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MATERNAL DEATHS REVIEW: AN APPROACH TOWARDS IMPROVING MATERNAL HEALTH

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ABSTRACT: BACKGROUND: To achieve the Millennium Development Goals (MDG) adopted at the 2000 Millennium Summit, there are two targets for assessing progress in improving maternal health (MDG 5): Reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015 and achieving universal access to reproductive health by 2015. Closer examination of maternal mortality level is needed to inform planning of reproductive health programs, to guide advocacy efforts and research at the national and international levels, and to inform decision-making. The audit for the reasons for maternal mortality in a resource poor country is extremely helpful in not only identifying the reasons but also in identifying the preventable causes of maternal mortality. **AIMS & OBJECTIVE:** 1. To determine the causes of maternal mortality in NSCB Medical College and Hospital of Jabalpur. 2. To study the various socio-demographic factors associated with maternal mortality. **MATERIAL AND METHODS:** This is a record based study conducted at Obs and Gynae Dept of NSCB medical College, Jabalpur. Mortality Data from January 2012 to December 2012 was analyzed including for all pregnancy-related deaths, their demographic profile, including age, parity, antenatal care record, type of delivery, status of patient i.e., booked or not booked, diagnosis during admission, duration of the hospital stay, and cause of death by reviewing case sheet records. Gynaecological deaths were excluded in this study. Data entry as well analysis was done in Microsoft Excel. **RESULTS:** Eighty nine maternal deaths were recorded during study period. Most of the deaths were 87(98%) unbooked. Majority of the deaths were ANC primi i.e. 57(64%). The major direct cause for deaths were eclampsia 39(44%) followed by pre eclampsia 10(11%) and haemorrhage 7(8%). Severe anaemia 14(16%) followed by hepatitis 5(6%) were the most common indirect causes. Maternal mortality ratio was 2182/100,000 live births (89/4078). Antenatal care among all women was found in poor status. **CONCLUSION:** Obstetrical haemorrhage and hypertensive disorders are still major causes of maternal deaths. As most maternal deaths are preventable hence, provision of adequate and quality Antenatal Care, timely referral and management of complications can significantly contribute in reducing maternal mortality. **KEYWORDS:** Maternal mortality, pregnancy-related deaths, antenatal care, booked or unbooked cases, direct and indirect causes of maternal deaths.

INTRODUCTION: The health of women and children has always been an important social goal of all societies. Over the years, maternal health has evolved through various stages of conceptual approach, technological advances and social prioritization. The realization that, improved maternal and child health is the key to the ultimate objective of lifelong health in any society, has led to renewed interest and global focus towards this very important social health issue. A very important approach towards improving maternal health is to reduce the no. of maternal deaths.

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Maternal death, as defined by WHO as "the death of a woman while pregnant or within 42 days of the end of the pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes."^[1]

The lion's share of maternal deaths is attributable to direct causes like haemorrhage, eclampsia, infection (sepsis) and Indirect obstetric deaths result from previously existing disease or disease that developed during pregnancy not directly due to obstetric causes but are aggravated by the physiologic effects of pregnancy.

INDIAN SCENARIO: The maternal mortality ratio in India is 212 per 1,00,000 live births according to 2009 SRS, which is much above the objective of 109 per 1,00,000 live births as per the fifth Millennium Development Goal (MDG-5).^[2]

Approximately one quarter of all pregnancy and delivery related maternal deaths worldwide occur in India.

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%)

States realizing MDG target of 109 have gone up to 3 with Tamil Nadu & Maharashtra (new entrants) joining Kerala. Andhra Pradesh, West Bengal, Gujarat and Haryana are in closer proximity to achieving the MDG target.^[2]

Some of the national average key indicators as per DLHS2 have shown that 75.2% mothers had attended any ANC visit and 51.1% had seen 3 or more visits. 47% had institutional deliveries. 46.6% women have received iron folic acid tablets. Only 47.9% women undergo post natal checkup.^[3]

This tragic picture has only gradually become clearer largely as a result of a growing number of good community surveys conducted since the mid 1970's which drew attention to the unexpectedly high rates of maternal mortality and serious morbidity. Maternal mortality in India is not a chance event. It has its origins in many intertwined factors, starting with the social status, position of women, greatly affected by the economic resource and infrastructure of the country, and immediately dependent on accessibility and availability of skills, materials and facilities for family planning and maternity care.

STATUS OF MATERNAL MORTALITY IN MADHYA PRADESH: According to Annual health survey 2010-11 maternal mortality ratio of Madhya Pradesh is 310. If we analyze the division wise data of MMR we found that Shahdol ranks highest among all 10 divisions with 435 MMR following Sagar (397), Rewa (336), Chambal (311), and Jabalpur (310). Gwalior ranks lowest among all the divisions with 262 MMR and If we analyze the situation of Empowered Action Group (EAG) states and Assam, we found that Madhya Pradesh ranks fourth among all 8 EAG states including Assam ranks highest with 381 MMR, following Uttar Pradesh with 345 Rajasthan with 331 and Madhya Pradesh with 310 MMR.^[4]

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RATIONALE: Three years remain until the 2015 deadline to achieve the Millennium Development Goals (MDG) adopted at the 2000 Millennium Summit. There are two targets for assessing progress in improving maternal health (MDG 5): Reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015 and achieving universal access to reproductive health by 2015.^[1] Closer examination of maternal mortality level is needed to inform planning of reproductive health programs, to guide advocacy efforts and research at the national and international levels, and to inform decision-making.

The audit for the reasons for maternal mortality in a resource poor country is extremely helpful in not only identifying the reasons but also in identifying the preventable causes of maternal mortality. The present study is an approach to determine the causes of maternal mortality and to study the various factors associated with maternal mortality in NSCB Medical College Hospital of Jabalpur.

METHODOLOGY: This cross sectional record -based study has been conducted in Obstetrics and Gynecology Department at NSCB Medical College Hospital, Jabalpur, from January 2012 to December 2012 for all pregnancy-related deaths. The patients' demographic record including age, gravida, antenatal care record, type of delivery, status of patient i.e., booked or not booked (Booked case is one who has essential ante natal care), condition in which the patient was admitted to the hospital, duration of hospital stay, interventions, problems encountered, and probable cause of death as assessed by reviewing case sheet records were recorded. Necessary permissions and clearances to access the hospital records were obtained from the Medical Superintendent of the hospital and head of Obstetrics and Gynaecology Department. Data analysis was done using MS excel.

RESULTS:

FIGURE 1: TREND IN THE NO. OF DELIVERIES CONDUCTED IN THE HOSPITAL IN LAST 10 YEARS

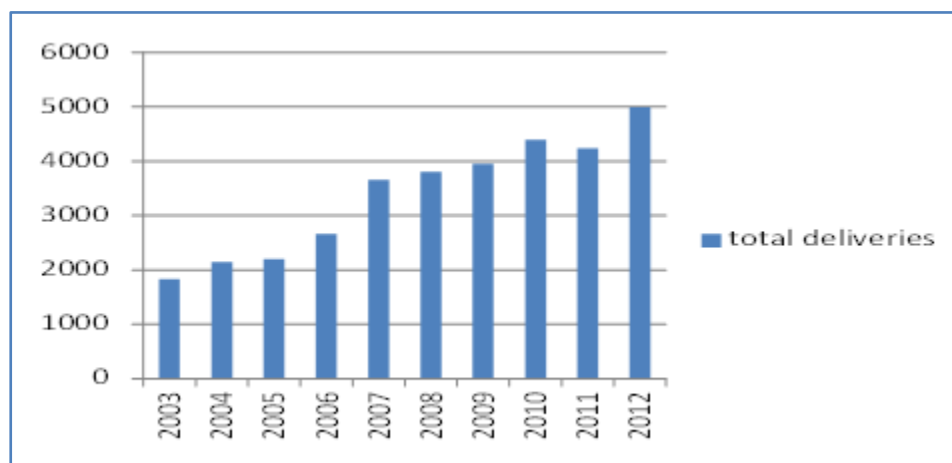


FIGURE 1

This graph shows a gradual rising trend in the no. of deliveries conducted in the hospital in last 10 years. It is due to successful implementation of Janani suraksha scheme.

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FIGURE 2: TREND OF MATERNAL DEATHS IN THE HOSPITAL IN LAST 10 YEARS

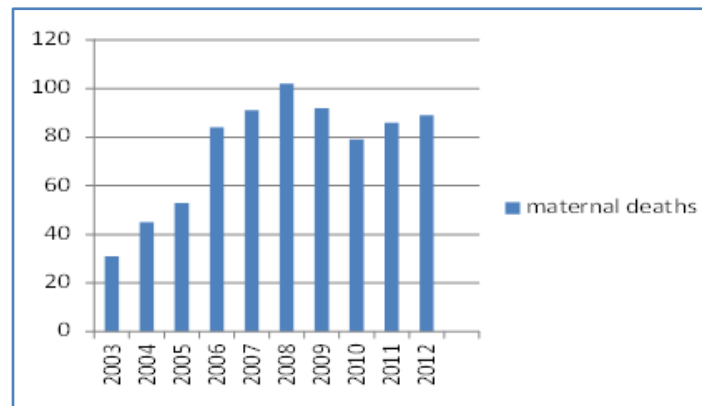
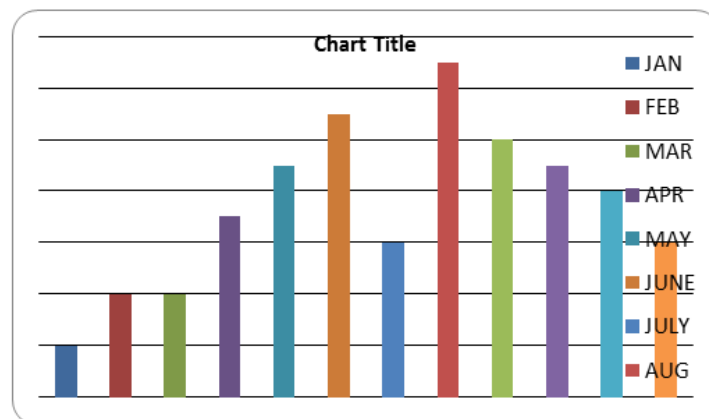


FIGURE 2

The rising trend in the no. of maternal deaths occurring in the hospital is because most of the seriously ill patients were being referred to the tertiary care centers.

FIGURE 3: MONTH WISE DISTRIBUTION OF MATERNAL DEATHS IN THE YEAR 2012



MMR (MATERNAL MORTALITY RATIO) FOR THE YEAR 2012 was 2182 PER LAKH LIVE BIRTHS. The death rate for mothers from rural areas was higher with 82 % and 94.4% of them were Hindu by religion.

AGE GROUPS	MATERNAL DEATHS	PROPORTIONAL MORTALITY RATE
<20yrs	4	4.5%
20-29yrs	68	76.4%
30-39yrs	16	17.97%
>40yrs	1	1.12%
TOTAL	89	100%

TABLE 1: DISTRIBUTION OF AGE WISE PROPORTIONAL MORTALITY RATE

(Chi square – 4.296, df-1, p value-0.0382)

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It was observed that the proportional mortality rate was highest in the age group 20-29 years followed by 30-39 yrs.

Among the maternal deaths reported, youngest age was seen to be 18 years while oldest age was seen to be 40 years.

AGE GROUPS	MATERNAL DEATHS	NO. OF DELIVERIES	AGE SPECIFIC DEATH RATE (Per 1000 deliveries)
<20yrs	4	161	24.84/1000
20-30yrs	68	4188	16.24/1000
30-40yrs	16	523	30.6/1000
>40yrs	1	64	1.56/1000

TABLE 2: DISTRIBUTION OF AGE SPECIFIC MATERNAL DAETHS

Age -Specific death rate was higher among women >30 years and <20 years indicates that these age groups are at higher risk.

REFERRAL	MATERNAL DEATHS	%
Direct	23	25.84%
1 st Referral	62	69.66%
2 nd Referral	4	4.5%
TOTAL	89	100%

TABLE 3: DISTRIBUTION OF MATERNAL DEATHS ACCORDING TO THEIR ADMISSION STATUS

Maximum admissions (74.1%) were referred from other health care centers. Only 25.84% were admitted directly. It indicates delay in referral of complicated cases that gave insufficient time for their management. This also shows the inadequate management of complications at the peripheral health centers. Maximum referral came from Damoh, Dindori and Elgin.

GRAVIDA	MATERNAL DEATHS	%
G1	57	64%
G2	13	14.6%
G3	14	15.7%
G4	4	4.5%
G>4	1	1.2%
TOTAL	89	100%

TABLE 4: DISTRIBUTION OF MATERNAL DEATHS ACCORDING TO THEIR GRAVIDA STATUS

The highest number of maternal deaths occurred among those who were primi gravida (64%) which is not unexpected because the reported incidences of eclampsia are much higher in this group of patients. This was followed by third (15.7%) and second gravida(14.6%).

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GRAVIDA	MATERNAL DEATHS	NO. OF DELIVERIES	SPECIFIC DEATH RATES
G1	57	2445	23.31/1000
G2	13	1682	7.72/1000
G3	14	578	24.22/1000
G4	4	163	24.53/1000
G>4	1	68	14.70/1000
TABLE 5: DISTRIBUTION OF GRAVIDA SPECIFIC DEATH RATES			

The risk of maternal deaths increases with the no. of successive pregnancies while in primi gravida maximum deaths occurred due to eclampsia.

ANC REGISTRATION	MATERNAL DEATHS	%
Un booked	87	97.8%
Booked	2	2.2%
TOTAL	89	100%
TABLE 6: DISTRIBUTION OF MATERNAL DEATHS ACCORDING TO THEIR ANC REGISTRATION		

Majority of the maternal deaths (97.8%) were seen in unbooked cases while only 2 deaths were seen in booked cases as they had received essential ante natal care.

DEATHS	MATERNAL DEATHS	%
ANC died as ANC	30	33.7%
ANC died as PNC	39	43.8%
PNC died as PNC	20	22.5%
TOTAL	89	100%
TABLE 7: DISTRIBUTION OF MATERNAL DEATHS ACCORDING TO THEIR TIME OF DEATH		

Most of the deaths occurred during delivery that may be due to complications during labour.

DURATION OF STAY IN THE HOSPITAL	MATERNAL DEATHS	%
<48hrs	69	77.52%
>48hrs	20	22.48%
TOTAL	89	100%
TABLE 8: DISTRIBUTION OF MATERNAL DEATHS ACCORDING TO THEIR DURATION OF STAY IN THE HOSPITAL		

In the majority of cases (77.52%), the women were admitted in the hospital for less than 48 hrs. This shows that the patients were brought to the hospital in severely deteriorated conditions which were unable to be managed thus failure to save the life of mothers.

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DIRECT CAUSES OF DEATH	MATERNAL DEATHS	%
Eclampsia	39	32.6%
Pre eclampsia	10	5.6%
Ante partum haemorrhage	6	6.7%
Obstructed labour	6	6.7%
Post-partum haemorrhage	1	1.1%
Sepsis (Post-partum)	1	1.1%
Sepsis (Abortion)	2	2.2%
Pulmonary embolism	0	0%
TOTAL	65	56%

**TABLE 9: DISTRIBUTION OF MATERNAL DEATHS
ACCORDING TO THE DIRECT CAUSES OF DEATH**

($z=4.39$, shows that direct causes are statistically highly significant in contributing to maternal deaths)

INDIRECT CAUSES OF DEATH	MATERNAL DEATHS	%
Severe anaemia	14	15.7%
Hepatitis	5	5.6%
Malaria	2	2.2%
Heart disease	2	2.2%
Diabetes	1	1.1%
Inversion of uterus	0	0%
Blood transfusion reaction	0	0%
TOTAL	24	26.8%

**TABLE 10: DISTRIBUTION OF MATERNAL DEATHS
ACCORDING TO THE INDIRECT CAUSES OF DEATH**

Direct causes were responsible for 56% of maternal deaths. 37.6% cases had died due to hypertensive disorders of pregnancy which included eclampsia (32.6%) and pregnancy-induced hypertension (5.6%). Hemorrhage (7.8%) was other important cause of maternal deaths. Hemorrhage was mostly ante-partum in nature. Anemia was the most common (15.7%) contributory indirect cause of maternal death.

DISCUSSION: A total of 6,450 females were admitted between January 2012 and December 2012, of which 4,936 females delivered and of them 1,764 had undergone caesarean section. The rest of the women were admitted for other reasons like pregnancy-induced hypertension, severe anemia, or for other obstetric reasons and were discharged after being treated. 89 maternal deaths were recorded during this period making the maternal mortality ratio around 2182/100,000 live births. This high maternal mortality can be attributed to the fact that the study was conducted in the tertiary care referral center. Institutional mortality rates are 2-10 times higher as compared with field surveys, because most of the seriously ill patients were referred to the tertiary care centers.

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The maternal mortality ratio in India is 212 per 1,00,000 live births according to 2009 SRS, which is much above the objective of 109 per 1,00,000 live births as per the fifth Millennium Development Goal (MDG-5).^[1] Reducing the maternal morbidity and mortality is the prime healthcare goal in developing countries.

Maximum deaths were reported in the age group 20-30years (76.4%) followed by 30-40years (19.1%).

The age distribution pattern of the deceased mothers is similar to the pattern of maternal deaths in India. In a study done by Rohul Jabeen Shah, Imtiaz Ali, a higher number of deaths were recorded in the 25-30 year age group.^[5] In a study done by Paul B, Mohapatra B most of the maternal deaths (72.1%) were in the 20-30 year age group.^[6] Singh et al also observed that majority of deaths were in the age group of 21 to 30 years old (56.54%) followed by 31 to 40 years old (22.49%). The death rate for mothers from rural areas was higher (67.17%).^[7] Baul, et al. had a similar observation of 51.8%. Women from rural areas contributed to a major share of maternal mortality (67.17%).^[8] Chi, et al. also reported higher maternal mortality among women of rural areas.^[9]

Taneja showed that 78% of maternal deaths were observed in 20-30 years.^[10] They are young healthy mothers who die majority of the times. Loss of a mother shatters the family. Studies have shown that infants who lost their mother during childbirth are more likely to die before reaching their second birthday than infants whose mother survives.

The highest number of maternal deaths occurred among those who were primi gravida (64%) which is not unexpected because the reported incidence of eclampsia, (which was the commonest cause for maternal death observed in our study) is much higher in this group of patients. This was followed by third (15.7%) and second gravida (14.6%).

In a study by Singh, Sinha the highest number of maternal deaths occurred among those who were second or third gravida (48.94%) followed by fourth gravida and above (26.14%).^[4] Baul, et al. and Rajaraman, et al. had similar observations.^{[8], [11]}

97.8% of the deaths were seen in unbooked cases who have not received adequate antenatal care in present study which is very high. Daba et al found that 64.7% of the deaths were above 35 years, 71% of the cases were multiparous and majority of the cases received no antenatal care (65%). Girls below 18 years and women above 34 years have been reported to be at a higher risk of pregnancy-related mortality.^[12] As per DLHS2 – only 51.1% women had attended 3 or more ANC visits along with 46.6% women receiving iron folic acid tablets.^[4] It reflects the poor status of ongoing programme interventions at grass root levels as well poor maternal health status.

Socioeconomic status and educational status could not be ascertained from the case records to conclude that they have an impact on the maternal mortality rate.

In present study, the major cause of death was eclampsia (32.6%) followed by pre eclampsia (5.6%), ante partum haemorrhage (6.7%) obstructed labour (6.7%). this indicated that 37.6% of deaths could be prevented by careful monitoring during pregnancy and treatment with relatively simple anticonvulsants.

Ezegwui ^[13] et al reported that direct obstetric causes were responsible for 84.2% of the deaths, whereas indirect causes resulted in 15.2% of the deaths. Hemorrhage was the most important cause of maternal mortality, accounting for 23.0%. This was followed by puerperal sepsis (18.8%), ruptured uterus (13.9%), and obstructed labor (13.3%).

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This corroborates findings from other studies in Nigeria, ^[14] which show that eclampsia was the leading cause of maternal mortality. Among the indirect causes Anaemia accounted for 15.7% of maternal deaths.

As per study in Odisha by Mohapatra,^[6] Direct causes were responsible for 76.7% of maternal deaths. Most of the deaths were due to eclampsia in pregnancy (O15.0, ICD-10) followed by severe pre-eclampsia (O14.1, ICD-10). Hemorrhage and sepsis (14% each) were other important causes of maternal deaths. Hemorrhage was mostly post-partum (O072.0 and O072.1, ICD-10) in nature. Malaria (9.3%) and anemia (7%) were common indirect causes. The most common immediate causes of death were hemorrhage and shock (16.3% each). Anemia was the most common (48.8%) contributory cause of maternal death.

Singh et al ^[7] observed that the direct obstetric causes accounted for 66.56% of maternal deaths; toxemia (24.01%), sepsis (17.93%), and hemorrhage (16.11%) were the major causes. Anemia accounted for another 15.81% of deaths. These findings are in conformity with the findings of Rajaraman, et al. and Ramteke, et al. ^{[11], [15]}

Mundukar et al reported 20.96% deaths due to post-partum hemorrhage.^[16]

Sengupta et al., also noticed that, among the direct causes, hemorrhage (12.40%) and sepsis (17.82%) were the leading and, among the indirect causes, it was hepatitis (29.93%) followed by anemia (17.82%). ^[17]

Bera et al., revealed that, among the direct causes, hemorrhage was responsible for 23.8% deaths and sepsis for 16.4% deaths, and, among the indirect causes, jaundice was responsible for 9.9% deaths, followed by anemia and heart disease with 5.9% and 3.4% deaths, respectively.^[18]

CONCLUSIONS: A systematic audit of each and every maternal death should be conducted for the analysis of root cause. The corrective action to prevent the recurrence of such deaths should be taken. In the present study, 70% of the maternal deaths were preventable.

Although hospital-based maternal mortality figures do not give the true picture in the community, they tend to provide a more thorough assessment of the underlying cause of death and contributing factors that provide useful data in planning various strategies or interventions.

It is concluded that good quality antenatal care supported by assisted deliveries can reduce the maternal mortality rate.

Timely identification of risk factors, intervention and referral to better health facilities will go a long way in the reduction of maternal mortality rates. Strengthening of the first referral units with equipment, blood bank, and adequately competent staff should be of prime importance.

Continued medical education of the medical personnel at the periphery is required. The delay in referral to the tertiary care center could also be due poor knowledge about medical disorders that complicate pregnancy among the peripheral health center. Appropriate transfer with facilities for resuscitation and medical personnel accompanying the patient could prevent such mortality.

Such medical personnel should be trained in the basic and advanced life support. Educating the pregnant women regarding the need for medical care early during such illness and awareness of peripheral healthcare givers for early referral can reduce such mortality.

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