

## Research Article

### Management and Outcome of Burn During Pregnancy

Lubna Cheema,<sup>1</sup> Sobia Manzoor,<sup>2</sup> Usman Khalid,<sup>3</sup> Mamoona Khadim,<sup>4</sup> Zahid Tayyab<sup>5</sup>

<sup>1-5</sup>Department of Plastic Surgery and Mayo Burn Centre, King Edward Medical University/Mayo Hospital, Lahore

#### Abstract |

**Background:** Working in kitchens exposes women of reproductive age to burn injuries on daily basis in low socio-economic countries. Though rare burn injuries during pregnancy are a significant healthcare burden as they are a threat to the health of both mother and fetus. The objective of this study is to describe demography and burn characteristics of patients and to determine the factors affecting maternal and fetal outcomes.

**Methodology:** Retrospective study conducted in burn unit of Mayo Hospital / KEMU for a period of 3½ years (June 2018 – Jan2022.) Data was collected about age, TBSA, depth and mode of burn, gestational age, hospital stay, treatment and fate of mother and fetus.

**Results:** Total no of patients was 30. Mean age was 26.2±5.17. Mean gestational age was 23.±8.0. Mean hospital stay was 12 ±9.95 days. Maternal Mortality was 26.7%. There were 3 deaths in less than 28 weeks and 5 deaths in more than 28 weeks of gestation. There were 13 patients with less than 20% TBSA, 10 in (21 - 40%), 5 in (41 - 60%), 2 in more than 61%. Fetal mortality was 20 %.

**Conclusion:** Maternal mortality is related to Percentage of total burn surface area, inhalation injury, depth of burn and gestational age. Burn in pregnant females has a strong negative effect on fetal wellbeing and survival.

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**Corresponding Author** | Dr. Lubna Cheema (Assistant Professor, Department of Plastic Surgery, King Edward Medical University, Lahore) **Email:**

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#### Introduction

Burn injury, major source of morbidity and mortality in different parts of world especially in developing countries where more than 95% of fatal fire related burns occur. Four million females suffer from burn each year<sup>1</sup> Burn injury in pregnancy is associated with increased morbidity and mortality in both mother and fetus. It is directly related to the depth and total burn surface area.<sup>2</sup> Other factors affecting outcome include site of burn inhalation. injury, age of patient, gestational age, comorbidities like diabetes, hypertension and epilepsy.

Common Causes are flame burns / scald burns, chemical and contact burns. Causes may be accidental, homicidal or suicidal. Working in kitchen exposes females of repro-

ductive age to burn injury on daily basis.

Burn in pregnancy causes a threat to both mother and fetus simultaneously. Therefore, it has even being suggested to consider fetus as a second patient. Lethal burn injury to maternal body reduces chance of fetal survival leading to sudden in-utero death or complications like pre-maturity and spontaneous labor.<sup>3</sup>

Acute management of burn in pregnancy is of utmost importance. Main goal of management should be avoidance of hypovolemia, hypoxia and hypotension to reduce risk of complications like fluid and electrolyte, imbalance, infection and systematic inflammatory response syndrome, adequate nutrition, physiotherapy and psychological support are also important adjuncts. All therapies are directed

primarily towards saving mother as it is not clear from previous studies that either burn or resultant therapy cause delirious effect on fetal wellbeing.<sup>7,8</sup>

### Methodology

Retrospective study conducted in burn unit of Mayo Hospital / KEMU over a period of 3½ years from (June 2018-Jan2022). Inclusion criteria: pregnant females of any age presenting with flame, scald, electrical or chemical burns and both early/late presentation. Exclusion criteria: non pregnant females, patients needing direct gynecological assistance due to other complications of pregnancy. Data about all pregnant patients with burn presenting during this period was collected including Age, TBSA, depth of burn, anatomical site, mode of burn, gestational age, Hospital stay and treatment and fate of mother and fetus was documented. All the patients were managed with burn care including fluid resuscitation, fasciotomies and tracheostomy if required, wound care, nutritional support and physiotherapy. Serial ultrasounds for viability of fetus were done. Management was done in collaboration with Gynae and Obstetric department. Wound care included use of interactive dressings, wound debridement, tangential excision, fascial excision and skin grafting.

### Figure 1: Degree of Burn

a) Superficial partial thickness burn



b) Mixed thickness burn (Superficial & deep partial thickness) c) Full thickness burn

d) Chemical burn (Acid burn – Full thickness)

### Results

Total of 30 pregnant females were admitted in burn unit (June 2018 - Jan2022) during this period. Mean age was  $26.2 \pm 5.17$ , with 25 patients less than 30yrs of age ( $25 \pm 3.82$ ) and 5 patients above 30yrs ( $34.6 \pm 3.14$ ).<sup>21</sup> 12 Patients had gestational age <28 weeks (66.7%) and 9 patients with >28 weeks of gestational age (33.5%). Mean gestational age was  $23.5 \pm 8.0$ . 6 patients (10%) were primigravida and 24 were multi-gravida. Common causes of burn were flame burn 20 patients (66.7%), scald burn 9(30%), chemical burn 1(33.3%). 13(43.3)patients had TBSA < 20%, 10(33.3%) had TBSA (21-41%), 5 (16.7%) had TBSA(41- 60%) and 2(6.7%) had TBSA >61%). 14(46.7%) patients had superficial partial burn,

3(10%)had deep partial, 6(20%) had mixed pattern and 7(23.3%) full thickness burn (Fig 1).12(40%) presented within 12hrs, 13 (43.3%) between 12 – 24 hours and 5(16.7%) after 24hrs. 12 patients had fluid

**Table 1:** Correlation of Material Outcomes with clinical data

Patient characteristics	Maternal Survival (%)	Maternal death (%)	Total (%)	P value
Patient Number	22 (73.3)	8 (26.7)	30 (100)	
<b>Age of Patient</b>				
≤30 years (n=25)	18 (81.8)	7 (87.5)	25 (83.3)	0.7
>30 years(n=5)	4 (18.2)	1 (12.5)	5 (16.7)	
<b>Gestational Age</b>				
≤28 Weeks (n=20)	17 (77.3)	3 (37.5)	20 (66.7)	0.04
>29 Weeks(n=10)	5 (22.7)	5 (62.5)	10 (33.3)	
<b>Presentation in emergency after burn</b>				
≤12 hours (n=20)	10 (45.4)	2 (25)	12 (40)	0.03
13-24 hours (n=)	8 (36.4)	3 (37.5)	13 (43.3)	
>24 hours (n=10)	4 (18.2)	3 (37.5)	5 (16.7)	
<b>Clinical data</b>				
Mode of burn:				
<b>Flame burn</b>	13 (59.1)	7 (87.5)	20 (66.7)	0.18
Scald burn	9 (40.9)	---	9 (30)	
Electrical burn	---	---	---	
Chemical burn	---	1 (12.5)	1 (3.33)	
Total Burn surface area (% TBSA):				
≤20	12 (54.5)	1 (12.5)	13 (43.3)	0.04
21- 40	8 (36.4)	2 (25)	10 (33.3)	
41- 60	2 (9.1)	3 (37.5)	5 (16.7)	
>61	---	2 (25)	2 (6.7)	
Anatomical site:				
Head and neck	10 (45.5)	8 (100)	18 (60)	----
Upper limb	10 (45.4)	4 (50)	14 (46.7)	
Trunk	15 (68.2)	8 (100)	23 (76.7)	
Lower limb	7 (31.8)	4 (50)	11 (36.7)	
Perineum	1 (4.5)	3 (37.5)	4 (13.3)	
<b>Depth of burn (Clinically)</b>				
Superficial partial thickness burn (SPTB)	14 (63.6)	---	14 (46.7)	
Deep partial thickness burn (DPTB)	2 (24.5)	1 (12.5)	3 (10)	0.1
Mixed thickness (Both SPTB & DPTB)	4 (18.2)	2 (25)	6 (20)	
Full thickness burn	2 (9)	5 (62.5)	7 (23.3)	
<b>Inhalational Burn</b>				
Yes	10 (45.4)	6 (75)	16 (40)	0.04
No	12 (54.5)	2 (25)	14 (60)	
<b>Fluid resuscitation in first 24 hours</b>				
Complete	10 (45.4)	2 (25)	12 (40)	0.03
Inadequate	7 (31.8)	1 (12.5)	8 (26.7)	
Not done	5 (22.7)	5 (62.5)	10 (33.3)	
<b>Emergency procedures done</b>				
Tracheostomy	4 (18.2)	4 (50)	8 (26.7)	0.26
Escharotomy	12 (54.5)	7 (87.5)	19 (63.3)	
Fasciotomy	3 (13.6)	5 (62.5)	8 (26.6)	
Amputation	---	2 (25)	2 (6.7)	

resuscitation completed and 18 had inadequate or resuscitation was not done. 16 patients (40%) had inhalational injury and 14Pt (60 %) did not sustained inhalation injury. Mean hospital stay  $12 \pm 9.95$  days. 13 of our patients had comorbidities like hypertension(4), Diabetes (5), Epilepsy (3), stroke (1)(Table 2).

**Table 2:** Maternal outcome in relation to Cormorbidities

Characteristics	Alive (%)	Dead (%)	Total (%)	P value
Hypertension	2 (9)	2 (25)	4 (13.3)	0.04
Diabetes Mellitus	---	2 (25)	5 (16.7)	
Epilepsy	5 (22.7)	1 (12.5)	3 (10)	
stroke	---	1 (12.5)	1 (3.33)	
None	15 (68.2)	2 (25)	17 (56.7)	

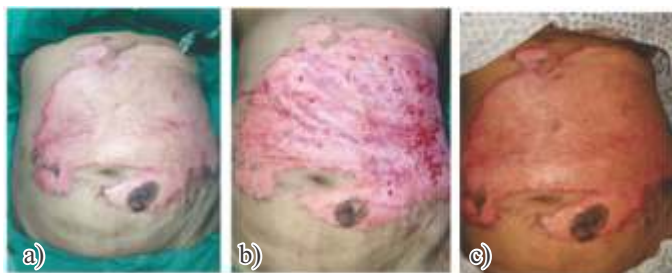
**Table 3:** Fetal Outcome

Characteristics	Total (%)	P value
<b>Fetal outcome</b>		
Ongoing pregnancy	15 (50)	---
Spontaneous expulsion	2 (6.7)	
Delivery at full term	5 (16.7)	
Premature birth	2 (6.7)	
Planned Caesarian section	3 (10)	
Sudden in-utero death	3 (10)	

### Maternal Outcome

Maternal mortality was 26.7%. There were 3 deaths in less than 28 weeks of gestation and 5 in more than 28 weeks of gestation (p-value .04). 1 death in less than 20% TBSA, 2 in (21-40), 3 in (41-60), 2 in more than 60%TBSA(p-value .04). 6 out of 8 patients who died had inhalational injury (p,-value .04) (Table1) .1 with incomplete resuscitation and 5 with no resuscitation (p-value .03). Correlation of clinical data with maternal outcomes is shown in table 1. Maternal complications leading to death were shock (n=4), septicemia (n=4), Respiratory distress(n=8), DIC (n= 5) and multi organ failure (n= 6).

**Figure 2:** Flame burn anterior abdominal wall – Superficial partial thickness burn



a) Day 2 after burn b) Wound after wound wash and curettage c) Day 9 – wound healed

### Fetal outcome:

Fetal mortality was 20%. There were 2 spontaneous

expulsions.2 premature birth,3 IUD, Delivery at full term was in 5 cases and planned C - section was done in three cases. Ongoing pregnancy in 15 cases.(Table 3).

### Discussion

In this study we found TBSA, delay in presentation after burn injury, inhalational injury and gestational age have significant effect on maternal and fetal outcome.

Burn injury in developing countries is a social issue. Working in kitchen exposes females of reproductive age to burn injury on daily basis in lower socioeconomic countries. It is rare in pregnant females but can have devastating effect on mother and fetus. Specific physiological changes occur during pregnancy to meet increased demands. Burn cause many changes which have an additional stress on system that are already highly modified. In pregnancy there is hyperdynamic cardiovascular status. Burn increases capillary permeability and third space loss leading to hypovolemia and hypotension if patient is not adequately resuscitated. This leads to placental insufficiency and fetal ischemia<sup>9</sup>. In case of inhalational injury and infection there is additional hypoxia in mother and fetus, thus increasing morbidity and mortality in mother and fetus.

Outcome of patients and fetus varies from one center to other. Highest incidence of burn during pregnancy is reported from India (7%-15 %). Different studies show maternal mortality ranging from 28.3 - 63%<sup>10</sup>. Ezatollah et al documented maternal mortality 29.2%<sup>11</sup>. In our study, a total of 30 women got admitted over a period of 4yrs and mortality was 26.7%. Most of the patients had large TBSA, Mixed and deep burns, inhalational injury and inadequate or no resuscitation. There were more deaths in patients with gestational age more than 28 weeks (n=5) as compared to less than 28 weeks (n=3). Similar was observed in study by Ezatollah. In a study by S. Mishra maternal mortality was 40% in first trimester, 66.7% in second trimester and 25% in third trimester.<sup>12</sup> Our Mean age was 26.2 (ranging from 20 - 35yrs) comparable to studies performed by Rezavand et al<sup>7</sup> Maghsoudi and Mago. Maternal mortality has direct relationship with TBSA.<sup>11</sup> Gaffar et al in their study of 32 patients showed that maternal mortality increased with burns more than 25% TBSA and was maximum in more than 50%TBSA<sup>13</sup>. In our study there were 2 deaths with TBSA ( 21 - 40% ).Both had deep burn and delayed presentation, 3 in (40-60%) and 2 in above 60%. Depth

of burn, delayed presentation, inhalational injury inadequate resuscitation had significant effect on maternal mortality. Burn precipitates abortion and premature labor in pregnant females.

Fetal mortality also varies in different series (27-72%). It increases with TBSA and Inhalational injury. In a study by Still J M fetal mortality was 18.8% and maternal mortality of 12%<sup>(14)</sup>. In our study it was 20% lower as compared to other studies but somewhere near to Still JM. There were 2 spontaneous expulsions and 3 IUD. 2 premature births, Delivery at full term in 5 cases and C-Section in 3 cases.

Management of burn during pregnancy is not easy rather challenging as it affects both fetal and maternal survival. For mother aim should be to minimize damage as much as possible. For fetus aim should be to reach full term being healthy. Minor burns might not affect pregnancy but burn > 30% can induce premature labor and/or fetal loss. In pregnancy there is hyperdynamic cardiovascular status and expanded total plasma volume to supply placenta. Burn increases capillary permeability and more fluid loss leading to hypovolemia and hypoxia. So we recommend 1) early and adequate fluid resuscitation to prevent hypovolemia and hypoxia, 2) Administration of antibiotics which are safe for fetus to combat infection and sepsis, 3) good oxygenation 4) special attention to management of comorbidities like diabetes and hypertension, 5) For wound management conservative approach is recommended especially surgery should be avoided in first trimester as anaesthetic drugs have adverse effect on fetus. Superficial partial thickness burns should be managed by interactive dressings. In Deep partial thickness minimal debridement followed by interactive dressing should be considered. Periodic ultrasounds for monitoring of fetus and management in collaboration with Obstetric team is very important. It is important to judge gestational period at the time of burn which helps in making decisions about obstetric intervention. In burns <20% and between 20-40% no obstetric intervention is recommended in first and second trimester and in third trimester conservative approach and closed fetal monitoring should be done. In extensive burns with late pregnancy and viable fetus termination of pregnancy should be considered. (Table 4).

Wound management should be done according to burn degree keeping in view patient condition. This includes use of interactive dressings and wound debridement/tangential excision and Skin grafting. In our study 18

patients underwent wound debridement, 6 tangential excision and 1 fascial excision. Interactive dressings were done in 21 pts. Skin grafting was done later to cover the wound.

**Limitations and Strengths:** As it was a retrospective study all the data was collected from medical charts of patients admitted in burn unit. We lack follow up of outcome of ongoing pregnancies after discharge and fate of all the babies delivered during hospital stay. Total of 30 patients were admitted during study period. We have tried to address almost all the factors effecting the maternal and fetal outcome. Not much literature is available on burns in pregnancy, there is need of more studies evaluating factors effecting the outcome and also including long term follow up of patients in regarding wound healing, fate of neonates delivered during hospital stay.

**Table 4:** *Obstetric management of patients*

TBSA	Gestational Age < 28 weeks	Gestational Age	Gestational Age
		28-36 weeks	>36 weeks
<20%	No obstetric intervention	Conservative approach Continuous monitoring	Induce labor/ C-section
20-40%	No obstetric intervention. Serial ultrasounds for fetal monitoring.	Careful fetal monitoring	Delivery within 48 hours
40-60%	No active intervention	If baby viable – induce labor /C- section IUD- no active intervention	
>60%	No treatment	C-section as an emergency procedure	

## Conclusion

Burn injury effects Maternal and fetal outcome. TBSA, depth of burn, gestational age, time of presentation, presence of inhalational injury and comorbidities all affect the outcome. Best is the prevention of burn. Early and adequate resuscitation, combating sepsis and collaboration with obstetric team is recommended.

**Conflict of Interest**

*None*

**Funding Source**

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