

Investigating Maternal and Fetal Outcomes in Burn Injury Cases During Pregnancy: Insights from a Major Burn Center

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Abstract

Objective: To determine the maternal and fetal outcomes of burn during pregnancy at a burn centre in a lower-middle-income country.

Material and Methods: This study was Retrospective and data was collected for 1 year. This retrospective study was conducted at the burn centre from 1st October 2022 to 30th September 2023 after obtaining ethical approval, and investigated outcomes in burned pregnant women. The data were extracted from patient records, supplemented by family contacts for missing information. A structured questionnaire systematically gathered essential data, including demographics (age, gestational age, parity, history of epilepsy), burn characteristics (depth of burn, intention and mode of burn, inhalational injury, TBSA involved, involvement of abdomen, pretreatment, blood transfusion, duration of hospital stay and surgical intervention), and maternal (discharged/expired) and fetal (IUD/Alive) outcomes.

Results: Out of twenty pregnant burn victims, 8 (40%) patients expired and 12 (60%) were discharged. Fetal outcome in terms of IUD and alive was 45% and 55%, respectively. When results were compared among discharged and expired groups using chi-square, it was statistically significant for gestational age, time of presentation, TBSA, inhalational injury, abdomen involvement and mode of burn ($p < 0.05\%$).

Conclusion: Burn incidents in pregnant women significantly adversely impact fetal and maternal well-being, especially in major burns.

Keywords: Burn, pregnancy, feto-maternal, outcome, flame burn, mortality.

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Introduction

Burn is a public health challenge worldwide, leaving long-lasting physical and psychological issues.¹

Approximately 90% of burn injuries take place in developing countries.² Burns are 4th most prevalent cause of injury, 5-12% of all global injuries and around four million females are affected annually.^{3,4} Burns in pregnancy are linked to many complications including abortion, intrauterine death, preterm labour, stillbirth, and maternal mortality and morbidity.⁵ The severity of the burn injury and the total surface area affected directly correlate with the feto-maternal outcomes.⁶ These complications arise due to hypervolemia, pulmonary injury, septicaemia, and a catabolic state. There are different modes of burns, including flame burns, scald, chemical, and contact burns.⁷ Majority of the chemical burns are due to assault or accidental.⁸ According to one local study conducted, the analysis revealed that no statistically significant difference was found

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between accidental and non-accidental unintentional and intentional burn injuries, except for the site involved (p-value 0.004), with the predominant cause of death being flame burns (81%).⁹ Burns can be superficial, deep or mixed type.¹⁰ According to another local study conducted in Islamabad shared results that accidental burns occurred in 79%, Kitchens were the most common accident site for females (27%), predominantly affecting housewives (35%), and Inhalational injury was observed in 23% of patients. On average, males had a total body surface area burned of 27.4%, while females had a higher average of 39.5% and among female patients mortality was 16%.¹¹ The acute management of burn injuries during pregnancy is of paramount importance, with a sharing burden on both surgeons and obstetricians, and the intensive care unit team with effort on preventing hypovolemia, hypoxia, and hypotension to minimise the risk of complications such as fluid and electrolyte imbalance, infection, and systemic inflammatory response syndrome. Additionally, ensuring adequate nutrition, implementing physiotherapy, and providing psychological support are crucial adjuncts to comprehensive care.¹²

Our study seeks to comprehensively investigate the demographic and burn-related characteristics of pregnant women experiencing burn injuries, aiming to identify key factors influencing maternal and fetal outcomes.

Material and Methods

After getting ethical approval from the institutional review board, this retrospective study is conducted at the Tertiary Care Burn Center. All burned pregnant women during the specified period from 1st October 2022 to 30th September 2023 were included without employing any exclusion criteria. After taking approval IRB No. 117/ED/JBRSC Dated 20-08-2022. Data was extracted from files, and in instances of incomplete data, we contacted the patients' families to obtain the missing information. All essential data, patient age, residence, parity, gestational age, total body surface area affected, burn intention, inhalational injury, mode of burn, involvement of abdomen, depth of burn, need for blood transfusion, surgical intervention, maternal and fetal outcome were systematically gathered from the patient's records utilizing a structured questionnaire. Data were analysed using SPSS 26, outcomes, and the characteristics of burn were calculated in terms of frequency and percentages. A comparison between discharged and expired

was done using chi-square with p-value <0.05 taken as significant.

Results

Table 1 shows factors affecting maternal outcomes and their comparison among discharged and expired. Out of twenty pregnant burn victims, 8 (40%) patients expired and 12(60%) were discharged. 30% of patients were <25 years and 70% > 25 years of age, and mortality was (6 out of 8) 75% among the >25 years age group as compared to <25 years of age. 60% of patients had

Table 1: Maternal Outcome

Characteristics		Dis-charged	Expired	Total	P
Age	<25y	4	2	6(30%)	0.6
	≥25	8	6	14(70%)	
Gestational age	<28	10	2	12(60%)	0.009
	≥28	2	6	8(40%)	
Duration of presentation	<24	9	2	11(55%)	0.02
	≥24	3	6	9(45%)	
TBSA	<30	10	2	12(60%)	0.005
	≥30	2	6	8(40%)	
Inhalational injury	Yes	1	5	6(30%)	0.009
	No	11	3	14(70%)	
Abdomen involvement	Yes	1	6	7(35%)	0.002
	No	11	2	13(65%)	
Intention	A	11	5	16(80%)	0.2
	H	1	2	3(15%)	
	S	0	1	1(5%)	
Thickness	Superficial	1	0	1(5%)	0.4
	Deep	1	2	3(15%)	
	Mixed	10	6	16(80%)	
Mode of burn	Flame	9	8	17(85%)	0.09
	Others	3	0	3(15%)	
Blood transfusion	Yes	1	4	5(25%)	0.03
	No	11	4	15(75%)	
Surgical Management	Yes	2	3	5(25%)	0.28
	No	10	5	15(75%)	
Stay	< 7days	4	3	7(35%)	0.8
	≥7days	8	5	13(65%)	
Parity	< 2	3	1	4(20%)	0.4
	>2	9	7	16(80%)	
Epilepsy	Yes	1	1	2(10%)	0.7
	No	11	7	18(90%)	
Pretreatment	Yes	1	3	4(20%)	0.1
	No	11	5	16(80%)	

(A Accidental, H Homicidal, S Suicidal)

a gestational age (GA) of < 28 weeks at the time of presentation. 55% of patients were presented within 24 hrs. after the burn, however, 45% took >24 hours, and only 20% had a history of pretreatment before coming to the hospital. Mostly intention of burn was accidental (80%) followed by homicidal (15%) and suicidal (5%). Only 2 out of 20 patients had a history of epilepsy.

30% had inhalation injury and 65% had involvement of gravid abdomen. 80% of patients had mix-thickness burns. Most burns were due to flames (85%), followed by others i.e., scald and chemical burns (15%). The percentage of total body surface area (TBSA) burned was categorised as <30% and >30%, showing percentages of 60% and 40% with high mortality of 75% calculated among TBSA >30% and only 25% survived, which is statistically significant at p 0.005. The duration of stay in the hospital was classified into 2 categories <7 days (35%) and >7 days (65%). 75% of patients were managed conservatively and 25% had surgery (fasciotomy/ escharotomy/excision plus superficial thickness skin grafting) while 75% were managed conservatively and 25% of patients were transfused with blood. When results were compared among discharged and expired groups using chi-square, it was statistically significant for gestational age, time of presentation, TBSA, inhalational injury, abdomen involvement and mode of burn (p <0.05%). However, results were not significant for the history of epilepsy, surgical interventions, blood transfusion, intention of burn, age, parity, the thickness of burn, duration of hospital stay and history of pretreatment before coming to the burn center. Fetal outcome in terms of IUD and alive was noted showing percentages

Table 2: Fetal Outcome

FETAL OUTCOME	N	PERCENTAGE
IUD	9	45%
ALIVE	11	55%

of 45% and 55% respectively (Table 2). Among IUD's all patients had spontaneous vaginal expulsion except one who had a C-section.

Discussion

We conducted this study to find out fetal and maternal outcomes due to burn and the important factors associated with the outcomes. In our review, flame was found to be the most common cause of burns 85%, followed by scalds and chemical burns. Supporting our results, many previous reviews also stated flame burn as the

commonest mode among adults 50-70%.^{13,14,15} contrary to this some studies were in favour of scald as the most common cause.¹⁶ Intention of burn was accidental (80%) followed by homicidal (15%) and then suicidal (5%). Also supported by a previous study that calculated accidental (unintentional) intention of burn among 79%-85% study population.^{11,17,18}

Results were not significant statistically for history of epilepsy, surgical interventions, blood transfusion, intention of burn, age, thickness of burn, duration of hospital stay and history of pretreatment before coming to Burn Center. First aid is necessary for burn patients before hospital admission but there is a lack of adequate knowledge on first aid and the rationale of their use, people use unsuitable substances on burn wounds all over the world.^{19,20} The Majority of patients presented within 24 hours of burn, however high mortality was calculated among those with delayed presentation that is greater than 24 hours. 35% of patients had involvement of gravid abdomen and 65% did not, results were significant with P <0.05. There was also high mortality among multiparous and having a gestational age of greater than 28 weeks and results were significant statistically, contrary to a previous study where the trimester of pregnancy was unrelated to maternal and fetal outcomes.²¹

When the duration of stay was compared, those with >7 days had high mortality as compared to those having less than 7 days stay. An important factor was the presence of inhalational injury among 30% of patients, with associated mortality calculated as 62.5% and significant with P 0.009. 60% had < 30% TBSA involved, 40% of patients had more than 30% area involved, and TBSA burned also affected overall mortality with a high expiry rate among the TBSA >30% group, these results were supported by previous studies.²¹ Burn increases capillary permeability and third space loss that results in hypovolemia and decline in blood pressure, ultimately causing placental insufficiency and fetal ischemia, with the additional presence of inhalational injury causing further hypoxia in mother and fetus, thus increasing mortality.²² In our study, in terms of feto-maternal outcomes 40% of pregnant females expired while 60% were discharged and 45% had IUDs while 55% alive issues. This mortality calculated for our study population was lower as compared to other studies among pregnant females.²¹ One study had better feto-maternal 18.8% and 12%, respectively and one study mortality was 43% which is close to our expiry percentage of 40%.^{23, 24, 25} One

local study on management and outcome of mother and fetus after burn also concluded that TBSA, burn thickness, gestational age, time of presentation after burn, presence of inhalational injury and affect the outcomes.²⁶ Raising awareness about the dangers of burn injuries in pregnant women is a critical step in reducing these high maternal mortality rates. Education on burn prevention, coupled with the implementation of immediate and appropriate medical responses, can significantly improve outcomes for both mothers and their unborn children. As healthcare professionals, we must advocate for increased resources, training, and public awareness campaigns to address this pressing issue.²⁷

Our study has certain limitations, retrospective, single-centered with a small sample size, data collected from the medical records, and we have not followed discharged patients to look for long-term feto-maternal outcomes. Given the limited existing literature on burns in pregnancy, there is a clear need for additional studies that not only explore factors influencing outcomes but also incorporate long-term follow-up assessments concerning wound healing in patients.

Conclusion

We concluded that burns during pregnancy significantly increase maternal and fetal mortality. Gestational age, time of presentation, TBSA, inhalational injury, abdomen involvement and mode of burn have significant effects on maternal and fetal outcomes.

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AW: Literature Search

MAY, MZ: Statistical Analysis

BA, FAK, RER: Drafting, Revision

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