



The Effect of Drug Abuse on Clinical Outcomes of Adult Burn Patients Admitted to a Burn Center in the North of Iran

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Received: March 06, 2023

Revised: April 04, 2023

Accepted: April 05, 2023

ABSTRACT

Objective: Burn trauma is a life-threatening incident that may be accompanied by several risk factors that increase morbidity and mortality. Drug abuse is one of the lifestyle dangers on the rise globally and can have an impact on the outcomes of burn injuries. This study aimed to evaluate the effect of drug abuse on the clinical outcomes of adult burn patients who were admitted to a burn center in the North of Iran.

Methods: This retrospective cross-sectional study included adult burn patients who were referred to Velayat Hospital, between March 1, 2021, and March 20, 2022. The hospital information system (HIS) was used to select patients with a history of drug use and then were compared with burn victims who had never used drugs before. In both groups, demographic information, the cause of the burn, the comorbid diseases, total body surface area, length of stay, and outcomes were collected and recorded for both groups.

Results: This study included 114 inpatients, 90 of whom (78.95%) were men. The mean age of the patients was 43±15 years. The mean length of hospitalization in the drug-user group was significantly higher than in the non-drug abuse group ($p=0.004$). The drug abuse group had significantly higher rates of comorbid diseases ($p=0.021$), inhalation injury ($p<0.001$), mortality ($p=0.002$), and pneumonia ($p<0.001$). However, there were no statistically significant differences in the Infection and Sir's rates ($p=0.583$) between the groups.

Conclusion: Drug abuse is a risk factor in adult burn patients, which can affect the length of stay and burn-related morbidities.

Keywords: Burns; Substance abuse; Drug abuse; Burn injury.

Please cite this paper as:

Rahbar Taramsari M, Mobayen MR, Feizkhah AR, Letafatkar N, Esmailzadeh M, Hoseinzadeh S, Yeganehdooost F, Mehdipour F, Bagheri Toolaroud P. The Effect of Drug Abuse on Clinical Outcomes of Adult Burn Patients Admitted to a Burn Center in the North of Iran. *Bull Emerg Trauma*. 2023;11(2):90-95. doi: 10.30476/BEAT.2023.98282.1424.

Introduction

Burn trauma is a life-threatening incident that predominately affects low- and middle-income countries [1, 2]. Most burns are divided into three categories based on their origin: thermal, electrical, and chemical. Thermal burns are further classified as flame, contact, and scald injuries [3]. Despite the numerous advancements in burn treatments that have resulted in improved prognosis, burns continue to cause disability and high mortality [4]. According to a World Health Organization (WHO) report, thermal burns claimed the lives of more than 180,000 individuals globally [5]. Every year, more than 100,000 people are burned in Iran [1]. Besides, Burns are one of the most costly traumatic injuries due to prolonged hospitalization and associated consequences [6, 7].

Burn trauma might be accompanied by a number of risk factors that increase morbidity and mortality, however, few studies have investigated the impact of substance abuse on the outcomes of the burn patient, who were admitted to the burn departments [8]. According to previous studies, burn patients with drug abuse had higher morbidity, mortality, length of hospitalization, and care expenses than non-users [9-11]. Additionally, some studies have shown that individuals with burn injuries frequently use drugs [12, 13]. Substance abuse is not, however, regarded as a predictor of mortality rate by the majority of commonly used mortality risk score systems [14].

According to a report from the mental health services administration, in 2014, the number of individuals who suffer from substance use disorder (SUD) in Iran was estimated to be over 3 million [15], compared to the United States, which had 8.5 million substance abusers [16]. Iran's rate of substance use, however, follows a different pattern than that of other countries, such as the United States or European countries [10]. A Persian cohort study which was conducted in 18 different districts of Iran in 2020 reported that 11.09% of over 130,000 people had a history of drug abuse [17]. Furthermore, opium, cigarettes, and hookah are the most widely used substances in Iran [18]. Evidence on the epidemiology of SUD and burn injury outcomes in developing countries is inadequate. Therefore, this study aimed to evaluate the effect of drug abuse on the clinical outcomes of adult burn patients admitted to a burn center in northern Iran.

Materials and Methods

This retrospective cross-sectional study was conducted on all acute burn patients admitted to Velayat Burn Center between March 1, 2021, and March 20, 2022. This center is the only burn center in Guilan province (Iran). It has 55 beds in the burn ward and 10 beds in the burn intensive care unit (BICU), which has approximately 700 admissions

annually, and admits all burn patients in this area. The patients were identified using the hospital information system, which provides information on all admitted patients. Patients under the age of 18 were excluded from the study.

The samples were chosen using the classified sampling method. First, the total sample was calculated using the proportion of patients with severe burns to the total number of patients. Considering that approximately 40% of the patients admitted to the burn center during the study period had severe burns, a sample size of 92 with a 95% confidence coefficient and the error coefficient of 0.10 was determined.

$$n = \frac{\left(z_{1-\frac{\alpha}{2}}\right)^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.4 (0.6)}{0.01} = 92$$

A similar study [12] found that the prevalence rate of substance use in burn patients is about 0.33. The sample size in each category was calculated using the formula below:

$$n_2 = w_2 \times n = 0.67 \times 92 = 62$$

Considering a 10% attrition rate, the final sample size for consuming groups was calculated as 67 patients, while for non-consuming groups, it was 34 patients.

Statistical Analysis

The data were analyzed using SPSS software, version 28.0 (SPSS Inc., Chicago, IL, USA) and expressed as mean±SD (standard deviation), and frequency (percentage). Data normality was assessed using the Kolmogorov-Smirnov test. The Chi-square test and Fisher's exact test were used to compare the frequency distribution of variables within the groups. The Mann-Whitney U-test was used to analyze the continuous variables. All data were analyzed two-tailed, and a *p-value* < 0.05 was considered statistically significant.

Results

We analyzed data on a total of 114 patients, consisting of 90 (78.95%) men and 24 (21.05%) women. The patient's mean age was 43.88±15.59 years old. With regard to the level of education, 64 patients (56.14%) had a Bachelor's degree or higher, and about 77 (67.54%) lived in the city. More injuries were due to thermal causes (53.8 % vs. 42.7 %). Table 1 summarized the demographic information of the participants.

A group of patients with no history of drug use was randomly selected and their demographic and clinical characteristics were compared to those of the SUD group. As indicated in Table 1, there was no statistically significant association between drug use and demographic data.

As shown in Table 2, the clinical and burn

Table 1. Comparisons of demographic features between the two groups (Non-substance abuse/ Substance abuse)

Variables		History of drug use			P value*
		Total	Non-drug abuse groups	Drug abuse groups	
Age		43.88±15.59	44.49±15.19	42.69±16.48	0.393
Sex	Male	90 (78.95)	59 (78.7)	31 (79.5)	0.920
	Female	24 (21.05)	16 (21.3)	8 (20.5)	
Marital status	Single	30 (26.32)	17 (22.7)	13 (33.3)	0.223
	Married	84 (73.68)	58 (77.3)	26 (66.7)	
Educational level	Diploma and lower	50 (43.86)	33 (44.0)	17 (43.6)	0.690
	Bachelor degree	43 (37.72)	30 (40.0)	13 (33.3)	
	Master's degree and higher	21 (18.42)	12 (16.0)	9 (23.1)	
State of Residence	Urban	77 (67.54)	53 (70.7)	24 (61.5)	0.328
	Rural	37 (32.46)	22 (29.3)	15 (38.5)	

*Chi-square test; Independent-Samples Mann-Whitney U Test

Table 2. Comparisons of clinical and burn features between two groups (Non-substance abuse/ Substance abuse)

Variables		History of drug use			P value
		Total	Non-drug abuse group	Drug abuse group	
Cause	Thermal	53 (46.49)	32 (42.7)	21 (53.8)	0.062*
	Hot surface	13 (11.40)	8 (10.7)	5 (12.8)	
	Hot liquid, steam, or gas	32 (28.07)	27 (36.0)	5 (12.8)	
	Chemical	12 (10.53)	5 (6.7)	7 (17.9)	
	Electrical	4 (3.51)	3 (4.0)	1 (2.6)	
Organ	Head and neck	17 (14.91)	12 (16.0)	5 (12.8)	0.580**
	Buttock	13 (11.40)	10 (13.3)	3 (7.7)	
	Upper limb	40 (35.09)	25 (33.3)	15 (38.5)	
	Lower limb	30 (26.32)	21 (28.0)	9 (23.1)	
	Total body	14 (12.28)	7 (9.3)	7 (17.9)	
Inhalation injury	Yes	16	4 (5.33)	12 (30.77)	<0.001*
	No	98	71 (94.67)	27 (69.23)	
Sirs	Yes	14	8 (10.67)	6 (15.38)	0.467*
	No	100	67 (84.81)	33 (84.62)	
Discharge status	Recovered	98	70 (93.33)	28 (71.79)	0.002*
	Death	16	5 (6.67)	11 (28.21)	
Infection	Yes	23	16 (21.33)	7 (17.95)	0.669*
	No	91	59 (78.67)	32 (82.05)	
Pneumonia	Yes	15	3 (4)	12 (30.77)	0.000*
	No	99	72 (96)	27 (69.23)	
Comorbid diseases	Yes	29	14 (18.67)	15 (38.46)	0.021*
	No	85	61 (81.33)	24 (61.53)	
Length of stay in hospital (Mean±SD)		9.38±6.88	6.88 (SD=4.50)	9.38±6.68	0.046***
Length of stay in BICU (Mean±SD)		2.21±3.94	1.40±2.79	3.77±5.22	0.004***
Burn percentage (Mean±SD)		34.46±14.35	32.99±11.75	37.28±18.17	0.382***

*Chi Square test; **Fisher Exact test; *** Independent-Samples Mann-Whitney U Test

characteristics of the patients were assessed Besides, there was a significant association between drug usage and inhalation injury, which was significantly higher in the SUD group (30.77% vs 5.33%; $p < 0.001$).

Regarding discharge status, the SUD group had significantly higher mortality rates than the non-drug abuse group (28.21% vs 6.67%). As demonstrated in Table 2, the length of hospitalization in the SUD group was significantly longer than the non-substance abuse group ($p = 0.004$). Moreover, there was a significant association between the use of drugs with pneumonia status ($p < 0.001$) and comorbid diseases ($p < 0.001$). No statistically significant difference existed between having an infection and Sirs from

drug use ($p = 0.583$).

The researchers also asked the SUD group about the type of drug they consumed. The findings indicated that opium was the most commonly used ($n = 21$, 53.85%), followed by methadone ($n = 9$, 23.08%), heroin ($n = 6$, 15.38%), alcohol ($n = 2$, 5.13%), and tramadol ($n = 1$, 2.56%).

Discussion

The findings of the present study indicated that the total length of hospitalization, as well as ICU stays, were significantly higher in the SUD group than in the control group. Furthermore, there was

a significant correlation between substance abuse and an increased risk of inhalation injuries and pneumonia. The findings also indicated that drug use had an impact on hospital discharge status and poor outcomes in SUD patients.

Patients with SUD were at increased risk of developing pneumonia. This finding was consistent with previous studies [11, 19]. One study reported that substance use was associated with an increased risk of intubation and its complications [20]. In addition, another study found a strong association between inhalation injury and mortality in burn patients. Therefore, inhalation injury is an independent predictor in burn patients [21].

Substance abuse was associated with an increased risk of pneumonia in burn victims. A study indicated that taking the drug increases susceptibility to lung infections [22]. It might be due to malnutrition and a compromised immune system, both of which were prevalent in SUD patients [23, 24]. However, no association was found between drug use and bacteremia. The same findings were found in another study in which substance abuse alone was not associated with bacteremia [11].

According to the findings of the present study, a substance abuse patient was more likely to have an increased length of stay. Other studies also reported that hospital stays were 1.8, 1.2, and 1.88 times longer for poisoned patients, respectively [25–27].

Furthermore, the present study found that SUD patients had a higher mortality rate, and besides, substance abuse was associated with poorer outcomes. One of the reasons could be the increased risk of nosocomial infections associated with an increased length of stay [28]. Drug abuse also caused cardiovascular dysfunction and resuscitation failure, which could be a leading cause of mortality [29, 30]. In a study of over 11,000 burn patients, researchers found that unadjusted mortality was not significantly higher among illegal drug users (5.7 vs. 5.2%, $p=0.08$) [13]. Then, they compared the results in several groups selected based on the type of drug use. They found that the mortality rate was similar between marijuana users and non-users (5.3 and 5.2, respectively), while it increased to 6.5% among other drug users, indicating a 3.2% reduction in marijuana use (when combined). Therefore, it can be concluded that the use of marijuana, in addition to other drugs, minimized the increased risk. In the present study, the different patterns of drug usage throughout the country implied a stronger relationship between drug use and mortality. According to Gallup's annual survey of consumption habits, 16% of Americans used marijuana, while this rate, among the Iranian population, was 1.3% and 0.2%, respectively [31]. Besides, a study conducted in the United States showed that marijuana had the highest illegal drug use [9], while it had the lowest drug use in a study on the Iranian population [10].

One of the limitations of the present study was

the small sample size of burn patients with SUD. Another limitation was that the history of drug consumption in burn patients was based on self-report data, therefore, the number of drug abusers might have been underestimated. Accordingly, it is recommended to employ Drug Abuse Screening Test (DAST) to investigate the history of drug abuse in burn patients in future studies. Finally, it is suggested that future prospective multicenter studies be conducted to investigate further the outcomes of burn injuries in patients with a history of drug abuse.

Conclusion

Drug abuse might have an impact on various clinical features of burn patients. A higher incidence of inhalation injury, greater risk for pneumonia, increased days of hospitalization, as well as higher rates of morbidity and mortality were seen in addicted patients. Although the association between drug abuse and the increased mortality rate wasn't always significant in some previous studies, the mortality rate was increased in most of them. Substance use must be taken into account as an essential factor in efficient burn treatment.

Declaration

Ethics approval and consent to participate:

The Ethics Committee of Guilan University of Medical Sciences approved this study (IR.GUMS.REC.1400.458). Since, This is a retrospective study, the patient's consent was not applicable. No personal data was used after data collection. Patient informed consent was not acquired due to the use of previously gathered data from the hospital information system; nevertheless, for ethical reasons, the names of patients were not gathered from the Hospital Information System (HIS).

Consent for publication: All authors read and approved the final manuscript to be published and agreed to be accountable for all aspects of the work in terms of the accuracy and integrity of any of its parts.

Conflict of Interests: None of the authors has any personal or financial conflicts of interest.

Funding: The authors received no financial support for the research, authorship, and/or publication of this article.

Authors' Contribution: MRT, MM: Study conception and design. ME, PB: Data analysis and interpretation. PB, NL: Drafting of manuscript. AF, SH: Data collection. MRT, MM, ME, AF, NL, SH, FY, PBT: Critical revision and final approval of the manuscript to be published. All the co-authors contributed to this paper and are responsible for

all aspects of the work and approved the final manuscript.

Acknowledgment: This study was part of an MD thesis supported by the Guilan University of

medical sciences. In addition, we thank the Burn and Regenerative Medicine Research Center of Guilan University of Medical Sciences (Rasht, Iran) for their assistance in this study.

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