

Original Research Article

# Critical analysis of maternal deaths from sepsis in a tertiary care center and lessons learned

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## Abstract

**Background:** Maternal mortality in India is reported to be 300 to 500 per 100,000 births in the Bulletin of World Health Organisation. It is far away from Millennium development goal 5 where it is required to reduce MMR to 109 per 100, 000 live births. Sepsis in pregnancy continues to be the third leading cause of preventable maternal deaths in India, still accounts for up to 10 to 50% of maternal deaths in our country.

**Aim:** It was to critically analyze all the mothers who died due to sepsis in order to identify factors associated with deaths.

**Materials and methods:** This prospective study was carried out in the labor room, Department of Obstetrics and Gynecology, King George hospital, Andhra Medical College for a period of twelve months from November 2016 to October 2017. All the mothers who died due to sepsis were included in the study and they were all analyzed modelled on the United Kingdom Confidential Enquiries into maternal deaths.

**Results:** During the study period there were 44 total maternal deaths out of 5863 births giving maternal mortality ratio of 641 per 100,000 maternities. Out of 44 maternal deaths, 14 were due to sepsis making it the leading cause of maternal mortality in our institute. Out of fourteen deaths due to

sepsis nine were due to direct causes and the remaining five were due to indirect causes such as pneumonia, sickle cell disease with malaria, and pancytopenia. The ages of the women who died ranged from 19 to 38 years with a median age of 26 years. All had normal body mass index. Five women who died were tribals, six from rural areas and the remaining three from slums of urban areas. Eight women were primigravid. Eight women died from sepsis in the antenatal period, two deaths were in the first trimester after criminal abortion, three due to pneumonia, one had intrauterine dead fetus infected and the other was due to pancytopenia. Four deaths were due to genital tract sepsis after cesarean section and two were due to genital tract sepsis after normal delivery. These six had risk factors such as anemia, prolonged rupture of membranes etc.

**Conclusion:** In few cases, the outcome was inevitable, but for majority it might have been different had the infection been diagnosed and treated more promptly. There are lessons learned from the deaths of these women to improve the survival of mothers and to achieve millennium development goal 5.

### **Key words**

Maternal sepsis, Goal directed therapy, Surviving sepsis guidelines, Maternal death, Critical care.

### **Introduction**

India has the largest number of births per year in the world. With its high maternal mortality of about 300–500 per 100 000 births, about 75 000 to 150 000 maternal deaths occur every year in India [1]. This is about 20% of the global burden hence India's progress in reducing maternal deaths is crucial to the global achievement of Millennium Development Goal 5. Moreover, Maternal Health is an important aspect for the development of any country in terms of increasing equity and reducing poverty. The survival and well-being of mothers are not only important in their own right but also central to solving broader, economic, social and developmental challenges. Janani Suraksha Yojna, that aims to reduce maternal mortality among pregnant women by encouraging them to deliver in government health facilities, has resulted in a steep rise in demand for services in public health institutions with the institutional deliveries registering a substantial increase since its inception in 2005 by Government of India [2]. Sepsis in pregnancy continues to be the third leading cause of preventable maternal deaths in India, still accounts for up to 10 to 50% of maternal deaths in our country even in institutes. Early recognition and timely treatment is the key to ensuring a favorable outcome [3].

### **Materials and methods**

This prospective study was carried out in the labour room, Department of Obstetrics and Gynaecology, King George hospital, Andhra Medical College, a tertiary care centre in Andhra Pradesh, for a period of one year from November 2016 to October 2017. The study setting is one of the largest tertiary care center in the state of Andhra Pradesh, King George Hospital, Visakhapatnam where pregnant women are referred from 100 to 200 kilometers surrounding the Hospital including tribal areas. There are around 20 admissions per day to the Labor room out of which five to seven on an average are referrals. All the women admitted during pregnancy or within 42 days of termination of pregnancy or delivery who died of sepsis were included in the study. Pregnant women who died of sepsis due to other incidental causes such as pneumonia and other infections other than genital tract sepsis were also included. Women who were not pregnant or women who died of sepsis due to peritonitis secondary to ruptured ectopic pregnancy or hemorrhagic corpus luteum were not included in the study. All the case sheets of 44 women who died of sepsis were analyzed critically modeled on the United Kingdom Confidential Enquiries into maternal deaths. Data was collected using structured proforma from the time of admission to the time

of death. Information contained socioeconomic background, time of occurrence of death due to sepsis whether early antepartum, late antepartum, intrapartum or postpartum, demographic factors, risk factors, causes, time interval between admission and death, to identify failure or delay in diagnosing sepsis, failure to appreciate the severity of the woman's condition with resultant delay in giving appropriate treatment [4]. The definitions for sepsis used in this study were the specific criteria given by Surviving Sepsis Guidelines [3].

SIRS is defined by any two of the following criteria:

Temperature >38 or <36°C; Heart rate >90 beats/min; Respiratory rate >20 breaths/min or PaCO<sub>2</sub> <32 mmHg (4.3 kPa); White cell count: >12 000 cells/ml or <4000 cells/ml or 10% immature/band forms.

Sepsis is SIRS with infection

Severe sepsis is sepsis associated with organ dysfunction, hypoperfusion or hypotension. Hypoperfusion and perfusion abnormalities may include, but are not limited to, lactic acidosis, oliguria or an acute alteration in mental status.

Septic shock is defined as sepsis associated with hypotension, despite adequate fluid resuscitation along with the presence of perfusion abnormalities as listed for severe sepsis. Patients who are on inotropic or vasopressor agents may not be hypotensive at the time that perfusion abnormalities are measured.

## Results

Total live births reported during the study period from the study setting were 5863 in one year. Total number of pregnant women who died was 44 giving a maternal mortality ratio of 641 per 100,000 live births. Maternal mortality ratio in our institute still continues to be very high when the target of MDG5 was to reduce the MMR to 109 per 100,000 live births by 2020 [5] and it is almost five times higher than the National MMR of 167 reported in 2013 [6]. MMR in an institute in Government Medical college, Thiruvananthapuram, Kerala is 139 for the year 2011- 2012 [7]. Maternal death rate in the UK is 9.02 per 100,000 maternities for the years 2012-2014 [8]. This is given in **Table - 1** just to realize how far we are from achieving the MDG5 and figures of developed nations and the huge number of lessons need to be learned in achieving these targets.

**Table – 1:** MMR of our institute compared with Kerala, National statistics, and the UK.

	Andhra medical college, Visakhapatnam. (2016-2017)	Government medical college, Kerala. (2011- 2012)	National statistics of India. (2013)	UK (2012-2014)
Maternal Mortality Ratio per 100, 000 live births	641	139	167	9.02

Fourteen women died from sepsis making it the leading cause of maternal mortality in our institute. There were thirteen maternal deaths due to hemorrhage and six mothers died because of hypertensive disorders. Causes for 44 maternal deaths in our institute is shown in **Table - 2**. Sepsis has been the third leading cause in Kerala for many years [9]. Sepsis has been the third leading cause even in our national statistics.

The ages of the women who died from sepsis ranged from 19 to 38 years with a median age of 26 years. All had normal body mass index. Five women were tribals, six from rural areas and the remaining three from slums of urban areas. All were of low socioeconomic status whose resistance to infections was low, nutritional status was poor and the facilities for transport were poor. Eight women were primigravid and

the remaining six were multigravid. Of fourteen deaths from sepsis, nine mothers died from direct obstetric causes and five from pneumonia, sickle cell anemia, malaria, and pancytopenia. The most common pathogens identified among these women were E.coli, klebsiella, pseudomonas, streptococcus and in one case it was methicillin resistant staphylococcus aureus. Among the mothers who died from sepsis, two died in early pregnancy, six women in third trimester, four women after cesarean section, one woman after normal delivery at home in a tribal village, and one lady from septic peritonitis after accidental bowel transection at the time of puerperal tubectomy in a rural health center. These are shown in **Table - 3**.

**Table – 2:** Causes of maternal deaths in KGH for the year 2016 – 2017.

Cause	No of maternal deaths	% out of total maternal deaths
Sepsis	14	31.81%
Hemorrhage	13	29.54%
Hypertensive disorders	6	13.63%
Respiratory diseases	5	11.36%
Heart disease	5	11.36%
Neurological causes	3	7.41%

**Table – 3:** Number of mothers died from sepsis in each trimester of antepartum period and in postpartum period.

Status of pregnancy at maternal death	No of maternal deaths	Rate per 100
First trimester	2	14.28%
Third trimester	6	28.57%
After normal delivery	1	07.14%
After cesarean section	4	42.85%
After tubectomy	1	07.14%

Two women who died in the first trimester were both multiparous living in tribal areas, had undergone a criminal abortion at six to eight

weeks, and came to the hospital in an irreversible septic shock, died within twenty-four hours after admission. They died from delays in first two levels. In 1994, Sreen Thaddeus of the United States Agency for International Development (USAID) and Deborah Maine, Professor Emerita at the Columbia University Mailman School of Public Health, linked causes of maternal mortality to “three delays:” delay in seeking care, delay in arrival at a health facility, and delay in the provision of adequate care [10].

Among six women who died in the third trimester one woman died of a direct cause. She had an unrecognized intrauterine dead fetus and had come to the hospital in septic shock and DIC. She died in seven hours of admission. Five women died from indirect causes, three had pneumonias, one had sickle cell disease complicated by malaria, one had pancytopenia.

Of six women who died in postpartum period one was after a normal delivery at home. She was admitted with septic shock fourteen days after delivery and died within 24 hours of admission. One woman underwent tubectomy in a rural health center where bowel was transected accidentally and had come to our institute 48 hours after surgery in septic shock. Although she was resuscitated immediately and relaparotomy done within three hours of admission she died two days after laparotomy. Among four women who died after a cesarean one was operated in a private hospital in a village where she developed severe genital tract sepsis was admitted with septic shock in IRCU where she died on seventh day from MRSA sepsis. Three women who underwent cesarean section died from sepsis on seventh to ninth postoperative days. All of them had risk factors for sepsis. There was delay in making the diagnosis though they were unwell for some time. Probably if Modified Obstetric Early Warning Scoring system was in place in our institute, sepsis would have been diagnosed early and clinical outcome would have been prevented though they progressed very rapidly. It was clear that doctors and nurses were unfamiliar with the signs and symptoms of sepsis, did not

realize when a woman was deteriorating or clinically ill and failed to appreciate how quickly the clinical condition of a septic woman can deteriorate.

**Table - 4** shows duration between the admission and death in these fourteen mothers who died of sepsis. Seven women died within 24 hours of admission, three women between 24 hours to 48 hours, and only three died between seven and ten days. Among 14 who died 11 were already seriously ill or moribund on arrival and deteriorated rapidly with little opportunity for altering the course of events.

**Table - 4:** Duration between admission and death.

Duration between admission and death	Number of mothers died
< 24 hours	7
24 to 48 hours	3
7 to 10 days	3

### Conclusion

Although 78% of our maternal deaths resulting from sepsis have come for admission in a moribund state in an irreversible septic shock died in 48 hours from admission, there are many lessons learned from the three maternal deaths that occurred in already admitted patients more than seven days after cesarean section. All the health care professionals need to be educated of the signs and symptoms of sepsis, early diagnosis of sepsis, and correct usage of maternal obstetric early warning charts which are indispensable in diagnosing critical illness in mothers, prompt surgical treatment wherever necessary. There was no delay in the administration of antibiotics or institution of resuscitation in our women. Broad spectrum antibiotics could be started for all within 30 minutes from admission. To prevent delays in first two levels; delay in seeking care, delay in arrival at a health facility, patients need to be educated by conducting awareness campaigns across the tribal and rural areas.

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