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ANALYSIS OF MATERNAL MORTALITY IN TERTIARY CARE HOSPITAL, VIJAYA NAGARA INSTITUTE OF MEDICAL SCIENCES, BELLARY, SOUTH INDIA

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ABSTRACT

The aims of the study were to help generate information and knowledge regarding the causes and complications leading to maternal deaths (MDs) in tertiary care hospital, to find if any of them are potentially preventable, and to use information thus generated to save lives. The medical records of all MDs occurring over a period of 15 years between January 1997 and December 2011 were reviewed and correlated with maternal age, parity, admission death interval, and causes of death. The maternal mortality rate (MMR) ranged between 459 and 1832 /100,000 live births in the study period. The causes of deaths were Eclampsia /Pregnancy-induced hypertension 32.53 %, hemorrhage 22.03 %, sepsis 16.69 %, anemia 14.80 %, hepatitis 4.64 %, other Indirect obstetrical causes 9.29 %. Maximum deaths 51.46 % occurred in women between 21 and 30 years of age while Primigravida had MMR of 50.60 %. Overall maternal mortality was 974 /100,000. MDs due to direct obstetric causes were 71.25 % and indirect obstetric deaths 28.75 %. The causes of potentially preventable deaths include deaths due to Eclampsia/Pregnancy induced hypertension, anemia, sepsis, hemorrhage, and their complications.

*Key Words: M*aternal Mortality, Direct Obstetric Death, Indirect Obstetric Death, Complication of the Pregnancy, Delivery or their Management

INTRODUCTION

Maternal mortality ratio (MMR) is number of maternal deaths (MDs) per 100,000 live births during a given period. Maternal mortality rate is number of MDs in a given period per 100,000 women of reproductive age during the same period. Direct MD is the result of complication of the pregnancy, delivery, or their management. Indirect MD is a pregnancy-related death in a patient with pre-existing or newly developed health problem. Other fatalities during but unrelated to pregnancy are nonobstetric/unrelated causes. Late MD is defined as the death of a woman from direct or indirect cause >42 days but <1 year after termination of pregnancy. Fortuitous or incidental causes are deaths from unrelated causes which happen to occur in pregnancy or puerperium (suicide, accident, murder).

Each minute of every day, at least one woman in developing countries dies, as a result of complications arising during pregnancy and childbirth .Global maternal mortality is at 358000 women per year, of which only 1% deaths occur in developed world while 99% occur in developing countries. In developed countries MMR averages at 14 per one lakh births. Developing countries have MMR of 290 per one lakh while underdeveloped countries have an MMR of 890 per one lakh births. Worldwide MMR is 260 per one lakh births (Trends in maternal mortality, 1990–2008).

An estimated 30 million women experience pregnancy every year and 27 million have live births. In India, 125,000 women die annually per year due to pregnancy-related complications (one death every 5 minutes). National average of MMR is 212/100,000 births (2007-2009), while in Karnataka it is 178/100,000 births and in Bellary district it is 182/100000 births. Decline in MMR estimates in 2007-09 over 2004-06: For India: 212 from 254 (a fall of about 17%), In Empowered Action Group (EAG) states & Assam: 308 from 375 (18%), Among Southern States: 127 from 149 (15%), In Other States: 149 from 174 (14%).

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MATERIALS AND METHODS

Vijayanagar Institute of Medical Sciences, Bellary, Karnataka, India is one of the biggest referral centres, A Government teaching general Hospital in Karnataka. It gets referrals from maternity homes, poly-clinics, rural and urban slums, district and primary health centers, other hospitals of middle Karnataka and Andhrapradesh. The present study was carried out in the Department of Obstetrics and Gynecology of this hospital. The medicalrecords of all MDs occurring in the peripartum period between January 1997 and December 2011 were reviewed irrespective of place of delivery and correlated with various factors like age, parity, admission death interval and causes of deaths. All women requiring hospital care were admitted irrespective of the availability of beds vacancy of ICU bed, or antenatal registration in the hospital.

RESULTS AND DISCUSSION

Between January 1997 and December 2011, there were a total of 59676 deliveries and 581 MDs. Year-wise distributions of deliveries, MDs, and yearly MMR are shown in Table 1.

Table 1: Year-wise distribution of deliveries and maternal deaths

Year	Deliveries	Maternal Deaths	MMR/100,000 births
1997	2511	46	1832
1998	2764	48	1737
1999	3054	32	1048
2000	3241	38	1172
2001	3455	32	926
2002	3730	40	1072
2003	3973	52	1309
2004	3917	31	1360
2005	4136	19	459
2006	3796	31	817
2007	5183	33	637
2008	4750	33	695
2009	4685	56	1195
2010	4855	45	927
2011	5626	45	800
TOTAL	59676	581	974

The mean Maternal Mortality Rate was 974 per 100,000 births.

Table 2: Maternal deaths as per age and parity

Maternal deaths as per age		
Age	No of Cases	Percentage
Less than 20 years	221	38.03%
20-30 years	299	51.46%
More than 30 years	61	10.49%
Maternal deaths as per parity		
Primigravida	294	50.60%
Multigravida	228	39.24%

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Grandmulti	59	10.15%

In our study, highest mortality of 51.46% was noted in the age group of 21-30 years, while mortality of 38.03% and 10.49 % was noted in women aged <20 and >30 years, respectively (Tables 2). Primigravida had maximum MMR of 50.60%, while multigravida (upto gravida 3) and grandmultigravida comprised 39.24% and 10.15 %, respectively (Table 2).

Direct obstetrical deaths include death from eclampsia and Pregnancy Induced hypertension (PIH) 32.53%, hemorrhage 22.03%, sepsis 16.69 %. Year-wise distribution of direct obstetric deaths is illustrated in Table 4.

Eclampsia and PIH accounted for 32.53%. Causes of death in Eclampsia includes pulmonary edema pneumonia,cerebral haemorrhage,acute renal failure, ARDS, pulmonary embolism, postpartum collapse etc.

48.53 percent of women died within 24 hours of admission, direct obstetric deaths occurred in 71.25% and indirect obstetric deaths in 28.75% (Table3).

Table 3: Admission to Death Interval

Interval	No of Cases	Percentage
Less than 24 Hours	282	48.53%
24 Hours to 7 days	242	41.65%
More than 7 days	57	9.81%

Table 4: Year wise distribution of Direct and Indirect Causes

cause	No of cases	Percentage
	Direct causes	
Pregnancy Induced Hypertension	189	32.53%
Haemorrhage	128	22.03%
Sepsis	97	16.69%
	Indirect Causes	
Anaemia	86	14.80%
Jaundice	27	4.64%
Others	54	9.29%

	DIRECT CAUSES [71.25%]			INDIRECT CAUSES [28.75%]		
	PIH/Eclampsia	Haemorrhage	Sepsis	Anemia	Jaundice	Others
1997	13[28.26%]	10[21.73%]	6[13.04%]	8[17.39%]	2[4.34%]	7[15.21%]
1998	10[20.83%]	7[14.58%]	13[27.08%]	8[16.66%]	2[4.16%]	8[16.66%]
1999	13[40.62%]	6[18.75%]	5[15.62%]	5[15.62%]	1[3.12%]	2[6.25%]
2000	8[21.05%]	12[31.58%]	4[10.52%]	7[18.42%]	2[5.26%]	5[13.16%]
2001	17[53.12%]	8[25%]	3[9.37%]	3[9.37%]	0	1[3.12%]
2002	15[37.50%]	7[17.50%]	5[12.50%]	8[20%]	3[7.50%]	2[5%]
2003	17[32.70%]	13[25%]	5[9.61%]	12[23.07%]	5[9.61%]	0
2004	7[22.58%]	10[32.25%]	6[19.35%]	6[19.35%]	0	2[6.45%]
2005	6[31.57%]	6[31.57%]	2[10.52%]	4[21.05%]	0	1[5.26%]
2006	18[58.06%]	4[12.09%]	5[16.12%]	1[3.22%]	1[3.22%]	2[6.44%]
2007	10[30.30%]	3[9.09%]	6[18.18%]	6[18.18%]	3[9.09%]	5[15.15%]
2008	8[24.24%]	6[18.18%]	9[27.27%]	3[9.09%]	3[9.09%]	4[12.12]
2009	17[30.35%]	14[25%]	13[23.21%]	7[12.5%]	4[7.14%]	1[1.78%]
2010	22[48.88%]	9[20%]	6[13..33%]	2[4.44%]	2[4.44%]	4[8.88%]
2011	11[24.44%]	10[22.22%]	9[20%]	6[13.33%]	2[4.44%]	7[15.55%]
Total	189[32.53%]	128[22.03%]	97[16.69%]	86[14.80%]	27[4.64%]	54[9.29%]

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Hemorrhage accounted for 22.03% of direct obstetric deaths and included atonic and traumatic postpartum hemorrhage in majority of cases. Sepsis cases included postabortal, surgical wound sepsis, puerperal sepsis.

Indirect obstetric deaths occurred in 28.75% women, and included deaths due to anemia 14.80%, hepatitis 4.64%, Other indirect causes constituted 9.29% of MDs and included anesthesia complication, acute blood transfusion reaction, surgical cause (gut perforation), aspiration syndrome and COPD cor pulmonale). Other studies show anemia deaths range from 4.8 to 27.27%, while in our study it was 14.80% (Table 4). The percentage of deaths due to anemia is a grossly underestimated figure because pre-existing anemia is a major contributory factor of direct obstetrical deaths due to PPH and sepsis.

Our study when compared with other Indian studies done in the last 15 years on the causes of MDs reveals a varying range of causes (Table 5).

Table 5: Causes of MD in various studies published

Studies	Nikhil Purandare et al., (2000-2005)	Pal Amitava et al., (1999-2004]	Anandalaxmi et al., (1979-1995)	Nishu Priya et al., (1999-2009)	Present Study
MMR	113	623	445	270	974
Admission death interval less than 24 hours				54.63%	48.53%
PIH	13.3%	50.56%	16.4%	27.8%	32.53%
Haemorrhage	70.83%	9.72%	2.6%	39.17%	22.03%
Sepsis	3.3%	18.17%	35.3%	18.55%	16.69%
Anemia	53.3%	4.18%		25.70%	14.80%
Hepatitis	3.3%	1.84%	12%	1%	4.64%
Others	10%	15.53%	33.7%	13.48%	9.29%

DISCUSSION

MD or maternal mortality is the death of a woman in relation to pregnancy. According to World Health Organization (WHO), "A maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by pregnancy or its management" (ICD-10).

During the study period of 15 years the MMR ranged between 459/100,000 to 1832/1,000,000 live births (Table 1). National average of MMR is 212/100,000 births (Office of Registrar General, India, 2011). Other Indian studies done in the last 15 years have shown wide variations in MMR ranging from 412/100,000 (1999) to 157/100,000 births (2005) (Nishu Priya et al., 2010). Pal Amitava et al., (2005) have observed the MMR of 623/100000 births[7]. Other studies conducted before 1997 have higher MMR ranging between 1450 to2063/100,000 births (Shankar and Seetharam, 2001). Only Nikhil Purandare *et al.,* (2007) reported MMR of 113/100,000 births (Nikhil Purandare, 2007). This variation could be explained due to many variables. This study has high MMR which can be due to the fact that it is one of the tertiary care referral government hospital that gets referrals from neighboring states as well.

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Our study showed that 51.46% of women die between the ages 21 and 30 years, as highest number of women belong to this age group. Nishu priya *et al.,* (2010) reported 74.22%. Similarly Primigravidas constitute 50.60% of MDs. Admission death interval analysis of our study revealed that 48.53% of women died within 24 hours of admission, possibly due to poor general condition of women on admission, late referrals, and at times due to a long travel time from neighboring states. Forty four percent of these women died within 6 hours of admission as they were in moribund or comatose condition. Nishu priya *et al.,* (2010) reported that 54.63% died within 24 hours of admission[5].

The analysis revealed that 71.25% of deaths are due to direct obstetrics causes and 28.75% due to indirect obstetrics causes. Other studies have shown variation in direct obstetrics deaths from 60 to 80%. Our figure of 71.25% is closer with Nikhil Purandare *et al* (2000 -2005) at 65% and Pal Amitava *et al.,* (2005) at 78.7%[7,8]. Nishu priya *et al* (1999-2009) reported 74.3%[5]. Percentage variation of indirect obstetrics deaths ranges between 17.2%[7] and 40%[6] and our study 28.75%.

Direct obstetric deaths accounted for 71.25% of all deaths in our study and included: Eclampsia and PIH 32.53%, Hemorrhage 22.03%, and Sepsis 16.69%.

Eclampsia and PIH account for 13% of MDs globally.Other studies reveal a large variation in eclampsia deaths between 50.56%[7] and 16.3%[8]. Our study had Eclampsia deaths of 32.53%. Year-wise analysis revealed that percentage deaths due to PIH have not changed significantly over 15 years. Active use of MgSO4 regimen, better monitoring and investigative facilities, and vigorous management techniques have failed to bring a significant decrease in eclampsia deaths.

Hemorrhage especially during postpartum period is sudden, unpredictable and is more dangerous when woman has preexisting anemia. Globally 25% of all MDs are due to hemorrhage. Other studies show variation between 9.72% and 70.83%[7,8]. In our study the rate of hemorrhage deaths was 22.03%. Year-wise analysis revealed no significant decrease in deaths due to hemorrhage. As most of the patients that died were transferred cases and four women died before blood could be made available it becomes apparent that many of the deaths that occurred could have been avoided if they were transferred earlier. In our study 44% of the patients died within 6 hours of admission further highlighting the need for adequate and quick transport facilities.

Sepsis which is a direct consequence of poor hygiene during delivery accounts for 15% of MDs globally[2]. In comparative analysis it varies between 18.17% and 35.30% (Pal Amitava *et al.,* 2005; and Nikhil Purandare *et al.,* 2000 -2005). In our study it was 16.69% which falls below the range but is higher than global figure. Year-wise analysis of our study showed no significant decrease in sepsis deaths. This is probably due to emergence of multidrug resistant strain of bacteria in the urban community, may be due to irrational use of higher generation antibiotics at peripheral level. Another cause is overcrowding in the inpatient wards.

Globally indirect obstetrics causes account for 19.44% of all MDs particularly from anemia, malaria, HIV, CVS disease, etc. Other studies show this range between 20%[7] and 45%[10]. In our study it was 28.75% and included deaths due to anemia 14.80%, hepatitis 4.64%, others 9.29% which includes respiratory diseases, heart diseases, surgical cause, CNS disease, and enteric fever .Other studies show anemia deaths range from 25 to 53%, while in our study it was 14.80% (Table 5).The percentage of deaths due to anemia is a grossly underestimated because pre-existing anemia is a major contributory factor of direct obstetrical deaths due to PPH and sepsis.

A significant finding of our study was the high mortality noted in cases of pregnancy complicated by PIH and Haemorrhage.

The Deaths due to anemia, eclampsia, sepsis along with hemorrhage, are considered potentially preventable causes.

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Conclusion

The classical triad of causes of maternal mortality in ourstudy remained eclampsia, hemorrhage and sepsis, in the same order. Reviewing maternal deaths over the last 15 years, there appears an urgent need to address the issue of early intervention in PIH and obstetric hemorrhages. It simply means that reproductive health care and MCH care needs to be strengthened at all levels.Much needs to be done for maternal health care in rural areas, as most of the deaths reported from urban institutions are referrals from peripheral centers. Many eclampsia cases occur in rural places where immediate treatment to arrest the seizures is not readily available. Despite the compelling evidence in favor of Mgso4, health personnel at primary care level do not administer Mgso4. Most of these women receive either no immediate treatment or receive some anticonvulsants like diazepam and sent to tertiary care centers for further management. Transportation of these highly irritable eclamptic women is far from ideal in India. since last 2 years we are training 24hours X 7days medical officers of Bellary district to give Mgso4 at PHCs and then transfer the case to our medical college Hospital. We are witnessing a change in the way eclampsia cases are handled at primary care settings. We are also training them regarding importance of management of anemia with emphasis on intravenous Iron sucrose, prevention of post partum haemorrhage by use of active management of labor and liberal use of oxytocics and also teaching measures to prevent sepsis. If this programme continues for further couple of years we will definitely see decrease in MD due to PIH etc.

The present study highlights the importance of early antenatal registration of all pregnancies and regular follow-up of cases by trained staff. Poor nutritional status, lack of antenatal care, lack of awareness of warning imminent symptoms of eclampsia, unsupervised/dai-handled deliveries, social bias toward blood donation, and late referrals are the major contributory factors leading to poor maternal prognosis.

The lessons learnt through review of records of MDs have helped us to identify the high-risk group, solely for the purpose of improving service-delivery system by ascertaining the cause of death, reason(s) for inability to provide appropriate care at appropriate time, and finding the key interventions at service-delivery level to prevent similar deaths. There should be active management of high-risk group by frequent ANC visits, direct consultant supervision, biochemical markers, fluid and component transfusions, aggressive management of infection, and closer monitoring of women in labor. Vigorous mass campaign for community-based maternal education program should be the top priority of all maternal and child health programs.

It simply means that reproductive health care and MCH care needs to be strengthened at all levels.

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