 4, Ref. 23)*. Text in PDF *www.elis.sk.*
KEY WORDS: burn injury, Syrian civil war, cost.

Abbreviations: creatine phosphokinase – (CPK), creatine kinase – (CK), n – number, GCS – Glasgow coma scale, SBP – systolic blood pressure, DBP – diastolic blood pressure, BUN – blood urea nitrogen, Cr – creatinin, SGOT – serum glutamic oxaloacetic transaminase , SGPT – serum glutamic pyruvic transaminase, Na – sodium, K – potasium, Ca – calcium, WBC – white blood cell, Htc – hematocrite, PH – power of hydrogen, PO2 – partial pressure of oxygen, PCO2 – partial pressure of carbon dioxide

Introduction

Burn injuries are the fourth most common type of all injuries and the most devastating of all traumas (1–3). The total costs of burn injuries are very high, which is why it is very important to prevent fire and reduce the cost of the most common burn injuries. The most common burn injuries are seen in the home environment affected by children and elderly people, often during cooking (1, 4–6). But armed conflict increases the incidence of all trauma and burn injuries, the incidence of burn injuries during the Iraq War was very high (30–117 per 100.000) (7). Burn injuries of war are affected adult male and children.

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The effect of war and mass disasters can be very destructive which serious burn injuries and multiple trauma occurring during the war effect the whole population, especially children, young adults and women (8–11). On the contrary, civilian fires and vehicular fires result in burns that generally impact small number of individuals, especially children, individuals with older age and women.

September 11, 2001, the number of burn patients in the terrorist attack on the New York World Trade Center was 39, which is 19 percent of all injuries (12–14).On September 11, 2001, the number of patients treated with Pentagon a in the attack was 106 and 8 of these patients were burn patients and these patient numbers are quite serious. According to the United State Army Burn Center reports; During March 2003 – October 2011, 1037 burned patients were treated during the war in Iraq and Afghanistan, which accounted for 14 percent of all injuries. These patient numbers are quite serious. In addition to burn injuries it can also occur in other injuries, such as respiratory damage, neurological injuries, pressure damage due to explosion, penetrant and chemical injries, broke injuries due to trauma (15).

Materials and methods

In this study, we analyzed 217 burn patients and analyzed these patients' data in a retrospective analysis. The study protocol was approved by Mustafa Kemal University Research Hospital (Protocol Code: 2015–13172). Between January 2012 and

April 2015, a total of 3136 trauma patients were admitted to our emergency department, 217 of whom were burn victims. In this study, we analyzed these burn patients and the associated costs, and analyzed these patients' data in a retrospective manner. Since the burns occur very frequently during the winter months and during this period when war is most active, this calendar interval has been selected. The patients were brought to the hospital with 112 emergency ambulances and the surrounding district hospitals and camps.

Statistics

SPSS for Windows 16.0 (Statistical Package for Social Sciences) software was used for statistical evaluations. Relationships between nominal variables were analyzed by chi-square test and the differences between the groups were analyzed by Mann–Whitney U tests. For all statistical data, $p < 0.05$ was considered significant.

Results

The most frequent cause of firearm injuries was in 3136 cases of patients admitted to emergency services; for example 217 (6.9 %) patients with burns due to bomb explosions and heater bursts, 2919 (93 %) injuries due to shrapnel pieces, mine explosion, and bullet injuries (Figs 1–4.)

Average of all patients data values,

Age (19±14 Minimum = Min 1 Maximum = Max 81)

Sex (Male 125 – 58 %, Female 78 – 36 %)

Number of dead patients (14 – 6.5 %) and 14 of these burn patients died in the emergency department (14 – 6.5 %), but the number of dead patients in the referral burn units is unknown. The remaining data are shown in Tables 1 and 2.

Fig. 2. Burn patient.

Fig. 3. Burn patient.

Fig. 1. Burn patient.

Fig. 4. Burn patient.

Tab. 1. All patients data values.

	Survived n=203 (93.6%)	Exitus n=14 (6.4%)	p
Age	20.9±14.6 (Min=1, Max=81)	9 ±7.2 (Min=2, Max=27)	0.001
Sex	Male 125 58% Female 78 36%	Male 8 4% Female 6 3%	
GCS	10±1.5 (Min=8, Max=15)	8 ±0.5 (Min=8, Max=10)	0.000
SBP/mmHg	92.2±13.9 (Min=60, Max=135)	64.6±5.7 (Min=50, Max=70)	0.000
DBP/mmHg	67.1±10.8 (Min=45, Max=95)	47.8±5,7 (Min=30, Max=50)	0.000
PULSE RATE/dk	106.6±15.5 (Min=78, Max=142)	129.6±133.6 (Min=75, Max=145)	0.000
BUN mg/dL	18.3±13.4 (Min=5, Max=100)	51±40.9 (Min=1, Max=118)	0.450
Cr mg/dL	0.7±0.5 (Min=0.2, Max=4.2)	0.5±0.2 (Min=0.3, Max=1)	0.042
SGOT U/L	67.5±72 .4 (Min=12, Max=634)	182.5±169.4 (Min=16, Max=483)	0.001
SGPT U/L	29.9±30 (Min=6, Max=267)	20.9±14.6 (Min=1, Max=81)	0.017
Na^{++}mmol/L	134.1±4.9 (Min=117, Max=146)	130.4±4.2 (Min=123, Max=136)	0.006
K^{+}mmol/L	4.5±0.7 (Min=0.4, Max=6.9)	4.8±0.9 (Min=3.4, Max=6.4)	0.319
Ca^{++} mg/dL	6.2±0.5 (Min=4.1, Max=7.3)	5.9±0.6 (Min=4.9, Max=6.9)	0.057
WBC $10^3/\mu L$.	24.5±11.6 (Min=7.4, Max=56.8)	30.3±21.5 (Min=10.1, Max=74.6)	0.770
Htc / %	42.1±7.8 (Min=25, Max=63)	35.8±7.9 (Min=21, Max=56)	0.015
PLATELET/$10^3/\mu L$.	393.1±143.9 (Min=118,Max=834)	390.2±198.9 (Min=207, Max=783)	0.367
Ph	7.1±0.1 (Min=6.8, Max=7.4)	7.02±0.1 (Min=6.9, Max=7.1)	0.000
PO_2/mmHg	95±20.2 (Min=75, Max=228)	81.9±9.6 (Min=73, Max=98)	0.000
PCO_2/mmHg	31.2±5.9 (Min=20, Max=55)	38.2±7.3 (Min=29, Max=48)	0.001
% Saturation	89.6±9 (Min=71, Max=130)	77.2±5.4 (Min=70, Max=85)	0.000
HCO_3^-	14.5±4.3 (Min=3.1, Max=26.6)	9.1±3.8 (Min=4.7, Max=14.5)	0.000
Lactate	7.2±1.7 (Min=3.2, Max=10)	9±0.7 (Min=6.9, Max=9.8)	0.000
Cost/Turkish lira	33.4±25.9 (Min=102.1 Max=6813.2)	26.8±17.1 (Min=132.1 Max=793.2)	

Other pathologies that have been identified in addition to burn injuries include; crush syndrome, kidney failure and pregnant woman. Blood creatine phosphokinase (CPK) and creatine kinase (CK) levels were found to be high in patients with crush syndrome. Majority of the burn patients were admitted to the emergency service during the winter months.

The total cost of the burned patients in the emergency unit was observed to be (33.4 ± 25.9, 10.2–6813.2), but the cost in the referral burn units is unknown. The data values of the dead patients are shown in Tables 1 and 2. Other pathologies that have been identified in addition to burn injuries include crush syndrome (n = 26, 12 %), kidney failure (n = 1) and pregnant woman (n = 1). Blood CPK and CK levels were found to be high in patients with crush syndrome. Majority of the burn patients were admitted to the emergency service during the winter months (n = 217, 100 %).

Severe burns can result in significant morbidity and mortality (≥ 20 % body surface burns in surviving patients 184 – 78 %, ≥ 20 % body surface burns in dying patients 14 – 6 % ($p \leq 0.005$).

In addition, high lactate levels were the factors affecting mortality and morbidity and were statistically significant (Surviving patients 7.2 ± 1.7 Min = 3.2, Max = 10, Dying patients 9 ± 0.7 Min = 6.9, Max = 9.8 ($p \leq 0.000$).

Discussion

Wars, conflicts or natural disasters negatively affect human life, causing serious injury, significant costs and death. Especially; they affect the young population and this changes the structure of the community, for example, as we have seen in burn patients, more children and young people are affected. As we have seen in the studies done, it is stated that the population migrating to other countries is mostly in the group of males (70 –100 %) and young people (16–34 years) (16–19). In this study, similar data were obtained.

About 5–20 % of those injured after conventional war, civilian catastrophes and terrorist attacks can suffer serious burn injuries (20). Most of these surviving patients have at least 20 % body surface burning. In our study, the percentage of burns and the number of patients were similar, but the rates were significantly higher. The majority of multiple traumatized and severely burned patients die at the time of the event, in the area of the event or within the following first 24 hours (21, 22). In this study fourteen (6 %) of the burned patients died within the first 24 hours.

In the presence of these conditions, traumatic and surviving serious burn victims in the Syrian Civil War came to our emergency service and were accepted. As soon as the patients came, their examination and treatment started immediately, but there is no burn-in care unit at the hospital; care and treatment were carried out in our emergency unit until the patients were referred to various burn care units. The treatment in the emergency department continued for a mean of 3 days and all the patients were referred to other hospitals because there was no burn intensive care unit in the hospital. As the emergency department capacity has been exceeded, it is difficult to provide services.

Although the most common vulnerable groups for burn injuries are children, women and elders, in armed conflicts he most common vulnerable groups are children, young adults and women as like in Syrian Civil War.

Often fires occur in winter as it is in Syria's civil war. In the winter months, these patients applied to the emergency service with flame burns, and all the patients with flame burns were found to have in the history of the patient's bomb and heater burst when they arrived at the emergency service. According to the American

Tab. 2. All patients data values.

	Survived			Exitus			p
	n=203	93.6%		n=14	6.4%		
Burn percentage	5%	2	1%	5%			0,005
	10%	6	3%	10%			
	15%	10	5%	15%			
	20%	25	12%	20%			
	25%	75	34%	25%	3	1%	
	30%	43	20%	30%	2	1%	
	35%	13	6%	35%	3	1%	
	40%	12	5%	40%	5	2%	
	45%	12	5%	45%	1	1%	
	≥ 50%	5	2%	≥ 50%			
Burn grade	2° superficial	40	18%				0,001
	2° superficial – deep	145	67%		7	3%	
	2°–3° degrees	14	7%		6	3%	
	3° degrees	4	2%		1	1%	
Seizures		16	7%		8	4%	0,000
Additional pathologies		21	10%		5	2%	0.016
Treatment times	1day	16	7%		14	7%	0.000
	2 day	75	34%				
	3 day	94	43%				
	4≥day	18	8%				
Bomb explosions A)		115	53%		10	5%	0,556
Heater burst (B)		65	30%		3	1%	
A+ B		23	10%		1	1%	
Sent To Burn Care Units		203	94%		14	6%	0,000
Age	1–16 age	85	39%		10	5%	0.071
	17–40 age	90	42%		4	2%	
	41 ≥ 65 age	28	13%				

Burn Society, the prognosis and treatment of burn victims are directly related to the burn classification, so careful evaluation of the depth and size of the burns is very important. For this reason, it is very important that clinicians should be reassessed at the outset of treatment as it is important that the size and depth of the burns are correctly identified.

In the United States, one third of burn patients are treated in emergency services, and this rate may increase in cases of war and disaster (1, 4).For this reason, if the patients exceed the capacity of the local burn centers, the American Burn Society defines it as a catastrophic condition (13).This situation applies to all wars, similar situation occurred in hospitals in the Hatay region (8, 13, 23).The battle in Syria has shown that the planning of emergency services, hospitals and burn intensive care units in battle and mass catastrophes is very important. Patients were treated for an average of 72 hours in the emergency department, and approximately 6 percent of these patients have died.

Conclusion

Our study showed that burn patients need much longer treatment time; the need for trained personnel in case of mass disasters and warfare, the identification of burn intensive care units and hospitals to be referred is important. It is also an inevitable responsibility for the triage system to be very practical and continuous in training of its personnel. Otherwise, the service quality and cost will be much higher because the emergency service units will have to care for more patients, not only 1/3 of burn patients. Because the loss of young population will increase, the social structure of the society may change. In cases of mass disasters and wars; it is very important to prepare national disaster plans for burning cases, because such events can affect the young population, ultimately disturbing social development.

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