

### ANALYSIS OF MATERNAL MORTALITY IN A TERTIARY CARE CENTRE: A 5 YRS RETROSPECTIVE STUDY.

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**KEYWORDS:** Maternal mortality ratio, Hypertensive disorder of pregnancy, EMoC emergency obstetric care

**ABSTRACT: AIMS:** This study aimed to study the determinants, common causes and possible prevention of maternal mortality. **MATERIALS AND METHODS:** Maternal mortalities in Department of Obstetrics and gynecology, Gandhi medical college, Sultania Zanana Hospital, Bhopal during 5 year period from Jan 2007- Dec 2011 were studied. The individual records of all maternal deaths occurring during the study period of 5 years were extracted from patient's case notes and hospital record registers. Total deliveries for the period were extracted from the delivery registers. **RESULTS :** In the year 2007-2011 total live births were 43,683 of which 338 mothers died giving cumulative maternal mortality ratio of 773.75 per 1,00,000 live births. Among 338 total maternal deaths, the maximum deaths were in the age group 20-30 years (88.16%). The death rate of mothers from rural areas was higher (65.68%). The highest number of maternal death occurred among multigravidae (46.74%) . A total of 91.72% of maternal death occurred in unbooked patients. Most were referred patients (74.55%). Most of them were illiterate (61.8%). 76.62% patients died within 24 hours of admission. 33.13% women died in antenatal period while 64.49% died in postnatal period. Direct obstetric causes of death accounted for 76.03% of all maternal deaths. Among the direct causes 39.64% died due to hypertensive disorder of pregnancy, 18.93% due to hemorrhage. Indirect causes accounted for 23.96% in which anemia (8.57%), malaria (3.55%) hepatitis (2.66%) were the leading causes. **CONCLUSIONS:** This study has shown higher maternal mortality due to being a tertiary care hospital based study where more complicated and referred cases are admitted. Most maternal deaths can be prevented by providing care at grass root level, linkage between primary, secondary and tertiary care, strengthening of referral services and instituting emergency obstetric services.

**INTRODUCTION:** According to World health organization: Maternal death is defined as 'Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental causes or incidental causes(ICD 10 REVISION) <sup>[1]</sup>

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MATERNAL MORTALITY RATIO is number of maternal deaths during given time per 100,000 live births during the same period.

Estimates by UNFPA indicates that one in every four women in developing countries suffer from acute or chronic condition related to pregnancy and 5% of pregnant women need surgery. A woman dies every 90 seconds from complications during pregnancy or childbirth. It has been estimated that 86 % of maternal death cases occur in Asian and Sub-Saharan Africa, with India alone accounting for 25 % of such deaths worldwide. Data on causes of maternal death reveal that more than 80 % of such deaths are due to direct obstetric causes<sup>[2]</sup>

MMR was 540 in 1999. Currently it is 212/100,000 live births by SRS 2007-2009. <sup>[3]</sup> Desired figure in millennium development goal is 100/100,000 live births. India is also committed to 8th millennium development goal set by United Nations and one of the goals is reduction in maternal mortality ratio by 3/4th by 2015. <sup>[4]</sup>

Maternal death has serious implication on the family, the society and the nation. The average lifetime risk of a woman in a developing country dying from complications related to pregnancy or childbirth is more than 300 times greater than for a woman living in an industrialized country. The preventable and avoidable factors have been noted in 50- 80% of maternal deaths and these can be reduced through actions that are effective and affordable in developing countries <sup>[5]</sup>. Maternal mortality ratio is a very sensitive index that reflects the quality of reproductive care provided to the pregnant woman. This study was conducted to know the determinants of maternal mortality, to assess maternal mortality ratio and to determine the causes of maternal mortality at a tertiary care centre so that corrective steps can be taken to reach the goal.

**MATERIAL AND METHODS:** A Retrospective study was carried out over a period of five years from Jan 2007 to Dec 2011 in the department of Obstetrics & Gynecology, Sultania Zanana Hospital, GMC Bhopal, a tertiary care & biggest referral centre of Bhopal. All the women who died were pregnant or within 42 days of termination of pregnancy, irrespective of duration or site of pregnancy or its management but not from accidental or incidental causes were included in the study. All maternal deaths occurring during study period were analyzed with parity, cause of death, time interval from admission to death and trimester of pregnancy at the time of death, mode of management given.. All the relevant data were collected from hospital records and registers. Total number of deliveries during study period was extracted from delivery register. MMR was calculated by total number of live births.

**RESULTS:** Total vaginal deliveries during the study period were 34,443. Total caesarean deliveries were 11,333. Total live births during the study period were 43,683. Total 338 maternal deaths were found giving maternal mortality ratio of 773.75/100,000 live births.

**Table I: - Maternal mortality in 5 years**

Year	Total live births	Maternal deaths	MMR
2007	8099	67	827
2008	8674	63	726
2009	9840	77	782
2010	9695	76	783
2011	7375	55	745
5 yrs	43683	338	773.5

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Table I shows maternal death distribution in the five years of study. The highest MMR of 827 was in the year 2007, with the lowest of 745 in the year 2011. So the average of the 5 year study period was 773.5 per 100,000 live births.

**Table II: - Clinical and demographic features**

	NUMBER	PERCENTAGE
<b><u>Maternal age</u></b>		
<20yrs	5	1.1%
20-30yrs	298	88.16%
>30 yrs	35	10.6%
<b><u>Gravidity/ Parity</u></b>		
Primi	151	44.67%
Multi	158	46.74%
Grandmulti	29	8.57%
<b><u>Pregnancy status</u></b>		
Antenatal	112	33.13%
Postnatal	218	64.5%
Postabortal	8	2.36%
<b><u>Antenatal care</u></b>		
Booked	28	8%
Unbooked	310	92%
<b><u>Locality</u></b>		
Rural	116	34.31%
Urban	222	65.68%

Table II shows 298 (88.16%) cases were of the age group of 20-30 yrs, which is the peak of reproductive age group. Maximum number of deaths were of multiparas i.e. 158(46.74%), although primipara were also 151(44.67%) and grandmulti were 29 (8.57%) cases. Deaths in post natal cases were 218(64.5%), antenatal cases were 112(33.13%), and post abortal cases were 8(2.36%). Maximum maternal deaths were in unbooked cases i.e. 310(91%) patients as compared to 28 (8%) booked cases. 252(74.55%) were referred. 222(65.68%) women who died belonged to rural area as compared to 116(34.31%) women of urban area.

**Table III: - Other contributory factors**

DURATION FROM ADMISSION TO DEATH	NUMBER	PERCENTAGE
<6hrs	137	40.5%
6-24hrs	122	36.09%
24-72hrs	53	15.6%
>72hrs	26	7.6%
<b>ANTENATAL CARE PROVIDER</b>		
None	106	31.3%

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TBA	69	20.4%
ANM	80	23.6%
MO	61	18.05%
Specialist	22	6.51%
<b>CONTRIBUTORY FACTORS</b>		
Poverty	277	82%
Health care personnel problem	250	74%
Illiteracy	209	61.8%
Transport	162	48%
Lack of blood	162	48%
Multiple referrals	78	23%

Table III shows that maximum number of patients died within 24hrs of admission. The graph shown below also depicts that maximum deaths occurred in <6 hrs. This shows delayed referral from various centers and that patients were referred to our institute in moribund conditions.

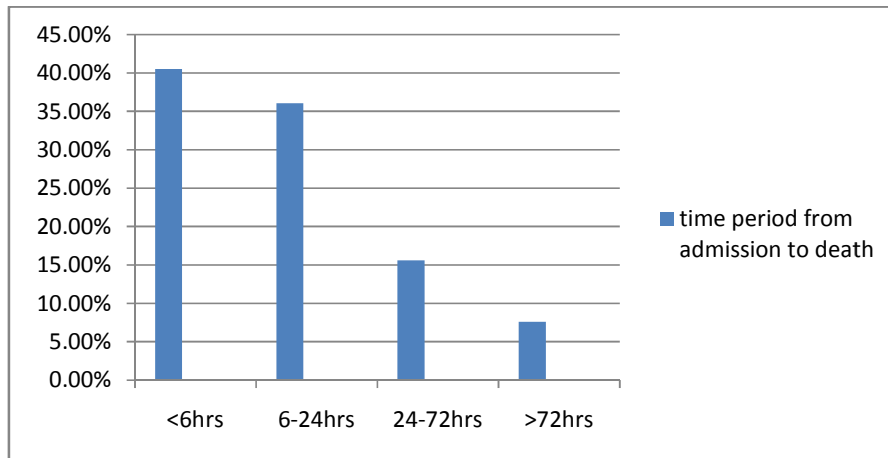
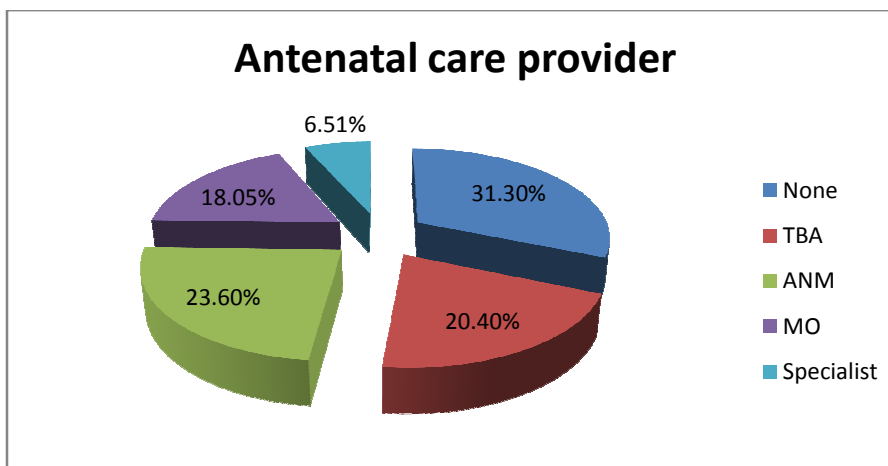


Table III also shows that 31.3 % patients received no antenatal care, 20.4 % by traditional birth attendants, and 23.6% by ANMs. 75.3% women received no proper antenatal care.

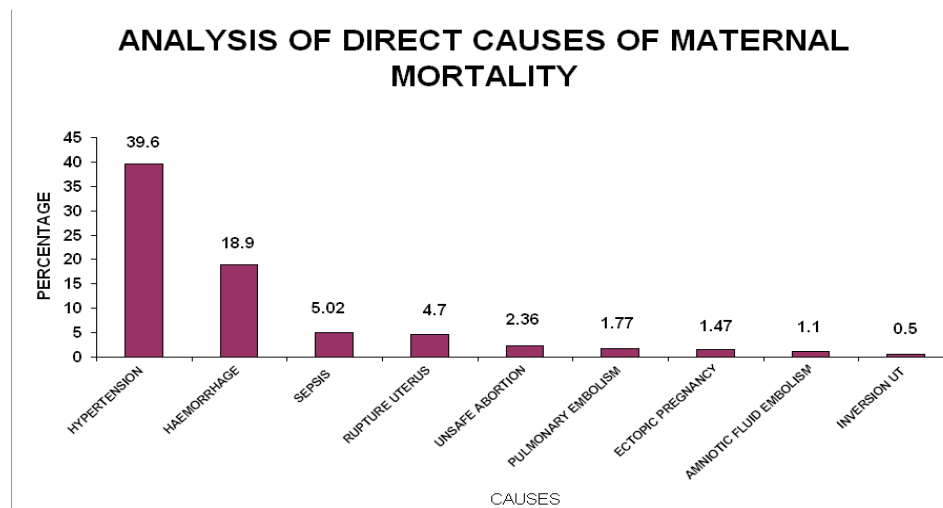


82% women were of poor socioeconomic strata. 61.8% were illiterate and 23% had multiple referrals from different centers.

**Table IV: - Direct and Indirect causes of maternal death**

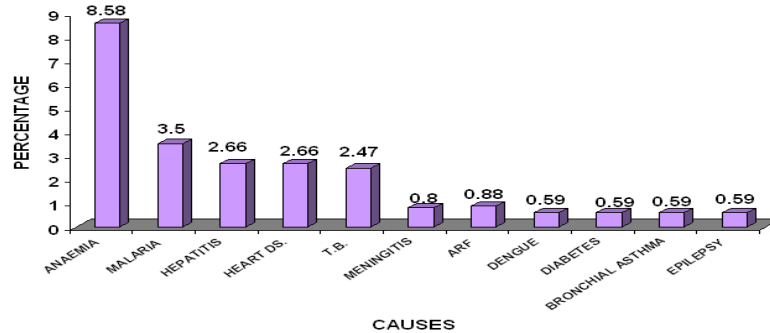
<b>DIRECT CAUSES</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
Hypertension	134	39.6%
Hemorrhage	64	18.9%
Sepsis	17	5.02%
Rupture uterus/obstructed labor	16	4.7%
Unsafe abortion	8	2.36%
Pulmonary embolism	6	1.77%
Ectopic pregnancy	5	1.47%
Amniotic fluid embolism	4	1.1%
Inversion uterus	2	0.5%
<b>INDIRECT CAUSES</b>	<b>NUMBER</b>	<b>PERCENTAGE</b>
Anemia	29	8.58%
Malaria	12	3.5%
Hepatitis	9	2.66%
Heart disease	9	2.66%
Tuberculosis	8	2.47%
Meningitis	3	0.8%
ARF	3	0.8%
Dengue	2	0.59%
Diabetes	2	0.59%
Bronchial asthma	2	0.59%
Epilepsy	2	0.59%

Table IV shows various causes of maternal deaths in our study. In our study 75.42% of deaths were due to direct causes. Hypertension is the leading cause of death (39.6%), hemorrhage was found in 18.9%, sepsis in 5.02%, rupture uterus/obstructed labor in 4.7%, unsafe abortion in 2.36 % and rest of the direct causes constitute 4.84% of all maternal deaths.



Indirect causes accounted for 24.58% of all maternal deaths. Major indirect causes that were found were anemia i.e. 8.58%, malaria in 3.5%, hepatitis in 2.66% and heart disease in 2.66%.

## ANALYSIS OF INDIRECT CAUSES OF MATERNAL MORTALITY



**DISCUSSION:** Today's status of maternal mortality and health issue shows a far greater disparity between developed and developing countries. As per 1993 statistics maternal mortality in developed country is 30 per 100,000 live births as compared to 450/100000 live births in developing countries. 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. Reasons why woman die in pregnancy and child birth have many layers. Besides direct, indirect, and co-incidental causes, there are also logistic causes that is failure in the health care system, lack of transport, lack of manpower and apathy towards patient care. And behind these are all the social cultural and political factors which together determine the status of woman, their health, in 8000 for women in industrialized fertility and health seeking behaviour. To improve this scenario, the problem of the rural health is to be addressed both at the district, regional (micro) state and national (macro) level. [6]

Maternal mortality is a global tragedy. The maternal mortality rate has declined from 407/ 100,000 live births in 1999 to 212/ 100,000 live births according to SRS 2007- 2009.[3]In Madhya Pradesh also it has declined from 498 to 310/ 100,000 live births. In the developing world as a whole, a woman has a 1 in 76 life time risk of maternal death, compared with a probability of just 1 countries [7]. It has to be understood that if India has to achieve the millennium development goals by 2015, we will have to work for the states like Madhya Pradesh, Bihar and Rajasthan currently having high rates of maternal mortality.

During the study period there were 43,683 live births and 338 cases of maternal deaths were found. MMR was found to be 773/100,000 live births. MMR was higher in our study, as our centre is a higher referral & tertiary care centre. We received maximum referrals from rural areas. Most of the patients were referred in moribund condition after complications had occurred. Majority of patients were unbooked (92%), belonging to rural area (65.6%), mostly referred (74.55%), illiterate (61.8%). Majority of deaths occurred in post partum period (64.5%). The most vulnerable time for maternal deaths is the postpartum period constituting 51- 71% of all deaths. About 45 % of postpartum maternal deaths occur during first 24hrs and > 2/3<sup>rd</sup> during first week. Unfortunately the postpartum period is the most neglected period. In developing countries 65% women receive some form of antenatal care, 53% receive intranatal care and 30% have access to postpartum care.

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**Table 5: Comparison with other studies**

author	Place & year	direct	hemorrhage	hypertension	sepsis	anemia	mmr
Patel et al <sup>[8]</sup>	2001	62.8%	31.9%	13.7%	20.9%	17.4%	3840
Khare et al <sup>[9]</sup>	2002	83%	66.7%	13.3%	3.3%	53.3%	2842.3
Singh et al <sup>[10]</sup>	2003	66.5%	16.1%	24%	17.9%	15.8%	3906
Kaur et al <sup>[11]</sup>	2005	77.3%	33%	7.5%	21.7%	16%	1470
Vidhya et al <sup>[12]</sup>	2006	50%	21%	10.5%	7.8%	2.63%	302
Bhaskar et al <sup>[13]</sup>	2011	72.5%	26.66%	26.66%	18.33%	10%	302.23
PRESENT STUDY	2007 to 2011	76.03%	18.93%	39.64%	7.39%	8.58%	773

Table 5 gives the maternal mortality rate in various studies conducted in India. MMR was found to be high in our study as most of the women were referred in terminal and irreversible condition from referral centers to our centre. In our study the MMR was 773. In the study of Kaur et al MMR was 1470 which is comparable to our study whereas Patel et al, Khare et al and Singh et al have reported even higher MMR in their studies. While Vidhya et al and Bhaskar et al have reported a very low MMR of 302 in their studies. Direct causes of maternal mortality account for 80% of all maternal deaths worldwide. In our study 76.03% of maternal deaths were due to direct causes which are consistent with other studies of Bhaskar et al (72.5%), Patel et al (62.8%), Khare et al (83%), Singh et al (66.5%), Kaur et al (77.3%). Majority of direct causes of maternal mortality are preventable by high risk screening and proper antenatal, intranatal, emergency obstetric care. They are hemorrhage (25%), infections / septicemia (13%), eclampsia (12%), obstructed labour (8%), unsafe abortion (3%), other direct causes (8%). Indirect causes account for 20 % of maternal deaths which includes causes like malaria, anemia, jaundice and other medical disorders which complicate pregnancy or are aggravated by it. In our study direct causes account for 76.03% of all maternal deaths, in which **Hypertension** tops the list (39.64%) which is consistent with study of Singh et al, in contradiction to other studies in which hemorrhage was the most common cause of maternal deaths. All cases of hypertensive disorders were referred very late. About (62%) were **Eclampsia** patients in the terminal stage. **Hemorrhage** was the second most common cause in which PPH accounts for 68% among hemorrhage cases. Sepsis accounted for 7.39% of all maternal deaths in our study. Among the indirect causes **Anemia** was the commonest cause which is also the leading indirect cause of maternal deaths in various studies. All of them were severely anemic with congestive cardiac failure. Malaria accounts for 3.5% of all cases. They came very late, all with complicated malaria. Madhya Pradesh accounts for 40% of all falciparum malaria cases in the country. All patients of hepatitis (2.66%) came with deep jaundice & Hepatic Encephalopathy. Majority of patients died within 24hrs of admission (about 76.5%) which is directly related to late referrals from periphery.

**CONCLUSION:** The tragedy is that most of these maternal deaths are preventable. This has immense effect on the family especially on the child. When mother dies during delivery the child has 17 fold increase risk of death during the first six month (Sure Bergstrom 1994). Maternal death is not only due to medical causes but due to a number of other contributory factors. After

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this study it was concluded that hypertensive disorder of pregnancy has emerged as the leading cause of maternal deaths and can be prevented by proper antenatal care, screening and postnatal care. Early detection of high risk pregnancy and timely referral is very important. Referral card should be with important and adequate information. Basic and immediate management should be given as per protocol. Multiple referrals should be avoided. There should be a proper linkage between primary, secondary & tertiary care centre. Other causes like Hemorrhage, sepsis, anemia should be taken in to account.

There are various ways to reduce maternal mortality like strengthening of referral services, written management protocols for obstetric emergencies in the hospital, refresher courses for the health care personnel, periodic audit of maternal death, social inequalities & discrimination on grounds of gender should be removed. There is a need for cohesive & integrated health care system. A mother should have an access to and PNC Services, access to skill birth attendant & institutional deliveries, access to Emergency Obstetric Care (BEMOC+CEMOC), access to safe abortion services, easy transport & blood transfusion facilities and access to information and services for family planning– too early, too frequent and too many.

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