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**ABSTRACT... Objectives:** To estimate maternal mortality ratio (MMR), obstetrical causes and determinants of maternal mortality. **Study Design:** A descriptive study. **Place & Duration of Study:** The study was conducted in Obstetrics & Gynaecology Department at Bahawal Victoria Hospital, affiliated with Quaid-e-Azam Medical College, Bahawalpur. This was a 3 years study conducted from January 2006 to December 2008. **Patients & Methods:** All direct and indirect maternal deaths during pregnancy, labor and peripartum were included. The patients who expired after arrival were analyzed on specially designed Performa from their hospital records and questions asking from their attendants. The reason for admission, condition at arrival, cause of death and possible factors responsible for death were identified. The other information including age, parity, booking status, gestational age and relevant features of index pregnancy, along with the distance from hospital was recorded on Performa and analyzed by SPSS version 11. **Results:** There were a total of 21501 deliveries and 19462 live births with 2039 peri-natal mortalities. Total 133 maternal deaths occurred during last 3 consecutive years revealed MMR 683 per 100000 live births. Majority of the women who died were un-booked (91%). The highest maternal mortality age group was 20-30 years in which 54.2% deaths were observed. Out of 133 maternal deaths, 21% were primigravida. Obstetrical hemorrhage (44.4%) was the most frequent cause followed by hypertensive disorders (21.8%) & sepsis (15%). There were 33.8% of patients who were brought at compromised stage and 52.6% brought critical, only 13.5% died were stable at the time of arrival at hospital. **Conclusions:** Obstetrical haemorrhage was the leading cause of maternal deaths. This dreadful cause is preventable and manageable if steps are taken in time during antenatal period for risk detection and in postnatal period. Community awareness, training of traditional birth attendants to recognize the severity of disease and importance of being in time and improving referral can reduce the maternal deaths.

**Key words:** Maternal Mortality Ratio (MMR), Live Births (LB), Obstetrical Hemorrhage.

## INTRODUCTION

To become mother and to have a baby is the dream of every married woman. The status given to a mother by Islam is supreme. Is our society giving this status to a mother. Maternal mortality in developing countries is a matter of big concern and is a neglected and socially unjustifiable tragedy.

Deaths of women related to pregnancy and childbirth remains a major public health problem. It is estimated that 500,000 mothers die annually in the world and 1600 maternal death per day or about one maternal death per minute<sup>1</sup>.

Maternal mortality and associated morbidity reflect the quality of healthcare provided to a woman and

importance of a woman in her family and society. Lack of access to skilled healthcare for complicated pregnancies or for emergencies is often the most important cause of death. Barriers can be physical delay in arrival to an appropriate medical care facility (e.g. poor, or no transportation, long distance from healthcare facility). Social cultural aspect shows women needing to seek permission from family members before obtaining care.

They cannot decide themselves or lack of resources. Delay in referral to more specialized centers. Then delay in receiving adequate care once a woman reach to medical facility in unrecognized / untreated life threatening condition. Timely decisions are not made, inadequate facilities for severity of disease, delay in

referral to more specialized center in time. This framework enables assessment of patients, provider and social / cultural practices which contribute to a maternal death<sup>2,3</sup>.

Developing countries bear a disproportionate share of maternal deaths, 99%, compared to 1% in more developed nations<sup>1</sup>. Maternal mortality is the health indicator with the greatest disparity between dying as a result of pregnancy and childbirth during her lifetime is about one in six in the poorest part of the world as Afghanistan compared with about one in 30,000 in Northern Europe like Sweden<sup>4</sup>. Over 5 million deliveries take place in Pakistan each year. It is estimated that about 25000 to 30000 women die each year of pregnancy and related cause i.e. one maternal death occur in every 20 minute, a grave tragedy, thousand more suffer from serious morbidities<sup>5</sup>.

Only one in 20 women with complication of pregnancy or childbirth reaches a facility with emergency obstetrical care<sup>6</sup>. Most deaths occur during or few hours after delivery. Haemorrhage, hypertension, obstructed labor are the direct obstetric causes<sup>7</sup>. One of the Millennium Development Goal is to improve "Maternal Health", can we reduce maternal mortality to achieve the Millennium Development Goal to reduce MMR by 70% between 1990-2015 like Sri Lanka, Thailand and Bangladesh who took 25, 18 and 21 years respectively to reduce the maternal mortality<sup>1,6</sup>. The implication is that maternal mortality not just responds to a single intervention but to a range of services by multiple authorities with involvement of top to bottom level / grass root level.

WHO stated that it is estimated that more than 80% of deaths could be prevented or avoided through actions that are proven to be effective and affordable, even in resource poor countries<sup>6</sup>.

The international code of disease (ICD-10) defines the maternal death and other sub-classifications<sup>8</sup>; Maternal Death: The death of a women 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 or incidental causes.

Maternal Mortality Ratio (MMR) is defined as number of maternal deaths during a given time period per 100000 live births. It is the most commonly used measure of maternal mortality and serves as an indicator of the risk for death once a woman becomes pregnant.

## METHODOLOGY

The study was conducted from January 2006 to December 2008 in the Gynaecology and Obstetrical Department of Bahawal Victoria Hospital, Bahawalpur. There are two units of Obstetrics & Gynaecology and it covers the population of South Punjab, Interior Sindh, and Balochistan. The nature of admission is mostly by emergency and out patient department.

The patients who expired after arrival were analyzed from their records and their attendants or next of kin were interviewed on a properly designed Performa. The reason for admission, condition at arrival, and cause of death and possible factors responsible for death were identified. The other information included age, parity, booking status, gestational age and relevant features of index pregnancy, along with the distance from hospital was noted.

Lastly, data and record was reviewed in meeting of Gynae & Obs Department to find out the factors to improve "3<sup>rd</sup> Delay".

The compiled data was analyzed on SPSS version<sup>11</sup>. The qualitative response variable like age, parity, antenatal booking status, distance from hospital, obstetrical causes leading to maternal mortalities were presented by frequencies and percentages.

## RESULTS

There were 47137 admissions over the period of last 3 consecutive years with average of 15712 per year in two

**Table-I. Yearly Review of MMR**

Year	Admissions	Deliveries	Perinatal Deaths	Live Births	Maternal Deaths	MMR/1000000
2006	11327	4959	490	4469	35	783
2007	16817	7481	611	6870	40	582
2008	18993	9061	938	8123	58	714
Total	47137	21501	2039	19462	133	

*Average MMR over 3 years = 683 / 1000000 L.B*

**Table-II. Gestational age**

Gestational age (weeks)	1 <sup>st</sup> Trimester (12 wks)	2 <sup>nd</sup> Trimester (12-24wks)	3 <sup>rd</sup> Trimester (24-37 wks)	At Term (37-41 wks)	Postnatal Period
No. of Patients	13	11	28	65	16
%age	9.8	8.3	21	48.9	12

Gynaecology & Obstetrics Units. There were a total of 21501 deliveries and out of them 19462 were live births while 2039 were perinatal deaths. Total 133 maternal deaths occurred from January 2006 to December 2008 that revealed MMR=683/100000 live births, being highest in 2006(Table-I). Out of 133 maternal deaths, 16(12%) occurred in postnatal period, 13(9.8%) died in 1st trimester, 11(8.3%) died during 2nd trimester, 28(21%) died between 24-37 weeks and 65(48.9%) died at term gestation (Table-II). Majority of deaths occurred in un-booked patients 121 (91%) (Table-III).

An increasing trend in the admission from 11327 in 2006 to 18993 in 2008 and number of deliveries from 4959 in 2006 to 9061 in 2008, almost double in 3 years was reported (Table-I).

**Table-III. Booking status of patient**

Booking status	No. of cases	%age
Booking patient(>3A.N Visit in current pregnancy)	121	91%
Unbooked patient(<3A.N visit in current pregnancy)	12	9%

The youngest age recorded in maternal deaths was 18 years and was due to eclampsia. The peak age group of maternal deaths was 20-30 years in which 72 (54.2%) deaths occurred. Out of 133 maternal deaths, 28 (21%) were primigravidas, and grand multiparous were 50 (37.6%). Regarding distance from hospital, 15 (11%) patients came from distance < 20 km from Bahawalpur City. Mostly patients 68 (51.1%) came from distance > 50 km i.e. from peripheral draining area around Bahawalpur (Table-IV).

**Table-IV. Demographic Characteristics**

Age in years	No. of Patients	%age
<20	8	6
20-30	72	54.2
31-40	43	32.3
>40	10	7.5

*Mean = 29.56, Standard Deviation = 6.82*

Direct causes lead to 116(87.2%) of deaths. Obstetrical hemorrhage was the most frequent cause with a rate of 59 (44.4)%. Among it, Post partum haemorrhage contributed 40 (30.1%) of maternal deaths, then placental abruption 12 (9%) and uterine rupture 7 (5.3%).

Parity	No. of Patients	%age
Primegravida	28	21
G2-G5	55	41.4
G6-G10	32	24.1
>G10	18	13.5

Distance in Km	No. of Patients	%age
< 20	15	11.3
20-50	50	37.6
> 50	68	51.1

Complications of hypertensive disorders of pregnancy lead to 29 (21.8%) of maternal deaths. Pregnancy related sepsis causing death in 20 (15%) women. Indirect maternal death causes accounts for 17 (12.8%) in this study. Most common cause was hepatic encephalopathy which lead to 6 (4.5%) of deaths. Cardiac diseases, mostly valvular lesions accounted for 5 (3.8%) deaths. Then deaths due to Blood transfusion reactions were 4 (3%). Rare causes included spinal shock and tetanus after delivery, each accounted from 1 (0.8%) each (Table-V).

There were 45 (33.8%) of patients who were brought at compromised stage and 70 (52.6%) brought critical, only 18 (13.5%) died were stable at the time of arrival at hospital (Table-VI).

Table-VI. Condition at arrival		
Condition at arrival	No. of Cases	%age
Stable	18	13.5
Compromised	45	33.8
Critical	70	52.6

## DISCUSSION

Maternal mortality ratio represents the level of healthcare services, social welfare, and economic affluence of a community. Studies from hospitals and communities show a wide variation in the MMRs. Even among the hospitals the figure varies greatly according to whether hospital is public or private, and also in different cities.

Table-V. Obstetrical causes contributing to maternal deaths		
Causes	No. of Patients	%age
<b>* Direct</b>	<b>116</b>	<b>87.2</b>
1: Obstetrical Haemorrhage	59	44.4
a: PPH	40	30.1
b: APH (Abruptio)	12	9.0
c: Ut rupture	7	5.3
2: hypertensive Disorders of Pregnancy (eclampsia/HELLP syndrome)	29	21.8
3: Pregnancy related Sepsis	20	15
4: Pulmonary Embolism	4	3
5: Amniotic fluid Embolism	4	3
<b>* Indirect Causes</b>	<b>17</b>	<b>12.8</b>
1: Hepatic encephalopathy	6	4.5
2: Valvular Heart Disease	5	3.8
3: Blood transfusion reaction	4	3
4: Spinal shock	1	0.8
5: Teatnus	1	0.8

MMR in developing countries is a matter of big concern and unfortunately here are only a few published studies that have presented data covering a period of a decade or more from a university teaching hospital<sup>9-12</sup>. These studies have shown the declining trend of maternal mortality over the last 25 years, thanks to the introduction of safer obstetric practices that have taken steps to combat three principle killers namely hemorrhage, eclampsia and sepsis. This is achieved by introduction of uterotonic agents, active management of 3<sup>rd</sup> stage of labour, MgSO<sub>4</sub> therapy, improved ICU facilities and good availability of antibiotics. Each year the number of hospital deliveries is increasing due to awareness of health facilities available. The studies showed that Pakistan has a poor situation regarding maternal health and trends in MMR continue to grow in hospital based

studies: MMR was 327/100000 L.B<sup>13</sup> and an average 500 maternal death per 100000 L.B<sup>14</sup>. This study showed MMR of 683/100000 which was slightly higher than national average of 340/100000 L.B<sup>15</sup>. But similar study at Quetta<sup>16</sup> where MMR was 560/100000 L.B and at RGH which showed MMR of 659/100000 L.B<sup>15</sup> and is comparable with a study held in JPMC-Karachi, a tertiary hospital where MMR was 710/100000 L.B over the ten year period (1981-1991)<sup>5</sup>. Results of a study conducted at Lahore<sup>17</sup> showed 1300/100000 and another study conducted at Karachi gave MMR of 1248/100000 over a period of five years (2002-2006)<sup>6</sup>.

Demographic and health survey of Pakistan in 2006-2007 conducted under USAID/Pakistan showed MMR in Pakistan for the 3 year before survey as such in Punjab MMR 227/100000, NWFP 275/100000, Sindh 314/100000 L.B, Balochistan 785/100000<sup>18</sup>. MMR is significantly higher in rural areas as compared to urban area.

The causes of maternal deaths are multiple, interrelated, complex and almost preventable. The majority of causes of maternal deaths were same in hospitals throughout the country and in the community though in different proportions. In the SOGP country world wide study: 84.6% were direct obstetric deaths; 21% due to obstetric haemorrhage, 18.6% due to hypertensive disorders and sepsis in 13% of cases<sup>19</sup>. There were differences in proportions in provinces, cities and in rural and urban areas. A study showed that in Quetta sepsis was the major killer, Sindh (excluding Karachi) sepsis and hypertensive orders of pregnancy both were major factors, while post-partum haemorrhage was the leading cause of maternal deaths in Punjab and Karachi<sup>19</sup>. The results matched with our study and also with study conducted at Karachi<sup>6</sup>. Obstetrical Hemorrhage was the leading cause in our study accounts for 44.4% of death nearly half of total. The factors leading to maternal deaths due to haemorrhage are accessibility of timed and skilled obstetrical care. In this study 30.1% cases were due to post-partum haemorrhage as also observed in studies at Larkana<sup>20</sup> and Peshawar<sup>21</sup> and also in demographic and health survey in 2006-2007<sup>18</sup>. The 2<sup>nd</sup> leading cause in our study was hypertensive disorders leading to 21.8% of

deaths which was similar to study conducted at Lahore<sup>22</sup>. Pregnancy related sepsis accounts for 15% of deaths but it was leading cause of deaths in Hyderabad<sup>23</sup>. So our study showed severe bleeding, hypertensive diseases and infections as dominant obstetrical causes of deaths as in Abbotabad<sup>24</sup> and in an international study<sup>25</sup>.

Separation of indirect obstetric deaths from direct causes is important because of the implications for intervention strategies. Moreover some indirect causes like anaemia and spread of hepatitis is preventable. In our study 12.8% deaths were due to indirect causes. Most common is hepatic encephalopathy 4.5%: the patients mostly admitted in medical units or get shifted as they all come with hepatic encephalopathy, altered conscious, coagulation disturbance, pyrexia and renal failure, many such patients expired in medical units so the data is missing. Study conducted in Nigeria showed hepatitis leading to 18.6% deaths<sup>26</sup>. Deaths from liver diseases like infective hepatitis are also rising in India and Africa<sup>27</sup>. A study conducted in Nepal showed increase in frequency of maternal deaths due to infective hepatitis<sup>28</sup>. Among other indirect causes is cardiac disease, 3.8% patients were having advanced valvular heart disease leading to cardio-pulmonary insufficiency and death, early antenatal visits can pick the lesions and combine approach by cardiologist and obstetricians is needed. Four (3%) women died of severe B.T reaction.

The condition at arrival to the hospital is very important. Women whom health already compromised by poor nutrition and disease are more likely to die during an obstetric emergency. These are the cases which are either due to problems with referral chain between facilities, and sometimes constrains of the community which might be financial, physical and cultural to access care or the first delay.

## CONCLUSION

Maternal mortality is a sensitive public health indicator. A model for reduction of maternal mortality should be based on the knowledge, skills and health care practices of the woman, her family, and the community and health care delivery systems. Target interventions should be applied on poor people and rural area. Lessons should

be drawn from every maternal death in order to avoid similar situation in future. In our circumstances, women empowerment has to be encouraged not only at community level but at Government level. This will help the women to take decisions on her own regarding her health.

At tertiary level the adoption of basic ICU principles i.e. adequate resuscitation along with the treatment of obstetrical cause should be considered. Also implementation of repeated emergency obstetric drills for the training of doctors in hospitals should be mandatory. Hepatic encephalopathy emerged as a most alarming cause of indirect maternal death: which should be addressed in future studies.

There is no magic bullet to reduce maternal mortality, but by developing effective Antenatal care system, availability of Emergency obstetrical care round the clock at all the three levels of health system, Training of LHV & TBA, CMW (community midwife), quick Referral system with the introduction of flying squads, and equipped ambulance for obstetrical emergencies, Audit of every maternal death & annual audit of maternal deaths at all hospitals, can help us to attain our goal (reduce MMR by 70% by the year 2015).

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