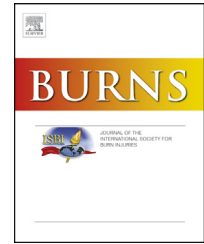


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Epidemiology of burns during pregnancy in Tehran, Iran

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ABSTRACT

Objective: The purpose of this study was to determine the epidemiological factors of burns in pregnant women admitted to Motahari hospital in Tehran during a 7-year period.

Study design: This retrospective descriptive study was carried out for a 7-year period. Researchers examined the medical records and documents of all 38 pregnant women admitted to Motahari hospital. The required data including age, days of hospitalization, burn percentage, cause of the burn, extent and severity of the burn, burn involved member, gestational age, and fetal and maternal outcomes were collected using check lists. The collected data were analyzed using statistical package using social sciences (SPSS) software version 20.

Results: During this 7-year period, 38 pregnant women with burns in different parts of their body were admitted to Motahari hospital in Tehran. Regarding burn frequency in the trimesters of pregnancy, the highest frequency was found in the second trimester (73.7%), and the frequency in the first and the third trimesters were 7.9 and 18.4%, respectively. Maternal mortality rate in the third trimester (57.1%) was higher than in the second (46.4%) and the first (33.3%) trimesters; however, fetal mortality rate was the highest in the first trimester (66.7%) followed by the third trimester (57.1%). Overall, fetal death occurred in half of the patients.

Conclusion: The results of this study showed high maternal and fetal mortality rates in pregnant women with burns. This issue indicates that planning and implementing supportive and therapeutic protocols in these patients are of utmost importance and should be carried out by maintaining the health of mother and fetus immediately after patient hospitalization.

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1. Introduction

Every year, more than 11 million people with severe burns require medical interventions. According to the World Health Organization statistics, more than 300,000 people die every

year from fire-related burns worldwide [1]. Injuries related to burns include fractures; dislocations; sprains; strains; intracranial, internal, superficial, and crushing injuries; open wounds; injury to blood vessels, nerve, and spinal cord; and contusions, which are associated with significant maternal and fetal morbidity and mortality with increased rates of

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preterm labor, premature rupture of membrane, and uterine rupture [2]. According to the definition provided by the International Society for Injuries caused by burn, burn is a damage to the skin or other organs which is caused by thermal sources. Burning occurs when a part or all of the cells of the skin or other body tissues are destroyed by hot liquids, hot objects, or flame [3]. Burns are always considered as one of the most devastating injuries that not only lead to death or disability, but also have major economic consequences and severe long-term mental and physical complications. Primary acute care for burns constitutes only a small part of the overall treatment. Patients with burns often require controlled rehabilitation, reconstruction, and psychological support for years [4,5].

Epidemiological studies of burns in different parts of our country show that young people, women, and those with low educational level are more common victims of burns. In addition, the burn frequency of burn, burn level, and mortality rate of women are higher than men in our country as well as many other least developed countries [6–9]. This is while reproductive age is the most important stage of life. The most positive health characteristics are observed in this age group, and the individuals are found to have maximum physical, esthetic, and reproductive capabilities. Mortality in women of reproductive age is generally caused by pregnancy and childbirth. Hence, particular attention has been paid to safe motherhood in order to reduce the mortality rate. Numerous studies have been carried out on mortality caused by pregnancy and childbirth worldwide, particularly in Iran. However, few studies are done on mortality caused by burns in this age group, especially during pregnancy [6].

Physiological changes during pregnancy affect the patient with burns during this period. Thermal burns during pregnancy have many side effects on maternal and fetal outcomes and are associated with a high incidence of complications such as intrauterine fetal death, miscarriage, and preterm birth. Apparently, pregnancy does not change the mother's survival rate [9]. The factors that can play a role in the survival of the mother and fetus are as follows:

1. Body surface burn percentage
2. Gestational age
3. Depth of the wound
4. Burn complications
5. Accompaniment of medical illnesses and other injuries

Generally, prognosis will be better with proper and planned management; however, >40% of the body surface area is affected with burns, and thus the mortality rate of mother and fetus would be approximately 100% [9–11]. Management of burns during pregnancy requires a team approach with close monitoring of the mother and fetus. In most cases, fetal health directly depends on mother's health. Based on this principle and the results of most previous studies, it is deduced that all pregnant patients with burns should receive primary measures; a proper and complete approach to resuscitation must be adopted after burn care for maintaining the health conditions of the mother and fetus. All these measures are found to have significant effects on prognosis and maternal

and fetal mortality [12,13]. Information on burns during pregnancy is limited to case reports and case series. Maternal age and trimester of pregnancy of the patients do not appear to affect maternal or fetal outcome, and pregnancy does not appear to independently alter maternal survival after severe burns [14]. This study was conducted for a 7-year period to determine the epidemiological factors and burn outcomes in pregnant women admitted to Motahari hospital in Tehran.

2. Materials and methods

This study is a 7-year retrospective descriptive study; the medical records and documents of all the pregnant women with burns who were admitted to the Motahari hospital were examined. During 2007–2014, this hospital was only the specialized center in Tehran for treating patients with burns. The required data including age, days of hospitalization, burn percentage, cause of burns, extent and severity of burns, burn involved member, gestational age, and fetal and maternal outcomes were collected using check lists.

The extent of burns is estimated on the basis of the burn percentage of total body surface area (TBSA); this burn percentage of skin surface is indicated from moderate to severe intensity using schematic symbols representing the front and back surfaces of the human body. In order to clinically assess the severity of burns, a three-grade classification (2, 3, and 4) is developed. According to this classification, skin irritation, an indicator of mild burns, (grade 1) is not taken into account. The data collected were analyzed using statistical software SPSS version 20. Descriptive statistic methods such as relative and total frequency were used for data analysis.

3. Results

During the study period, 38 pregnant women with burns (average age: $26/5 \pm 6$ years) in different parts of their body were admitted to the Motahari hospital in Tehran. 86% of the patients were <30 years old, the youngest was 17 and the oldest 45 years old (Table 1).

The highest frequency was associated with burns caused by oil and gasoline (53%). Other causes were domestic gas (21.1%), boiling water (7.9%), and flame (5.3%). In addition, 10.5% of the burns were due to other causes (Table 2).

The frequency of total body burn percentage given in Table 3 indicates that the highest frequency was related to burn percentages of 11–20 and 61–70.

The mean burn percentage of body surface area was 45.76 ± 26.19 . In total, 18 out of the 38 admitted patients (47.4%) died. Fetal outcome was not better than maternal outcome as fetal death occurred in 50% of the patients during pregnancy.

The highest frequency of burns was associated with those caused by oil and gasoline (55.3%). The burn frequency with regard to other burn causes is in the following order: domestic gas (21.1%), boiling water (7.9%), and flame (5.3%); other reasons contributed to 10.5% of the cases. The highest burn percentage was 55.33 ± 26.97 , which was related to oil and gas,

Table 1 – Distribution of patients by age, mean burn percentage of TBSA, maternal death, fetal death, and suicidal intent.

Age group	Frequency	Burn % of TBSA	Maternal death	Fetal death	Suicidal intent
<20	4 (10.5)	31.25 ± 23.58	1 (25)	2 (50)	0 (0)
20–30	29 (76.3)	49.17 ± 26.57	16 (55.2)	16 (55.2)	10 (34.5)
>30	5 (13.2)	37.60 ± 24.27	1 (20)	1 (20)	1 (20)
Total	38 (100)	45.76 ± 26.19	18 (47.4)	19 (50)	11 (28.9)

Table 2 – Distribution of patients by cause of burns, mean burn percentage of TBSA, maternal death, fetal death, and suicidal intent.

Burn cause	Frequency	Burn % of TBSA	Maternal death	Fetal death	Suicidal intent
Boiling water	3 (7/9)	20/00 ± 0/00	0 (0)	0 (0)	0 (0)
Domestic gas	8 (21/1)	43/88 ± 19/06	4 (50)	5 (62/5)	1 (12/5)
Petroleum	21 (55/3)	55/33 ± 26/97	13 (61/9)	13 (61/9)	10 (47/6)
Flame	2 (5/3)	28/50 ± 9/19	0 (0)	0 (0)	0 (0)
Others	4 (10/5)	27/25 ± 27/71	1 (25)	1 (25)	0 (0)
Total	38 (100)	45.76 ± 26.19	18 (47.4)	19 (50)	11 (28.9)

Table 3 – Distribution of patients by mean burn percentage of TBSA, maternal death, fetal death, and suicidal intent.

Burn % of TBSA	Frequency	Maternal death	Fetal death	Suicidal intent
1–10	2 (5/3)	0 (0)	0 (0)	0 (0)
11–20	7 (18/4)	0 (0)	1 (14/3)	0 (0)
21–30	5 (13/2)	0 (0)	0 (0)	0 (0)
31–40	5 (13/2)	0 (0)	0 (0)	0 (0)
41–50	4 (10/5)	3 (75)	3 (75)	2 (50)
51–60	2 (5/3)	2 (100)	2 (100)	2 (100)
61–70	6 (15/8)	6 (100)	6 (100)	1 (16/7)
71–80	2 (5/3)	2 (100)	2 (100)	2 (100)
81–90	5 (13/2)	5 (100)	5 (100)	4 (80)
91–100	0 (0)	0 (0)	0 (0)	0 (0)
Total	38 (100)	18 (47/4)	19 (50)	11 (28/9)

and the highest maternal mortality (61.9%) rate was also observed to be in the same group. The highest fetal death rate was observed to be in patients with burns caused by domestic gas (62.5%) and oil and gasoline (61.9%). Meanwhile, 28.9% of the patients sustained burns following suicidal intent (Table 2).

The frequency of burn percentage of TBSA is given in Table 3; the highest frequency is related to the percentage ranges of 11–20 and 61–70. The results showed that maternal and fetal mortality increased with an increase in the percentage of TBSA burned. High burn percentage was observed in patients who intended to commit suicide.

The highest burn frequency was found to be in the second trimester of pregnancy (73.7%) when compared to

other trimesters. The burn frequency was 7.9% in the first trimester and 18.4% in the third. The mean burn percentage of TBSA was the highest in the third trimester (54.29 ± 27.32), while in the first and second trimesters, it was 42.00 ± 41.68 and 44.04 ± 24.9, respectively. Maternal mortality rate in the third trimester (57.1%) was higher than in the second trimester (46.4%) and the first trimester (33.3%), but fetal mortality rate was the highest in the first trimester (66.7%) and then in the third trimester (57.1%). Overall, fetal death occurred in half of the patients. The findings show that although the burn frequency was the highest in the second trimester, the suicide rate was low (25%) (Table 4).

The results of this study showed that among patients who sustained burns following suicidal intent, 100% had burn percentages >40%, while >70% of patients with burns not due to self-immolation intent had a burn percentage <40%. Pregnant women (90.9%) intended to commit suicide using oil and gasoline, and maternal and fetal death occurred in all these women (100%). It should be noted that most of the self-immolation cases (90.9%) were reported to be in the age group of 20–30 years and during the second trimester of pregnancy (63/6%) (Table 5).

4. Discussion

Burns during pregnancy is not a common phenomenon but can have many side effects on maternal and fetal outcomes. Fetal outcome heavily depends on maternal outcome. Hence,

Table 4 – Distribution of patients by pregnancy trimester, average age, burn percentage of TBSA, maternal death, fetal death, and suicidal intent in pregnant women.

Pregnancy trimester	Frequency	Average age	% of TBSA burned	Maternal death	Fetal death	Suicidal intent
First trimester	3 (7/9)	25/67 ± 7/51	42/00 ± 41/68	1 (33/3)	2 (66/7)	1 (33/3)
Second trimester	28 (73/7)	25/64 ± 5/93	44/04 ± 24/94	13 (46/4)	13 (46/4)	7 (25)
Third trimester	7 (18/4)	30/29 ± 6/07	54/29 ± 27/32	4 (57/1)	4 (57/1)	3 (42/9)
Total	38 (100)	26/5 ± 6/16	45/76 ± 26/19	18 (47/4)	19 (50)	11 (28/9)

Table 5 – Frequency distribution of age groups, cause of burns, total body burn percentage, maternal death, fetal death, and pregnancy trimester in pregnant women who sustained burns following suicidal intent.

Variables		Frequency
Age groups	<20	0 (0)
	20–30	10 (90/9)
	>30	1 (9/1)
	Total	11 (100)
Burn cause	Petroleum	10 (90/9)
	Domestic gas	1 (9/1)
	Total	11 (100)
Total body burn percentage	41–50	2 (18/2)
	51–60	2 (18/2)
	61–70	1 (9/1)
	71–80	2 (18/2)
	81–90	4 (36/4)
	Total	11 (100)
Pregnancy trimester	First	1 (9/1)
	Second	7 (63/6)
	Third	3 (27/3)
	Total	11 (100)
Maternal death	Death	11 (100)
	Total	11 (100)
Fetal death	Death	11 (100)
	Total	11 (100)

in order to minimize the maternal and fetal mortality rates, care should be given to pregnant women considering the fetal status. Treatment for pregnant women with burn requires a close cooperation between the gynecologist and the burn and trauma surgeon. Considering the possibility of pregnancy in patients with burns, consulting a gynecologist must be a priority in the case of confirming pregnancy.

In this study, the mortality rate of the mothers admitted because of burns was 47.4%, which is consistent with the value reported in the study by Karimi et al. (53.8%) [11]. The maternal mortality rate in this study was lower than the values reported in the study by Tavassoli Ashrafi (66%) [15]. Both of the aforementioned studies were conducted at the same medical center, but many years before this study. Thus, this indicates an improvement in the management of patients with burns in recent years. In addition, the fetal death rate reported in this study (50%) was less than that in the study by Karimi (56.6%) and Tavassoli Ashrafi (67.5%) [11,15]. This also indicates an improvement in management of patient with burns in recent years.

In this study, burn percentage in patients who intended to commit suicide was 28.9% that is consistent with the study of Karimi et al. (34%) [11]. The findings of this study also showed that maternal deaths that have occurred in the group with suicidal intent were higher than in other cases (100% vs. 25/9%). In addition, mean burn percentage of the patients who intended to commit suicide was higher than that of other patients (69/39 ± 15/13 vs. 24/50 ± 11/26). This is also true for fetal deaths (100% vs. 29/6%), which is also consistent with the findings of Karimi [11] and Maghsoudi [10]. Occurrence of self-immolation in pregnant women and poor maternal and fetal outcomes are attributed to mental stress and depression,

whose prevalence is higher in women than men in society, as well as the psychological states of pregnancy.

In this study, death outcome following burns during the pregnancy period was 47.4%. In other studies conducted in the cities of Tehran, Ahvaz, and Tabriz, this value was 62.1, 40.6, and 39.2%, respectively [7,10,16]. According to the results of previous studies, Iran is among the countries with the highest self-immolation rate with suicidal intent; besides, some parts of the country have an incidence of 22.4 per 100,000 persons per year which is the highest ratio in the world [17]. Ilam, Kermanshah, and Lorestan provinces are facing problems of women self-immolation. Indeed, deaths caused by burns especially in pregnant women are not limited to Tehran province [17]. According to the latest classification of diseases (10-ICD, International Classification of Diseases-10), pregnant women's death from suicide is one of the apparent examples of maternal death [18]. The maternal mortality review system in Iran uses the International Classification of Diseases-9 (9-ICD) and none of the deaths caused by burns are considered to be maternal and no investigations have been carried out to report the cause of death. This shows that the extent of maternal mortality is higher than in the documented statistics; moreover, in addition to the physical problems, injuries, and permanent disabilities, burns during pregnancy should be considered as a major factor for maternal mortality.

The average length of hospitalization in pregnant women with burns who had no self-immolation intent was 19.63 ± 16.53 days. The length of hospitalization for those with burns from self-immolation and died was 16.56 ± 15.76 days, which was not much different from that of the previous group.

In the present study, it was observed that only one of the patients survived with >50% burns, and others died due to the severity of burns, that is consistent with the results of Zarei, Karimi, and Tavasoli Ashrafi and also some other studies [9,11,12,15,16]. These findings suggest that there is a direct relationship between the maternal and fetal mortality rate and the percentage of TBSA burned, and in all the available reports, this percentage is the most significant factor in the prognosis of mother and fetus.

In the present study, mean percentage of TBSA burned was 45.76 ± 26.19, which was slightly lower than that reported in the studies of Karimi et al. in Tehran (52/5%) [11] and Zarei et al. in Ahvaz (52/2%) [16], and higher than that given in the study of Maghsoudi et al. in Tabriz (37.7%) [10]. The extent of burns depends on the cause of burns, duration of exposure to burn causes, and providing first aid on time, and is reported differently in different centers.

5. Conclusion

The results of this study showed high maternal and fetal mortality rates in pregnant women with burns, and these are significantly affected by the percentage of TBSA burned. In addition, mean burn percentage of the patients with burns following suicidal intent was higher than in the others.

It seems quite reasonable to consider the possible integration of a focused national injury prevention and mental health promotion into the current prenatal care delivered to pregnant

women. This problem needs to be brought to the attention of health policy-makers in Iran.

Social, cultural, and economic aspects may contribute to suicidal behavior and need to be addressed through workable actions such as education support and obligation. Hence, conducting educational programs and taking preventive measures play a major role in decreasing maternal and fetal morbidity rates caused by burns among pregnant women.

Given the retrospective nature of the present study, access to more information about the patients was restricted. There was also lack of documentation of medical records of the patients. However, it is recommended that similar prospective works be done for more precise examination of the consequences of burns in pregnant women. In addition, the results of this study emphasize the importance of planning and implementation of standard supportive and therapeutic protocols by maintaining health of mother and fetus immediately after patient hospitalization.

Conflict of interest

The authors have no conflict of interest to disclose for this study.

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