



Original Research Article

Maternal critical illness with special reference to sepsis – A comparison

Malvika Misra¹, Shubhi Srivastava^{1*}¹Dept. of Obstetrics and Gynaecology, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

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ABSTRACT

Background: Critical illness in a pregnant lady may occur due to pre-existing medical diseases, from diseases that are concomitant to pregnancy, or conditions that are peculiar to pregnancy. Sepsis is a leading cause of critical illness with high maternal morbidity and mortality in India and worldwide as well. This study was performed to analyze critical diseases in pregnant, postpartum and postabortal women with particular focus on maternal sepsis in a tertiary care hospital in North India.

Materials and Methods: A prospective cross-sectional study was done to analyse all critically ill pregnant women and women within 42 days of delivery or abortion for a study period of one year. Based on the causes of critical illness, Group S (those having sepsis/septic shock) and Group O (those who had critical illnesses excluding sepsis) were defined. Demographic, clinical, microbiological and feto-maternal outcome were recorded and analysed after comparing the parameters between Group S and Group O.

Results: Out of 181 critically ill patients, 55 were due to sepsis and 126 were due to other causes. The prevalence of maternal sepsis was 8.4/1000 live births. Out of 181 cases, 75% of the cases were unbooked, 66.3% patients presented antenatally while 27.6% presented in postpartum period and 6.1% were postabortal. The number of maternal deaths attributable to maternal critical illness were 26 which included 61.5% due to sepsis and 38.5% due to other causes of critical illness. In terms of foetal outcome, preterm births were less common in Group S (40%) as compared to Group O (44.4%). NICU admission were also lesser in Group S (32.7%) as compared to Group O (40%). Group S had less number of perinatal deaths (7/55, 12.7%) as compared to Group O (19/126, 15.1%).

Conclusion: Critical diseases can make any pregnancy difficult to manage. Monitoring of early warning scores can tell in advance about the clinical deterioration. Maternal sepsis remains a dangerous cause of both maternal and fetal morbidity and mortality. Successful maternal and neonatal outcomes are largely dependent on early recognition and prompt management of maternal sepsis by a multidisciplinary team.

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1. Introduction

Critical care or intensive care is an important part of obstetric practice. We don't have any consistent definition of Maternal critical illness. A critically ill obstetric patient is a women who develops complications because of normal or abnormal pregnancy, delivery, puerperium and abortion, or as a result of the effects of systemic disease, which puts her existence in danger. Such a patient needs thorough

observation and proper treatment. Early identification and prompt treatment of critical illness is necessary for a favourable fetomaternal outcome. Maternal sepsis is the main cause of avoidable maternal critical illness in India, and thus it adds up to a significant proportion of maternal deaths and admissions to the intensive care unit (ICU).¹ The economic burden, mortality, and morbidity are remarkable.² During pregnancy, women have various physiological and anatomical changes. Moreover, pregnancy causes complicated immune responses, which causes an increase in infection.³ Sepsis causes an unchecked host response to

* Corresponding author.

E-mail address: dr.shubhi.ss@gmail.com (S. Srivastava).

the infections resulting in organ damage, and the most vital organs can be affected. The source of infection in puerperal sepsis can be either pelvic or nonpelvic. Most commonly the origin of antepartum cases of sepsis are nonpelvic. The intrapartum and postpartum cases of sepsis usually have a pelvic origin.^{4,5}

The maximum number of cases of sepsis usually present within 24-48 hours of delivery, abortion, or rupture of membranes.⁶ We don't have much knowledge about the epidemiology, causes, incidences of maternal morbidity caused as a result of sepsis. Moreover, the outcome of maternal sepsis is unknown in developing countries like India.

We, therefore require a unanimous definition of severe infection in the clinical diagnosis for uniformity all over the world. This will allow proper management and facilitate accurate incidence reporting, which will influence health strategy and research, and prevent heterogeneity in these areas. The Confidential Enquiry into Maternal and Child Health in the United Kingdom pointed the significance of early identification and treatment of severely ill pregnant women and routine use of modified early obstetric warning scores (MEOWS) to be used for obstetric patients.⁷

WHO developed an obstetric specific consensus definition in 2017, stating that: "Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period."⁸ Sepsis-3 defined septic shock as sepsis associated with vasopressor requirements to maintain a mean arterial pressure (MAP) ≥ 65 mmHg in the absence of hypovolaemia and a serum lactate >2 mmol/l.⁹ A large number of maternal deaths are related with risk factors like lack of care, delivery in absence of a trained birth assistant, inaccessibility to healthcare facilities etc.^{10,11}

We can reduce the risk of maternal mortality and morbidity from sepsis by improving the healthcare facilities. Since the rates of sepsis are increasing worldwide and there is less data from developing countries like India, we did this study to analyze the clinical profile, fetomaternal outcome of maternal sepsis and percentage of sepsis in critically ill pregnant, postpartum and postabortal women.

2. Aims and Objectives

- 1. To find out prevalence of maternal sepsis in a tertiary care Institute in North India.
- 2. To compare feto-maternal outcomes in maternal sepsis vs critical illness other than sepsis in pregnant, postpartum and postabortal females.

3. Material and Methods

This study was done from 1st January 2020 to 31st December 2020 in the department of Obstetrics and Gynaecology, Dr. Ram Manohar Lohia Institute of

Medical Sciences, Lucknow. It included all critically ill pregnant women irrespective of the period of gestation and women within 42 days of delivery or abortion(excluding accidental or incidental causes). The selection criteria for the study were as follows -

3.1. Inclusion criteria

All pregnant women, irrespective of the period of gestation and all women within 42 days of delivery or abortion who had a score ≥ 2 in the MEOWS (Chart 1).

Score	3	2	1	0	1	2	3
Temperature		$<35^{\circ}\text{C}$	$35-35.9^{\circ}\text{C}$	$36-37.4^{\circ}\text{C}$	$37.5-37.9^{\circ}\text{C}$	$38.0-38.9^{\circ}\text{C}$	$\geq 39^{\circ}\text{C}$
Systolic BP	≤ 69	70-79	80-89	90-139	140-149	150-159	≥ 160
Diastolic BP			≤ 49	50-89	90-99	100-109	≥ 110
Pulse		<40	40-49	50-99	100-109	110-129	≥ 130
Respiratory Rate	≤ 10			11-19	20-24	25-29	≥ 30
AVPU				Alert	Responds to Voice	Responds to Pain	Unconscious
Urine output mLs/hr	<10	<30		Not Measured			

Chart 1: Meows

3.2. Exclusion criteria

- 1. Patients who refused to give consent.
- 2. Patients presenting with sepsis after 42 days of delivery or abortion.
- 3. Patients with sterile culture.
- 4. Covid positive patients.

All women who fulfilled the inclusion criteria were enrolled in the study and two groups were defined out of the cases selected. The groups were-

Group S – Patients who fulfilled the criteria of sepsis/septic shock.

Group O – Patients who had critical illnesses excluding sepsis.

3.3. Criteria of sepsis

- 1. **Two** of the following on atleast 2 occasions, at an interval of 4 hours:
- 2. Temperature $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$
- 3. Heart rate ≥ 100 beats/min
- 4. Respiratory rate ≥ 20 /min
- 5. WBC $\Rightarrow >17 \times 10^9/\text{l}$ or $\Rightarrow <4 \times 10^9/\text{l}$.
- 6. PaCO₂ <32 mmHg

Or

- 1. Purulent discharge from wound/drain.
- 2. Positive blood culture.

3.4. Criteria for septic shock

1. Persistent hypotension requiring vasopressors to maintain mean arterial pressure (MAP) ≥ 65 mm Hg.
2. A serum lactate level >2 mmol/L despite adequate volume resuscitation.

The cases were selected prospectively after recording their findings in MEOWS chart. The investigations done were complete blood counts, renal function tests, liver function test, serum electrolytes, blood sugar and coagulation parameters. Bacterial agents were identified by cultures of clinically indicated sites, including urine culture, vaginal swabs, episiotomy wound swabs, and caesarean wound swab. Chest Xray, ECG, MRI Brain, Oxygen saturation, CRP, serum lactate, serum pro-calcitonin, arterial blood gas analysis was done for all indicated cases. Patient's age, booking status, parity, gestational age, post-abortion or postpartum status, medical comorbidities, obstetric risk factors, organisms and their sources of infection was noted. The treatment strategy was individualized for each patient and was according to the protocols of our Institute. Maternal outcome were assessed in terms of admission to HDU/Intensive care unit, timing and mode of delivery and maternal death. Foetal outcomes were studied in the form of abortion, preterm birth, term birth, NICU admission, perinatal death. Ethical approval was taken from the Institutional Ethics Committee. The findings were recorded in a predesigned proforma.

Statistical Analysis was done using the Chi-Square test. Statistical analyses were performed with SPSS version 21.0 for windows.

4. Results

During the study period, 6571 deliveries occurred in our hospital. 181 patients were clinically diagnosed as critically ill as per our inclusion criteria. Out of 181 patients, 55 patients fulfilled the criteria of sepsis and 126 patients had critical illnesses excluding sepsis. The prevalence of sepsis and other critical illnesses was 8.3 per 1000 deliveries (55/6571) and 19.2 per 1000 deliveries (126/6571) respectively.

Demographic characteristics of patients of our study are given in Table 1. The mean maternal age was 30.0 years in Group S and 32.0 years in Group O. Majority of the patients were multipara in both the groups, 58.2% (32/55) in Group S and 67.4% (85/126) in Group O. 69.1% cases were unbooked in Group S, and 77.7% cases were unbooked in Group O. Both the groups had majority of patients from rural background, 70.9% (39/55) in Group S and 68.3% (86/126) in Group O. Most of the patients in both the groups had home delivery (67.3% in Group S and 53.17% in Group O). The duration of hospital stay was similar in both the groups. None of the demographic parameters had significant variation in between the two groups. This means that Group

S and Group O had almost similar demographic profile.

Sepsis was the most common cause which had 55 out of 181 cases (30.4%). Other causes were severe preeclampsia (21.5%), eclampsia (12.2%), postpartum haemorrhage (9.4%), ruptured ectopic (8.3%) and antepartum haemorrhage (7.2%) followed by haematological disorders (2.2%), renal disease (1.7%), dengue (1.7%), DVT (1.7%), cardiovascular diseases (1.7%). (Table 2)

In this study, sepsis was most common in the postpartum period (52.6%) while other critical illnesses were more commonly seen in antepartum period (86.8%). This result was highly significant.

Preterm deliveries were less common in Group S (38.2%) as compared to Group O (52.4%). Group S had 22(41.8%) admissions to ICU and 11(36.4%) admissions to HDU. While in Group O there were 34(9.5%) and 114(28.6%) admissions to ICU and HDU respectively. The incidence of HDU admissions was substantially higher in Group O as compared to Group S (p value <0.05). The mortality from sepsis was significantly higher (p value <0.05) in Group S (62%, 16/26) as compared to Group O (8%, 10/26).

Among the 55 women in Group S, there were 22 preterm births (40%), 19(34.5%) term births, 7(12.7%) perinatal deaths and 18(32.7%) NICU admissions. In Group O, there was a higher tendency of preterm births (44.4%), 35(27.8%) term births, 19(15.1%) perinatal deaths and 50 (40%) NICU admissions. (Table 3)

Genital tract infection was present in 47.2% of the women with sepsis. This was followed by wound infection (23.6%), urinary tract infection (18.2%) while in 11% of the patients, the site of infection remained undiagnosed (Table 4).

5. Discussion

After one year of this study, we came to the following conclusion that maternal age group between 21 to 35 years of age was most commonly associated with critical illnesses in obstetric population. The mortality rate were significantly higher in unbooked women than in booked women. This was similar to that found in the study by Shivananda et al¹² where maximum number of patients were also in the same age group. Majority of the female who had critical illnesses were multipara. Similar results were seen in the study done by Kumari et al¹³ where 51% were multipara. Sepsis alone was responsible for 30.4% of maternal critical illnesses. The most common source of infection was genital tract infection (26/55, 47.2%) which was similar to the study done by Acosta et al.¹⁴ Majority of the females had sepsis in the postpartum period (29/55, 52.7%), while other critical illnesses were more common in the antenatal period (104/126, 82.5%). In the study done by Knowles et al,¹⁵ Percentage of sepsis was 17%, 36% and 47% in the antenatal, intrapartum and the postpartum period respectively. In the study done by Timezguid et al¹⁶

Table 1: Characteristics of cases

Parameter	Group S (N=55)	Group O (N=126)	P value
Age (years)			
<20 years	08	19	0.926
21-35 years	31	77	0.549
>35 years	16	30	0.452
Parity			
Primipara	23	41	0.229
Multipara	32	85	
Booking status			
Booked	17	28	0.213
Unbooked	38	98	
Background			
Rural	39	86	0.722
Urban	16	40	
Place of delivery			
Home	37	67	0.077
Hospital	18	59	
Duration of Hospital Stay(days)			
1-10 days	07	16	0.995
11-20 days	36	64	0.068
>20 days	12	46	0.051

Table 2: Causes of critical illness

Cause	Number of cases (N=181)	Percentage (%)
Sepsis	55	30.4
Other causes		
Severe preeclampsia	39	21.5
Eclampsia	22	12.2
HELLP syndrome	01	0.5
Antepartum Haemorrhage	13	7.2
Uterine inversion	01	0.5
Ruptured ectopic	15	8.3
Liver disorders in pregnancy	02	1.1
Postpartum Haemorrhage	17	9.4
Renal Disease	03	1.7
Dengue	03	1.7
Cardiovascular diseases	03	1.7
Haematological disorders	04	2.2
DVT	03	1.7

perinatal complications were more in maternal sepsis, this was different in our study. Our study showed more perinatal deaths in Group O.

The mortality from sepsis was significantly higher (p value <0.05) in Group S (62%, 16/26) as compared to Group O (8%, 10/26). This is considerably greater than the data mentioned in other studies from India. Since our hospital is a tertiary care institute, patients from all cities around Lucknow are referred to our institute. 75% of the patients in our study were unbooked and were referred from peripheral health centres, who are usually not having availability of blood components, HDU and ICU facilities. This also has huge impact on the condition of the patient on arrival to our hospital as usually there is delay to seek adequate treatment

and the golden time period of management is lost. This study has a limitation that the data that has been collected is small to conclude and apply these results for a bigger population.

6. Conclusion

Critical illnesses have a very high fatality rate in obstetric patients. Currently, lack of data on the incidence, etiology, epidemiology, and outcomes in the pregnant population, especially in the developing countries, makes comparison and estimation of the burden difficult. Moreover, this lack of data makes it essential to research this subject to build a foundation for further studies and to decrease maternal and neonatal mortality and morbidity. So, we collected

Table 3: Maternal and neonatal outcome

	Total cases (n= 181)	Group S (n=55) N(%)	Group O (n=126) N(%)	P value
Timing of critical illness				
Antepartum	120	16(27.3%)	104(86.8%)	< 0.00001
Postpartum	50	29(52.6%)	21(16.7%)	< 0.00001
Postabortal	11	10(18.1%)	01(0.8%)	< 0.00001
Pregnancy outcome				
Preterm deliveries	87	21(38.2%)	66(52.4%)	0.078
Term deliveries	60	19(34.5%)	41(32.5%)	0.792
Abortion	19	14(25.5%)	05(4%)	0.00001
Ectopic pregnancy	15	01(1.8%)	14(12%)	0.037
Mode of delivery				
CS delivery	84	22(40%)	62(49.2%)	0.253
Instrumental delivery	16	05(9%)	11(8.7%)	0.937
Vaginal delivery	47	13(23.6%)	34(27%)	0.636
Maternal Complications				
Surgical intervention	18	06(21.8%)	12(4.8%)	0.774
HDU admission	125	11(36.4%)	114(28.6%)	< 0.00001
ICU admission	56	22(41.8%)	34(9.5%)	0.081
Maternal death	26	16(29%)	10(8%)	0.00019
Foetal/neonatal outcome				
Live, Preterm birth	67	22(40%)	56(44.4%)	0.578
Live, term	54	19(34.5%)	35(27.8%)	0.360
NICU admission	68	18(32.7%)	50(40%)	0.374
Perinatal deaths	26	07(12.7%)	19(15.1%)	0.678

Table 4: Site of infection in sepsis

Site of infection	Number of cases (N=55)	Percentage (%)
Genital tract	26	47.2
Urinary tract	10	18.2
Wound infection	13	23.6
Other	06	11

this one-year data on maternal critical illness with special reference to sepsis was and through this we came to the conclusion that lack of antenatal care and delay in referral to tertiary care centre negatively affects the results in critically ill pregnant, postpartum and postabortal females. Sepsis is alone responsible for significant proportion of maternal critical illnesses, thus increasing maternal morbidity and mortality. Critical illnesses other than sepsis have an increased risk for preterm delivery, NICU admissions and perinatal deaths. Hence, to improve maternal critical care, the goal must be early recognition of the warning signs and timely intervention. Pregnancy is a physiological condition, and both maternal and foetal prognosis remains good if she receives timely intervention and management by a multidisciplinary team in case of a critical illness.

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8. Conflict of Interest

Authors declare no conflicts of interest.

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None.

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Author's biography

Malvika Misra, Associate Professor

Shubhi Srivastava, Senior Resident

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