



AN EIGHT YEARS RETROSPECTIVE STUDY TO ASSESS MATERNAL AND FETAL MORTALITY IN BURN WITH PREGNANCY

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ABSTRACT

This study was undertaken to assess the parameters that may predict maternal and foetal outcome in 170 thermally injured pregnant women in a Burn unit in Gandhi Medical College Bhopal in the past 8 years. Burns suffered during pregnancy is common and can be a devastating injury. The presence of a fetus creates many special maternal physiological changes, and the burn wound further adds to the stress on these body systems. In first and second trimester foetal survival depends on maternal survival and in the last trimester fetal maturity determines fetal survival. Maternal survival is low when the burn wound exceeds 50% of total body surface area. So the management protocol in a pregnant burn female has to be tailored, taking into consideration the additional factor of fetal well-being and the fetal susceptibility to various agents.

KEYWORDS : Pregnancy with burns, maternal survival and fetal well-being.

INTRODUCTION

Pregnancy and burns occurring together are not an uncommon phenomenon with rates highest in the developing world. The literature on burns in pregnancy is limited but this condition is fairly common in India. The incidence of female burn patients of reproductive age varies from 0.6%-15% in different series with highest incidence reported from India.¹⁻⁷ Burn injury during pregnancy creates a severe threat to baby, as well as to the mother.⁸⁻⁹

There are specific physiological changes that occur during pregnancy that may have an impact after thermal injury on maternal and foetal well-being. Thermal injury sustained during pregnancy causes problem in the management of gravid woman and her foetus. The paucity of published data on the specific problems of burnt pregnant women has made it difficult to determine the incidence morbidity, mortality rate or most effective management program for them. More information is required to provide management guidelines for plastic surgeons and obstetricians. The management of burns in pregnant requires a multidisciplinary approach with close monitoring of fetal and maternal well-being. For the mother the aim of the treatment is to heal the skin wounds and restore full range of function. For the fetus the aim of treatment is to make it reach full term being healthy without any obstetric complications. Treatment is more difficult in the first trimester of pregnancy because of the risk of abortion. When the mother is at or near term, delivery should be done as soon as possible. This study attempts to determine the risk factors responsible for maternal and foetal survival in so that appropriate intervention to lower the morbidity and mortality in burn patients with pregnancy.

MATERIALS AND METHODS

This is a retrospective study performed from 2010 to 2018 (till 15 October) including 4663 patients admitted in the Burn unit in Gandhi Medical College Bhopal. In all patients the extent of burns were calculated by using the rule of 9. A burn less than 10% in total body surface area (TBSA) was considered as a minor burn. A major burn was defined as a partial or full thickness burn affecting more than 10% TBSA with 10-30% being graded as moderately severe, 31-50% as severe and more than 51% as critical.

170 patients age ranging from 18 years to 35 years (mean age 23.08 years) were assessed. All knew about pregnancy at the time of injury. The percentage of TBSA varied from 8% to 100% (mean 71.47%). 19 patients had minor and 60 patients had major burns and 91 patients had critical burn. Resuscitation was successful in all patients except 8 who sustained 95% -100% burns and died within 48 hours of admission to hospital. The injuries were predominantly domestic and fire being most common causative agent. Gestational age at the time of injury varied from 8 weeks to 34 weeks with 43 cases in first trimester, 67 in second trimester and 60 patients in last trimester.

All patients received routine thermal injury care, including fluid resuscitation, wound care and nutritional support. Patients were treated with 1% topical silver sulphadiazine and systemic antibiotics when indicated according to culture /sensitivity report. Wound care included hydrotherapy, desloughing, escharectomies, debridement and skin grafting. None of the patients underwent early excision and skin grafting. Nutritional support included daily intake of high protein and calories according to the basal energy expenditure. Obstetric consultation was sought promptly on admission for each pregnant patient. Confirmation of pregnancy was done by history, pregnancy test and ultrasonography of abdomen. State of foetus was recorded at admission and monitored. Maternal assessment included cause of burn, site, depth and extent of burn and any other preexisting comorbid disease. Foetal outcome was assessed in relation to gestational age, maternal TBSA involvement and complications.

RESULTS

Table 1: Year and Sex wise distributions of patients

Serial No	Year	No of Male Burn	No of Female Burn	Total No of Burn Pt
1	2010	212	378	590
2	2011	220	360	580
3	2012	182	349	531
4	2013	174	329	503
5	2014	298	357	655
6	2015	210	355	565
7	2016	218	275	493
8	2017	132	324	456
9	2018(Till 15 Oct)	90	200	290
Total		1736	2927	4663

There is total 4663 patients admitted in burn unit out of this 1736 (37.22%) are Male and 2927 (62.77%) Female. So there is more female burn as compare to male.

Table 2: Year wise distributions of pregnant patients

Serial No	Year	No of Female Burn	No of Pregnant Pt
1	2010	378	20
2	2011	360	17
3	2012	349	21
4	2013	329	22
5	2014	357	23
6	2015	355	17
7	2016	275	16
8	2017	324	19

9	2018(Till15 Oct)	200	15
Total		2927	170

Table 3: Type of Burn in Pregnant patients

Type of Burn	No of Pregnant Pt	Percentage
Accidental	136	80%
Suicidal	25	14.70%
Homicidal	9	5.30%

Table 4: Etiology of Burn in Pregnant patients

Type of Burn	No of Pregnant Pt	Percentage
Flame	142	83.52%
Scald	17	10%
Electric(Flash Burn)	11	6.48%1

Out of 2927 female there is 170 female (5.87%) are pregnant and mostly are accidental (80%) in nature and flame burn (83.52) are most common by etiology.

Table 5: Cause of Death in Pregnant patients

Cause of Death	No of Pregnant Pt	Percentage
Burn Shock	24	14.11%
Septicemia	87	51.17%
Respiratory Complication	59	34.70%

The distribution of Cause of death in the burnt pregnant female group is shown that more than 51% of patients died due to Septicemia followed by Respiratory Complication 34.7%

Table 6: Distributions of Pregnant patients according to Gestational Age

Gestational Age	No of Pregnant Pt	Percentage
First Trimester	43	25.3%
Second Trimester	67	39.4%
Third Trimester	60	35.3%

The gestational ages of the burnt pregnant females are shown that the second trimester (39.4%) was the most common trimester followed by the third trimester (35.3%)

*Incidence of first trimester burns in this study is less due to these burns not reporting higher Center (tertiary center)

Table 7: Distributions of Burn female and pregnant patients according to TBSA

TBSA of Burn	No of Female Burn	No of Pregnant Pt
< 10%	227	19
11-30%	356	17
31-50%	709	43
51-75%	1169	78
>76%	466	13
Total	2927	170

The distribution of TBSA in the burnt pregnant female group is shown that more than 50% of patients in this study had a TBSA of > 50%.

Table 8: Distributions of Death of Burn female and pregnant patients according to TBSA

TBSA of Burn	Death of Non Pregnant Female	% Death of Non Pregnant Female	Death of Pregnant Female	% Death of Pregnant Female
<10%	Nil	0	Nil	0
11-30%	9	2.52	1	5.9
31-50%	297	41.9	29	67.4
51-75%	889	76	70	89.7
>76%	451	96.8	12	92.3
Total	1646		112	

The distribution of mortality in pregnant females compare to non-pregnant female according to the TBSA is shown that of same TBSA the death of pregnant females more as compare to non-pregnant females.

Table 9: Distributions of Death of Fetus according to TBSA

TBSA of Burn	No of Pregnant Pt	Death of Fetus
< 10%	19	Nil
11-30%	17	1
31-50%	43	32
51-75%	78	76
>76	13	13
Total	170	122

Table 10: Distributions of Outcome of Fetus according to TBSA

TBSA of Burn	Abortion	IUFD	Live Fetus
< 10%	Nil	Nil	19
11-30%	1	Nil	16
31-50%	5	27	9
51-75%	Nil	76	2
>76	Nil	13	Nil

A total of 112 (65.88%) women had dead fetus during hospitalization and 58 (34.12%) discharge with live fetus 46.

Table 11: Distributions of Death of Pregnant patients according to Gestational Age

Gestational Age	No of Pregnant Pt	Death of Pregnant Pt	Percentage
First Trimester	43	11	25.6
Second Trimester	67	44	65.7
Third Trimester	60	57	85.07

The distribution of Cause of death in the burnt pregnant female according to gestational age shown that more death 85.07% occurs in third trimester followed by 65.7% in second trimester.

DISCUSSION

Burns cause many maternal physiological changes, and places additional stress on systems that are already highly modified. Pregnancy is associated with hyperdynamic cardiovascular state. After burns there is increased capillary permeability and third space loss leading to hypovolemia, which may in turn lead to hypotension if the patient is inadequately resuscitated. This may lead to placental insufficiency, fetal ischemia, hypoxia and acidosis. All these events lead to premature labor. Thus aggressive fluid resuscitation, upright posture and oxygen supplementation should be provided to the mothers.^{7,9}

There is a linear co-relationship between the maternal total percentage of burns and the probability of death.^{6,10}The incidence is varying reported to be 6% from Israel by Benmier et al.,¹⁰ 7% by Taylor et al.¹¹ and Amy et al.,¹² 7.9% by Srivastav et al.¹³ and Gang et al. from Kuwait,¹⁴ 7% by Akhtar et al.,¹⁵ 13.3% by Jain et al.,¹⁶ and 15% by Prasanna from India.¹⁷ In the present study the incidence of burns during pregnancy over an 8-yr period was 5.8% and the fatality rate among patients with TBSA of 50% or more was 2.5 times the fatality rate among women with smaller burns.

In our study both maternal and foetal mortality were high. In the study of Akhtar et al.,¹⁵ which showed a maternal mortality of 70% and a foetal mortality of 72%, as also with those reported from Tehran by Mehdizadeth et al.,¹⁸ who found 62.1% maternal mortality and 72.8% foetal mortality. The total maternal mortality rate in our study was 59.5%. Khadziiski reported 100% maternal mortality among pregnant women with more than 50% TBSA burned.¹⁹ A higher mortality rate in patients with over 50% TBSA burned was also observed in our study (90.10% = 82/91). Similarly to other studies, ours study also found a positive correlation between higher TBSA burned and maternal and foetal mortality. We also found that women with more than 50% TBSA burned, in any trimester, had a

higher mortality rate, with sepsis being the commonest cause of maternal mortality. According to the distribution by TBSA the mortality% was higher in the pregnant group in compared with the nonpregnant females and mortality was higher in first trimester burns compared with second or third trimester burn. In our study, we concluded that pregnancy increases the mortality of burned women.

In the third trimester fetal loss is very high since 57 of the 60 mothers fetus loss occurs because most mothers having burn >50% TBSA. Therefore it is directly related with the extent of maternal thermal injury. In the second trimester fetal loss largely depended on maternal survival and majority of the fetuses survived if the mother survived the thermal injury. In the third trimester fetal survival is dependent more on gestational age and less on maternal survival. It is important to establish the gestational period precisely by the menstrual history (LMP) and foetal ultrasound examination at the time of the burn accident that in turn determine the choice of obstetric procedures and ultimate foetal outcome. Fetuses delivered before 24 weeks generally will not survive, while those delivered after 32 weeks will do well with modern neonatal intensive care if born without hypoxia or birth trauma. Ex-utero survival of fetuses between 24 weeks to 32 weeks is difficult to predict therefore when preterm labour occurs, pharmacological inhibition of labour should be considered. Tocolytic therapy may be of value in preventing premature delivery or as a temporary method of arresting labour while maternal homeostasis is restored.

There is a direct relationship between the total burn surface area (TBSA) and fetal viability: Fetal mortality is about 41.8% when the TBSA is <50% and 97.8% when the TBSA is >50%.²⁰ No case of IUFD was identified among women with less than 25% TBSA burned and 27 cases were seen in patients with 30-50% TBSA burn. 89 cases of IUFD occurred in women with more than 50% TBSA burn. All

patients with less than 30% TBSA burns survived and there were only 1 foetal death.

The high incidence of IUFD in pregnant women with severe burns may be attributable to insufficient foetal-uterine circulation. Since foetal health depends on maternal health, when the mother's course is not complicated by sepsis, hypotension, hypoxia, and death the chances of foetal complications are low.^{21,22,18,23-25,14} So early delivery could be performed in this burn group if the fetus is viable to save the fetus. The other concept that is confirmed is the grave effects of burn on the fetus that may lead to abortion or preterm delivery. Factors that are involved in this process include TBSA, hypovolemia, septicemia, pulmonary injuries, severe catabolism, hyponatremia, side effects of drugs pregnant women of up to 40% in volume. Extreme care should therefore be taken to initiate resuscitation therapy as soon as possible, since the mother's intravascular space is in equilibrium with the amniotic fluid.²⁵

However, fatal maternal injury can lead to sudden in-utero death or complications of prematurity following spontaneous labour.²⁶ It is recommended that viable pregnancies should be terminated as soon as the mother is resuscitated following severe burn injury. Prophylactic systemic antibiotics should be given to minimize the development of sepsis²⁷

Obstetrical management should be individualized. It is advocated that in viable pregnancies (>32 weeks) early delivery should be performed as soon as the mother is resuscitated following severe burn injury (>40% TBSA) as this may increase the rate of fetal survival.²⁸

Table presents a protocol that has recently been proposed by From Gang et al 1992. Its presenters do not suggest that the protocol should be applied rigidly in all cases but rather that it should be regarded as a useful general guideline.

Total % burn	Age of gestation		Management
< 30	First trimester		No obstetric interference
	Second trimester		No obstetric interference
	Third trimester	More than 36 wks	Induce labour / caesarian section
		Less than 36 wks	Conservative approach and monitoring of heart rate
30-50	First trimester		Foetal monitoring by ultrasound 3-4 wks
	Second trimester		Foetal monitoring every 3-4 wks. Tocolytic therapy
	Third trimester	More than 32 wks	Deliver foetus within 48 h
		Less than 36 wks	Careful foetal monitoring
50-70	First trimester		Terminate pregnancy
	Second trimester		Terminate pregnancy
	Third trimester	If baby is viable	Induce labour / caesarian section within 24h
		Intrauterine death	No active intervention up to 4 wks / monitoring of foetus of haemocoagulation factors
> 70	First trimester		No treatment
	Second trimester		No treatment
	Third trimester		Caesarian section as an emergency procedure at the earliest

Thus, in this study, it is the severity of the burn injury that appears to be responsible for poor maternal and foetal outcomes, as has been observed in other centres. The maternal and foetal outcomes and the difficulties in the management of these patients point to the fact that burn prevention measures have to be taken, especially in developing countries like India, where burns are a social disease.

CONCLUSION

Burns during pregnancy are more common in a developing country like India, where burns are more frequent among females. Since the majority of such burns are accidental in nature, there is an opportunity for prevention by teaching pregnant women certain forms of preventive behavior, such as not wearing synthetic clothes while cooking and avoiding the use of a kerosene stove while dressed in loose-fitting saris and gowns. Best chance for foetal survival is to ensure maternal survival. Maternal survival is less likely if the burn wound exceeds 50% total body surface area. Thermal

injury does increase the risk of spontaneous abortion and premature labour and foetal survival depends upon foetal maturity.

Based on our experience as well as a review of the literature, management recommendations are proposed. These include:

- (1) Early pregnancy test for all female patients of childbearing age
- (2) Prompt and aggressive fluid resuscitation
- (3) Early supplemental oxygen and low threshold for mechanical ventilatory support
- (4) Monitoring of the pregnancy by frequent ultrasound scanning and where possible, cardiotocographic monitoring
- (5) Early delivery of the fetus if the pregnancy is in the third trimester
- (6) High suspicion for venous thrombosis and sepsis, with early and aggressive treatment.

In order to reduce pharmacological therapy to the minimum possible and to accelerate the burn healing process (and thus improve prognosis), the majority of authors are favorable to early surgical intervention.

So finally conclude

- Most burns in pregnancy are accidental-in the 15-35 years age group and are flame burns at home.
- Fetal mortality is proportional to the TBSA burned and maternal survival
- Maternal mortality is proportional to the TBSA burned and its complication
- Best care possible should be offered using a team approach supervised by the obstetrician
- Early delivery of a viable pregnancy (>32 weeks) should be attempted after resuscitation if the TBSA burnt is 30-50% and termination of pregnancy should be done irrespective of gestational age if the TBSA burnt is >50%

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