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Research Article

A Retrospective Study of Maternal Mortality in a Tertiary Care Hospital

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Abstract: Background: Maternal mortality in developing countries is twenty times greater than that of developed countries according to WHO. It is a strong indicator for measuring the women health care. Most of the maternal deaths are preventable with prompt medical care. **Aim:** To study the factors causing maternal mortality in a tertiary care teaching hospital for four years period from 2016 January to 2019 December. **Methodology**: The present study is a retrospective hospital based study done in a tertiary care teaching hospital King George Hospital in Andhra Pradesh, a state in southern India. King George hospital is multidisciplinary teaching hospital serves about 9,000 to 10,000 pregnant women annually with majority of high risk pregnancies. The data is collected from the hospital medical records. The study included all maternal deaths of delivered and undelivered, miscarriages, MTPs, Ectopic pregnancy and also medical disorders complicating pregnancy. Exclusion criteria include the cases of brought dead mothers, maternal deaths due to accidents and suicides. **Results:** The total number of maternal deaths are 160 in a period of four years. Majority of maternal deaths are unbooked (87.5%). Only 12.5% maternal deaths were booked. 56.5% of the maternal deaths occurred in the age group of 21 to 25 years. Majority (57.5%) of maternal deaths occurred in multigravida. Antenatal deaths constituted 32.5% of total maternal deaths. 54.9% were post natal deaths. 13.75% of maternal deaths due to illegal MTP outside the hospital and ruptured ectopic pregnancy. 57% of the maternal deaths were seen in first 48 hours of delivery. 34.8% of maternal deaths were between 2 to 7 days of delivery. 32.5% of maternal deaths occurred within 24 hrs of admission. Out of 160 maternal deaths, 120 (75%) deaths are due to direct causes. Remaining 40 (25%) maternal deaths contributed for Indirect Obstetric causes. Of all the direct obstetric causes haemorrhage both antepartum and post-partum haemorrhage which accounts for 27% of the maternal deaths, 23% accounted for Preeclampsia and Eclampsia and another 23% from sepsis. Heart disease, anaemia, dengue fever, viral hepatits, pulmonary embolism were the indirect obstetric causes of death. **Conclusion:** Most of the maternal deaths are due to unidentified high risk pregnancies and delayed referral to the higher centers. Health services need to be upgraded at all the levels of health care centers. The triad of haemorrhage, hypertension and sepsis are still occupying the important obstetric causes of death. Obstetric haemorrhage is still one of major causes of deaths indicates the need for blood transfusion facilities even at first referral unit. Early detection and referring the high risk antenatal women to tertiary care centers is to be encouraged.
Keywords: Maternal mortality, Hypertensive disorders, Shock, Sepsis.

Introduction

Maternal death is defined by WHO as the death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the site of the pregnancy, gestational age and a reason that

relates or aggravates due to pregnancy and its management but not from the accidental or incidental causes[1]. Maternal mortality is considered an indicator of health care delivery system reflecting access to quality of obstetric care as well as health status of women in reproductive age group. It remains a major challenge to the health system worldwide. Between 2000 to 2017 the maternal mortality rate dropped by about 38% worldwide. 94% of all maternal deaths occur in low and lower middle income group countries.[2] Globally 3,03,000 maternal deaths took place in 2015[3]. There is a considerable progress in India's MMR in recent years. The MMR ratio decreased by 77% from 556 per 1 lakh live births in 1990 to 130 per 1 lakh live births in 2016[4]. The MMR in India has declined to 113 in 2016-18. The MMR of various states in year 2016-18 by sample registration system has been given table 1below[5]. In India targeted rate of maternal mortality by 2020 is 100 per 100000 live births. The target 3.1 of Sustainable Developmental goals set by UN aims at reducing global maternal mortality ratio to less than 70 per 1 lakh live births[6]. Since the beginning of Safe motherhood initiative India's goal is to lower the maternal mortality to less than 100 per 100000 live births. The programs implemented by central and state government for better maternal health outcome are Janani SurakshaYojana, Pradhan Mantri Matru Vandana Yojana, Village health and nutrition days and wage compensation scheme for pregnant women. Although the increase in institutional deliveries has not resulted in considerable improvement in key maternal and new born indicators, the ministry of health launched labour room quality improvement initiative which aims at improving quality care in LR and OT which needs to be monitored[4]. Maternal mortality reflects the socio-economic status and the literacy of the women and also it indicates the quality of obstetric health care and its resources. Most of the maternal deaths are preventable when timely served.

Table 1. MMR of few states (2016-2018)

States	**MMR**
Assam	215
Bihar	149
Andhra Pradesh	65
Telengana	63
Karnataka	92
Kerala	43
Tamil Nadu	60
Gujarat	75
Maharastra	46

Aim and Objectives

The aim of the present study is to analyse the various causes that contribute to maternal mortality in a referral teaching hospital. The objective of the study was to identify direct and indirect obstetric causes of death and requirements and lacunae in the management of preventable causes of death.

Methodology

This is a retrospective study of maternal deaths in a tertiary care teaching hospital KGH, Visakhapatnam, Andhra Pradesh over a period of four years i.e. from January 2016 to December 2019. The data is collected from the hospital medical records with the permission of head of the department. The demographic parameters were noted including age, parity, antenatal registration, status of the pregnant woman at the time of death, admission to death interval, direct and indirect obstetric causes of death.

Inclusion criteria: All maternal deaths during pregnancy and within 42 days of delivery, ectopic pregnancy, septic abortions and mtps.

Exclusion criteria: all the cases of brought dead mothers, maternal deaths due to accidents and suicides.

Results

In the present study there were 160 maternal deaths occurred in our hospital in the period of 4 years. Of all 160 maternal deaths, 90 (56.25%) maternal deaths occurred between 21 to 25 years age group. 30 (18.75%) of maternal deaths were in younger age group i.e. less than 20 years and similarly at 26 to 30 years of age group contributed 29 (18.12%). Only 7 (4.375%) and 4 (2.5%) of maternal deaths were at the age groups of 31 to 35 years and more than 35 years age group consecutively as shown in table 2.

Table 2. Age wise distribution of maternal deaths

S. No.	Age (years)	No. of maternal deaths (Total deaths 160)	Percentage (%)
1	<20	30	18.75
2	21-25	90	56.25
3	26-30	29	18.125
4	31-35	7	4.375
5	>35	4	2.5

Among all the maternal deaths during this four years period, 140 (87.5%) were unbooked mothers and 12.5% deaths were booked mothers which is shown in below pie chart 1.

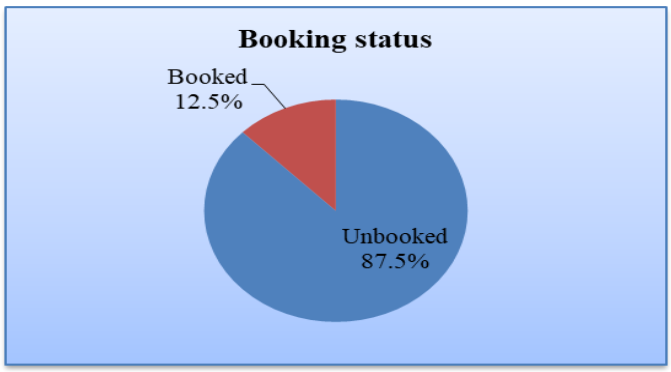

Figure 1. Booking status

In relation to parity, most of the maternal deaths occurred with multigravida 92(57.5%).

Table 3. Parity and maternal deaths

Parity	Number of maternal deaths
Primigravida	68 (42.5%)
Multigravida	92(57.5%)

32.5% of maternal deaths were in Antenatal period only. 53.75% of the deaths occurred after delivery. In these 27.5% of deaths after normal vaginal delivery, 24.375% after caesarean section and 1.875% of maternal deaths after instrumental delivery. Miscarriages contributed around 8.75% of the maternal mortality and 5% of deaths due to ruptured ectopic pregnancy.

Table 4. Status of the pregnant woman at time of death

Status of pregnant woman		No of maternal deaths (160)
Antenatal		52 (32.5%)
Postpartum	NDV	44 (27.5%)
	CS	39 (24.37%)
	Instrumental	3 (1.87%)
Ectopic pregnancy		8 (5 %)
Abortion/MTP		14 (8.75%)

In the present study 32 (38%) of deaths within 1 day of delivery, 17 (19%) occurred between 24 to 48 hours after delivery, 30 (34.8%) occurred between 2-7 days after delivery.

Table 5. Delivery–death interval

S.No.	Delivery to death interval in post-partum deaths	No of Maternal deaths (86)
1	0 to 1 day	32 (38%)
2	1 to 2 days	17 (19%)
3	2 to 7 days	30 (34.8%)
4	8 to 14 days	6 (7%)
5	15 to 42 days	1 (1.2 %)

In the present study 52 (32.5%) deaths occurred within 24 hrs of admission, 18 deaths occurred within 24 to 48 hrs of admission, 63 deaths occurred within 3-7 days of admission and 27 deaths occurred after 1 week of admission.

Table 6. Admission–death interval

Time interval	Number of deaths
< 24 hrs	52 (32.5%)
24–48 hrs	18 (11.25%)
3-7 days	63 (52.5%)
>7 days	27 (16.87%)

In the present study out of 160 maternal deaths direct obstetric causes led deaths were 75% in which nearly 3/4 deaths were caused by haemorrhage, preeclampsia, eclampsia and sepsis. 27.5% were due to haemorrhage which include both ante partum and post-partum haemorrhage, 23.33% deaths were due to hypertensive disorders of pregnancy and another 23.33% deaths were due to sepsis, 11% of deaths were due to abortions which include both spontaneous, medical termination of pregnancy and illegal abortions. 6.67% of deaths were due to ruptured ectopic pregnancy. 4.17% deaths were due obstructed labour.

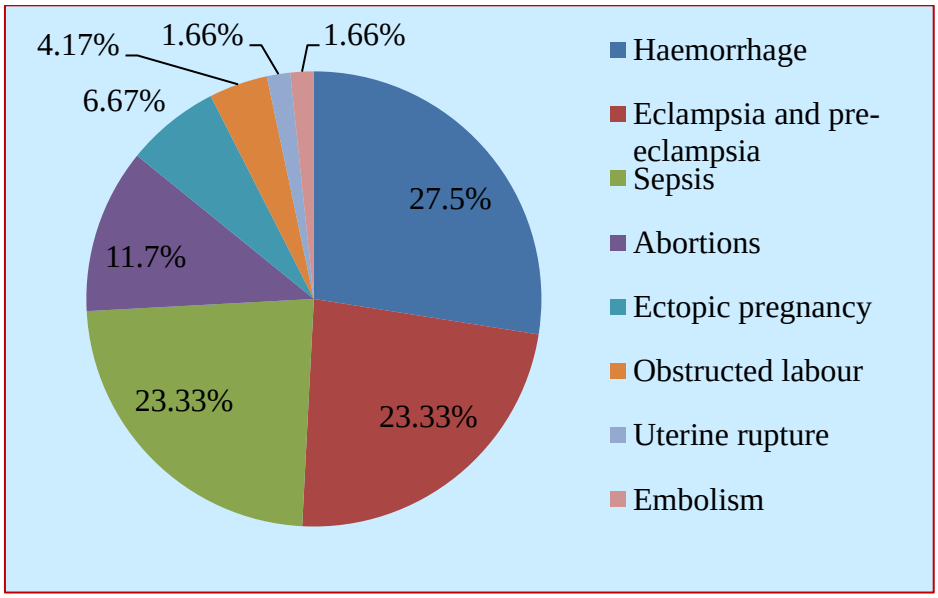

Figure 2. Direct causes of maternal mortality

On the other hand indirect causes contributed 25% of maternal deaths in this study. Of all indirect causes 8 (22.5%) deaths are due to heart disease complicated by pregnancy, 20% deaths due to anaemia, 12.5% with viral hepatitis, 20% with dengue fever, 7.5% with pulmonary embolism, 5% of

deaths with diabetes, 2.5% with thyroid disease, 2.5% with SLE and 7.5% due to infections which include Meningoencephalitis, Pneumocystis carinii pneumonia and swine flu as shown in below pie chart.

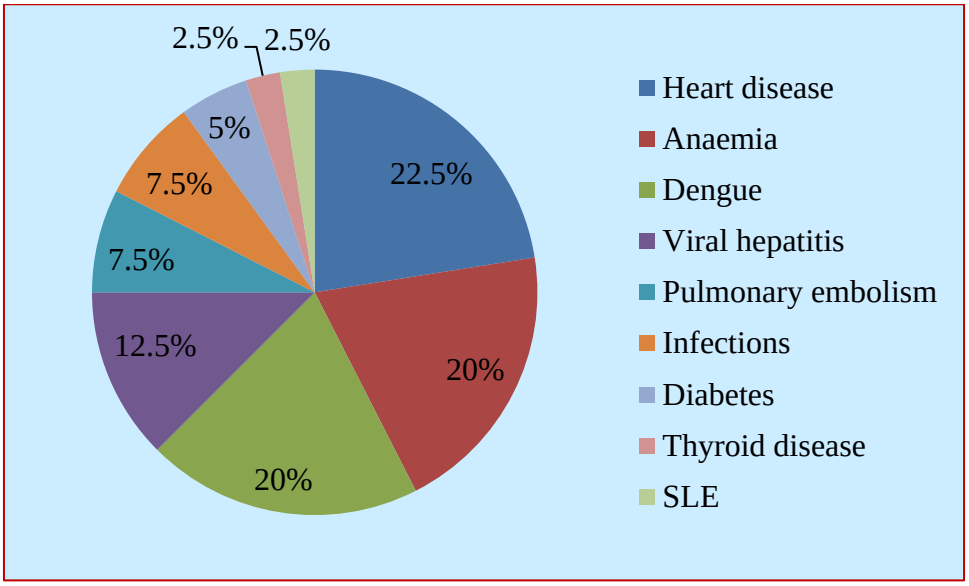

Figure 3. Indirect causes of maternal mortality

Discussion

MMR is considered a vital marker for the functioning of health system. Maternal death has a long impact on the family and society. Maternal death has an effect on the upbringing of surviving children. Low socioeconomic status, poor literacy, late referral, poor infrastructure facilities in the first referral unit etc., have impact on maternal mortality. In the present study there were 160 maternal deaths over a period of 4 years from 2016 to 2019. Most of these cases were referred from other hospitals of which, PHC, CHC and Area hospitals constituted major part. Delayed referrals, poor general condition of the patients at the time of admission were the cause of high maternal death rate.

In the present study, most of deaths occurred in the age group between 21-25 years. In a study by Yadav et al.[7] maximum deaths (72%) occurred between 20-29 years. Kapote et al[8]. reported (75.5%) deaths between 20-30 years. Suresh et al.[9] reported 48.7% deaths in age group 26-30 years. Where early marriage is still a custom in rural and tribal population, most of deaths occurred between age group of 21-25. Teenage pregnancies constituted 18% of total deaths. In teenage pregnancy there is extra demand of iron which is essential for the natural growth before the age of 21[10]. Preexisting anemic status with inadequate iron and folic acid supplementation in pregnancy may be the cause which increased mortality in teenage pregnant woman.

In the present study most of the cases were unbooked. The number of mothers who had regular antenatal visits in our hospital were 12.5%. This highlights the importance and requirement of adequate antenatal care. In booked cases no death reported because of anaemia, sepsis, rupture uterus, haemorrhage which were the important cause of maternal deaths. This indicates that most of the maternal death could be prevented by improved booking status of woman. Regular and meticulous antenatal care with intuition into associated risk factors plays an important role in early identification of complications and prevention of maternal death[11]. This is comparable to other studies, Yadav et al.[7] reported 94% of deaths in unbooked cases, Biradar et al.[12] noted (84%) deaths in unbooked cases.

In the present study majority of deaths occurred in multigravida (57.5%). Devi et al.[13] reported 57% deaths in multigravida, and 42% in primigravida. Yadav et al.[7] reported 56% deaths among

multigravida, Biradar et al.[12] reported 72% in multigravida and 28% deaths in primigravida. Sethi et al.[14] reported 59% of maternal deaths in multigravida and 41% in primigravida. Closely spaced pregnancies with poor nutritional status leads to increased mortality in multigravida.Multiple pregnancies without replenishing iron stores leads to increase mortality in multigravida. In the present study, 52 (32%) patients died in the antenatal period. 86 (52.8%) patients died in the postpartum period, 8(5%) of patients died after ectopic pregnancy and 14 (8.75%) died in post abortal period. Yadav et al.[7] reported 16% antenatal deaths, 72% post–natal deaths, 6% intranatal deaths. Kapote et al.[8] reported 65.3% post-partum deaths, 30% antenatal deaths. Biradar et al[12] observed 88% of deaths in postpartum period. Khandale et al.[15] reported 53% postpartum period, 24% antepartum, 7.65% intrapartum and 14% post abortal deaths. High number of deaths in post-partum period indicates the importance of monitoring in the post-partum period. In the present study 32(38%) of deaths within 1 day of delivery, 17(19%) occurred between 24 to 48 hours after delivery, 30(34.8%) occurred between 2-7 days after delivery.

In the present study 52 deaths occurred within 24hrs of admission, 18 deaths occurred in 24-48 hrs of admission and 63 deaths occurred within 7 days of admission. Biradar et al.[12] observed 48% of deaths within 6 hrs of admission, 24% of deaths within 7-12 hrs of admission. Sethi et al.[14] reported 27% of deaths took place within 1 hours of admission, 9% of deaths within 1-6 hours of admission, followed by 18% of deaths in 7-12 hrs of admission 14% of deaths in 13-24 hrs, 18% of deaths in 24-48 hrs of admission.

Kapote et al.[8] reported 34% of deaths occurred within 24 hrs of admission, 10% of deaths in 24-48 hrs of admission, 46% of deaths occurred after 72 hours of admission. Devi et al.[13] showed 2% of deaths within 1 hour of admission, 48% of deaths within 24 hrs of admission, 27% of deaths within 1-3 days, 14% of deaths in 4-7 days of admission and 7.22% of deaths were after 1 week of admission. As most of deaths occurred within 3-7 days of admission, it indicates the need for strengthening of emergency obstetric care even at primary health centre level which could save many lives. Availability of gynecologist, intensivist even at primary health centre leads to significant decrease in the maternal deaths. Out of 160 cases, 75% of deaths are due to direct obstetric causes. Out of direct causes, haemorrhage was the cause in 33 cases (27%), sepsis was the cause in 23% of causes and Hypertension (Preeclampsia and Eclampsia) constituted 23%. Yadav et al.[7] reported direct obstetric deaths in 73% of cases, indirect obstetric deaths in 26% of cases.

Table 7. Comparative analysis of direct causes of deaths in various studies

	Yadav	Devi	Suresh	Khandale	Sethi	Biradar	Present study
Haemorrhage (APH+ PPH)	43%	27%	23%	10.2%	31.8%	32%	27%
Hypertension (severe Preeclampsia + Eclampsia)	33%	23%	6%	28%	13.6%	16%	23%
Sepsis	12%	15%	49%	7.6%	13.6%	12%	23%
Embolism	10.5%	9.28%	11%	1.28%	4.5%	8%	

In the present study haemorrhage is the leading cause of death. Placenta previa cases, severe preeclampsia and eclampsia cases who are more prone to abruption and grand multipara, macrosomia, polyhydramnios who are prone to post-partum haemorrhage must be identified early. Early hospitalization, correction of preexisting anaemia, active management of third stage of labour reduces maternal deaths due to haemorrhage. Out of 9 cases of APH, 2 cases were central placenta previa with low haemoglobin levels. 7 cases were abruption placenta, among these 3 cases presented with abruption with disseminated intravascular coagulation and 4 cases presented with Abruption with DIC with IUD with Acute kidney Injury.

Among 24 cases of post-partum haemorrhage, 15 cases had atonic post-partum haemorrhage, 6 cases had traumatic post-partum haemorrhage. 1 case due to secondary post-partum haemorrhage, 1 death due to placenta percreta for which caesarean hysterectomy was done. 1 death due to colporrhexis after forceps application. Severe Preeclampsia and eclampsia was the cause of death in 28 cases. Out of them 19 cases deaths due to eclampsia and 9 deaths due to severe preeclampsia.

Among 28 cases, 8 deaths due to HELLP Syndrome with Acute Kidney injury, 10 cases due to HELLP with acute kidney injury with liver failure. 4 deaths due to acute pulmonary edema, 3 cases had intra cerebral haemorrhage, 3 cases had disseminated intravascular coagulation with multi organ dysfunction syndrome. All these cases of serve pre eclampsia and eclampsia presented in a critical condition where the end organ damage has already started. All these deaths could have been prevented by early detection of hypertension and early termination of pregnancy before the end organ damage. Regular BP monitoring of women in each and every antenatal visit and educating her about the warning signs of pre eclampsia can reduce complication due to hypertension. In the present study sepsis was the cause of death in 28 cases. Out of them 4 deaths due to post abortal sepsis and remaining due to puerperal sepsis. Intravenous antibiotics within one hour of suspicion of severe sepsis with or without septic shock is recommended.

Strict asceptic precautions during delivery, early referral and prompt administration of intra venous antibiotics at the suspicion of sepsis can reduce maternal mortality due to puerperal sepsis. Community health workers should be aware of importance of recently delivered women who feel unwell and have pyrexia. They should be aware of symptoms and signs of puerperal sepsis. Good quality supervision and strict vigilance and monitoring during postnatal, post-operative period for early detection of complications in the puerperium is needed.

In the present study, there are 5 deaths due to obstructed labour. Deaths due to obstructed labour could have been prevented by early detection of factors likely to produce prolonged labour and continuous vigilance, use of pantograph and timely intervention of a prolonged labour and timely referral to a higher centre. There are 2 cases of rupture uterus presented with hemorrhagic shock. Peripartum hysterectomy was done in these cases.

Indirect causes constituted 25% of material deaths. Out of them heart diseases constituted 20%, deaths due to anaemia (20%), diabetes (5%), viral hepatitis (12.5%), SLE (2.5%) pulmonary embolism (7.5%). Deaths due to dengue fever comprised 20% out of them 5 cases presented with dengue shock syndrome and7.5% due to infections which include Meningoencephalitis, pneumocystis cariniipneumonia and swine flu.

Similar results were seen in other studies.
Yadav et al.[7]reported 26.1 as indirect obstetric deaths, which include anaemia (14.9%), jaundice (6.2%), malaria (4%), gastroenteritis (1.03%). Biradar et al.[12] reported 32 % of indirect causes of obstetric deaths which includes heart disease (8%), CVA (8%), Anaemia (8%) jaundice (4%) and ARDS (4%). Kapote et al.[8] reported deaths due to heart disease (10%), liver disorders (6%), anaemia (8%) acute febrile illness and sepsis (10%). Suresh et al.[9] reported only 10% of indirect causes of obstetric deaths of which Gestational diabetes (14%), anaemia (43%), cardiac disease (7%), thyrotoxicosis (7%) carcinoma breast with extensive metastasis (7%), and depression (7%). Khandale et al.[15] reported 39% as indirect obstetric causes of death which includes heart disease (5%), hepatitis (6%), malaria (2.5%), ARDS (7.6%), Diabetes (2.5%), viral encephalitis (1.96%), Influenza H_1N_1 (2.5%) and CVE (3.8%).

Conclusion

Essential obstetric care, meticulous antenatal care, clean and safe delivery practices and family planning services which are four pillars of safe motherhood must be strengthened to reduce maternal mortality and morbidity. The triad of hemorrhage, hypertension and sepsis are still occupying the

important obstetric causes of death. Although safe birth attendants are giving $MgSO_4$ in severe preeclampsia and eclampsia, still early detection of hypertension is delayed.

Increasing the number of antenatal visits in third trimester for at least once a week may be solution for early detection of gestational hypertension. Strengthening the emergency obstetric care at first referral unit by employing a 24 hour obstetrician along with an intensevist along with ventilator facilities and dialysis units may be considered for reducing maternal mortality. Obstetric hemorrhage is still one of major causes of deaths indicates the need for blood transfusion facilities even at first referral unit. Regular maternal death review must be conducted. In confidential review of maternal deaths, the possible levels in the prevention of death must be sought and strengthening the areas where lacunae are found must be concentrated.

Conflicts of interest: The authors declare no conflicts of interest.

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