

## Acute Burns during Pregnancy: A Retrospective Study

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Original article</p>	<p><b>Background &amp; aim:</b> The incidence of acute burn injuries in pregnant women is very low. Burn injuries during pregnancy are often associated with a high rate of fetal and maternal mortality and morbidity. In this study, we aimed to review the cases of acute burn during pregnancy and evaluate the outcome of these patients in Mashhad, Iran.</p> <p><b>Methods:</b> This retrospective study was performed using the medical records of 48 pregnant women with thermal injuries over a 13-year period.</p> <p><b>Results:</b> The results showed that 8 (16.7%), 27 (56.3%), and 13 (27.1%) patients were in the first, second, and third trimesters of pregnancy. Moreover, 14 mothers (29.2%) died, 24 (50.0%) were discharged without any fetal problems, eight (16.7%) had fetal death, 13 (27.1%) had abortion, two (4.2%) had normal vaginal delivery, and one (2.1%) underwent normal caesarean section.</p> <p><b>Conclusion:</b> The rate of maternal survival in the first and second trimesters was higher than the third one. In the third trimester, pregnancy termination is indicated only after fetal maturation.</p>
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### Introduction

The incidence of acute burn injuries in pregnant women is very low (1); therefore, to delve into this problem, studying large populations over long periods of time is required. Burns during pregnancy are often associated with high rates of fetal and maternal mortality and morbidity. Various factors can affect the rate of mortality and morbidity in burns patients during pregnancy, including depth and size of burn injury, maternal health, age at pregnancy, and simultaneous existence of inhalation and burn injuries (2).

In a study performed by Agrawal, pregnancy did not influence the outcome of acute burn, but it increased the risk of abortion or premature birth (3). In a study by Maghsoudi et al., burn surface area and inhalation injury were the most important predictors of maternal and fetal mortality (4).

Imam Reza Hospital burn center in Mashhad, Khorasan Razavi province, Iran, serves more than

5.4 million people in an area of 302,000 km<sup>2</sup> with nearly 1,150 annual admissions (5). In this study, we aimed to review cases of burn injury during pregnancy and evaluate the outcome of these patients in Mashhad, Iran.

### Materials and Methods

In this retrospective study, the research protocol was approved by the Ethics Committee of Mashhad University of Medical Sciences. We reviewed the medical records of all cases of burns during pregnancy, who were admitted to Imam Reza Hospital, Mashhad, Iran, during March 2000-March 2013. The obtained data were analyzed regarding age, percentage of total body surface area (TBSA) burned, etiology (self-inflicted or suicidal against incidental burns) and cause of injury (kerosene, hot liquids, or gas explosion), gestational age, and fetal and maternal outcome.

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**Table 1.** Age, TBSA<sup>a</sup> burns, cause, and maternal and fetal mortality according to the etiology of burns

Etiology	Total No.	Mean age (Y)±SD <sup>1</sup>	TBSA (Mean) <sup>1</sup>	Cause			Maternal mortality <sup>3</sup>	Fetal mortality <sup>2</sup> (intrauterine+abortion)	Abortion	Fetal death <sup>3</sup>
				Kerosene <sup>3</sup>	Gas explosion <sup>3</sup>	Scald				
Accidental	28 (58.3%)	25.1±5.3	31.8%	15 (53.6%)	11 (39.3%)	2 (7.1%)	2 (7.1%)	8 (28.6%)	7 (25.0%)	1 (3.6%)
Suicide	20 (41.7%)	25.8±7.5	63.6%	19 (95.0%)	1 (5.0%)	-	12 (60.0%)	13 (65.0%)	6 (30.0%)	7 (35.0%)
P-value	-	NS <sup>b</sup>	<0.001	0.003	<0.001	-	<0.001	0.012	0.70	0.006

<sup>1</sup> T-student test; <sup>2</sup> Chi-square test; <sup>3</sup> Fisher's Exact test; <sup>a</sup> TBSA: Total Body Surface Area; <sup>b</sup> NS: non-significant

Patients with mild (first-degree) burn injuries were excluded from the study. For all the included pregnant patients, the data regarding pregnancy laboratory tests, ultrasonography, and gynecologic consultation were recorded.

## Results

The results demonstrated that 48 cases of burns during pregnancy were admitted during a 13-year period. On admission, the patients' age ranged from 15 to 43 years, with a mean age of 25.0±6.32 years. In a one-year period (March 2009-March 2010), 439 female burn patients were admitted to our center, 79 (18.0%) of whom died, and 173 (39.4%) were in reproductive age (15-45 years old). The etiology of injury was accidental and self-inflicted in 28 (58.3%) and 20 (41.7%) of the cases, respectively.

The injury in 34 (70.8%), 12 (25.0%), and two (4.2%) cases was due to kerosene, gas explosion, and scald. The TBSA ranged between 10% and 95%, with a mean of 45.1±25.49%. The patients' gestational age ranged from 8 to 41 weeks. In addition, 8, 27, and 13 patients were in the first, second, and third trimesters (Table 1).

Twenty-four mothers (50.0%) were discharged without any problems, eight (16.7%) had fetal death, 13 (27.1%) had abortion, two (4.2%) had normal vaginal delivery, and one (2.1%) had non-complicated cesarean section, totally, 21 (43.8%) fetuses died. Thirty-four patients were eventually discharged, and 14 mothers died. In the other words, in eight cases, both mother and fetus died (intrauterine death). Out of 13 abortions, six mothers died later and seven mothers were discharged. The burn surface area of the dead mothers was more than the survived ones (73.1% vs. 19.0%;  $P < 0.001$ ; Table 2).

The rate of maternal mortality, based on gestational trimester, was as follows: none in the first trimester, 8 out of 27 cases (29.6%) in the second trimester, and 6 out of 13 cases (46.2%) in the third trimester. These results indicate increased rate of maternal mortality with increasing gestational age. Table 3 demonstrates the etiology, TBSA, and maternal and fetal rate of mortality according to gestation trimesters.

## Discussion

The etiology of burns in 58.3% and 41.7% of the pregnant patients was accidental and

**Table 2.** Maternal and fetal mortality according to TBSA<sup>a</sup> burns

TBSA <sup>a</sup>	Mothers <sup>1</sup>		Fetal death <sup>1</sup> (abortion+intrauterine) (%)
	Total (%)	Died (%)	
<50%	28 (58.3%)	2 (7.1%)	5+1=6 (21.4%)
50-75%	11 (22.9%)	4 (36.4%)	3+4=7 (63.6%)
≥75%	9 (18.8%)	8 (88.9%)	5+3=8 (88.9%)
P-value	-	<0.001	0.001

<sup>1</sup> Chi-square; <sup>a</sup> TBSA: Total Burned Surface Area

**Table 3.** Etiology, TBSA<sup>a</sup> burns, and maternal and fetal mortality according to gestational trimesters

Trimester	Mothers No. (%)	Etiology		Mean TBSA (%)	Mother		Fetus			
		Accidental (%)	Suicidal (%)		Mothers died (%)	Mother's discharge without fetal problems (%)	Normal vaginal delivery (%)	Uncomplicated cesarean section (%)	Abortion/fetal death (%)	Fetal death (%)
1st	8 (16.7%)	6 (75.0%)	2 (25.0%)	35.0 %	-	6 (75.0%)	-	-	2 (25%)	-
2nd	27 (56.3%)	15 (55.6%)	12 (44.4%)	51.0 %	8 (29.6%)	13 (48.1%)	-	-	10 (37%)	4 (14.8%)
3rd	13 (27.1%)	7 (53.8%)	6 (46.2%)	39.0 %	6 (46.2%)	5 (38.5%)	2 (15.4%)	1 (7.7%)	1 (7.7%)	4 (30.8%)
Total	48	24 (58.3%)	20 (41.7%)	45.1 %	14 (29.2%)	24 (50%)	2 (4.2%)	1 (2.1%)	13 (27.1%)	8 (16.7%)

<sup>a</sup>TBSA: Total Body Surface Area

suicidal, respectively. Most of the accidental burns took place while cooking. The etiology of burns had a significant relationship with the rate of mortality (3). Among the 28 patients with accidental burn, only two (7.1%) deaths occurred, while one of them had previous history of seizure. Among the 20 patients with self-inflicted burns, there were 12 (60.0%) deaths. The mean TBSA in the accidental and self-inflicted groups was 32.8% and 63.6%, respectively, which were significantly different ( $P < 0.001$ ).

The rate of fetal mortality was higher in the suicidal group (65.0% vs. 28.6%). This result is consistent with those of other similar studies (4, 6). The cause of suicidal burns in the majority of cases was kerosene (95.0%) (4), while different causes of burns (gas explosion and hot liquid) were observed in the accidental group. Maternal rate of mortality had a significant relationship with TBSA (Table 2). Among the 28 patients with less than 50% TBSA burns, only two (7.1%) deaths were observed. This rate in mothers with  $\geq 50\%$  and less than 75% TBSA burns was four cases out of 11 (36.4%), and in  $\geq 75\%$  TBSA burns the rate was eight out of nine cases (88.9%). One mother (with 85% TBSA burns in the first pregnancy trimester [week 12]) and her fetus survived. These results were much better than those of other studies in which nearly all mothers with more than 40% (4) or 50% TBSA burns died (7).

The rate of fetal mortality also had a significant relationship with TBSA ( $P = 0.001$ ). In the first group ( $< 50\%$  TBSA burns), we had 6 out of 28 (21.4%) cases of fetal death. This rate in

the second and third groups was 7 out of 11 (63.6%) and eight out of nine (88.9%) cases, respectively. In this study, it was found that the rate of maternal mortality increased with increasing gestational age. The increased rate of mortality with gestational age is observed when mean TBSA in the third trimester is lower than the second trimester. This pattern proposes that pregnancy and gestational age are risk factors for death in burns patients.

The rate of fetal mortality was the highest in the second trimester, and possibility of cesarean section and vaginal delivery due to fetal viability in the third trimester reduces the rate of fetal mortality at the end of gestational period.

In the first gestational trimester, two out of eight cases (25.0%), in the second trimester 12 out of 27 cases (44.4%), and in the third trimester 6 out of 13 (46.1%) cases were due to suicidal attempts. It suggests that rate of self-inflicted burns increases with increased gestational age. The most common cause of burns was kerosene (73.2%). This finding is in agreement with the results of other similar studies, especially those conducted in Iran (4, 7, 8); although it may be different in other countries (9).

Some studies demonstrating low rate of survival and near complete maternal and fetal mortality in cases of more than 40-50% TBSA burns, recommended early termination of pregnancy in late gestational months (3). In this study, among cases of 50-75% TBSA burns, we had 30% maternal mortality and 60% fetal mortality. Therefore, the increased rate of maternal survival in the first and second

trimesters may be attributed to the higher rate of suicidal burns during the third trimester. In the third trimester, pregnancy termination is advised only after fetal maturation.

This study exhibited that suicidal burns comprise a noticeable amount of burns during pregnancy and lead to a high rate of mortality; this result is consistent with those of other studies conducted in Iran (10). This pattern may be different in other countries, even other regions (9, 11-13). In a study done in Iran, the majority (42.7%) of injuries among women of reproductive age were burns followed by lacerations in 32.6% of the cases (14, 15). The limitation of this study was not taking into account the reasons for the attempted suicides due to cultural issues.

In summary, maternal survival in the first and second trimesters was more than the third one. In the third trimester, pregnancy termination was advised only after fetal maturation. Suicidal burns led to higher rates of mortality; additionally, fetal and maternal mortality had a significant relationship with TBSA.

For more precise evaluation of the causes of self-inflicted burn injuries, conducting further studies is required. Investigation of the role of social factors such as addiction, illegitimate pregnancy, and level of education is required. In addition, the role of comorbidities such as diabetes mellitus and inhalation injuries on the rate of mortality should be considered.

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### Conflicts of Interest

The authors declare no conflicts of interest.

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