# AN ANALYSIS OF DIRECT CAUSES OF MATERNAL MORTALITY

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## *ABSTRACT*

**Objective:** This study was conducted to analyze the direct causes of maternal mortality during a period of seven years in a tertiary care hospital of NWFP.

**Material and Methods:** This retrospective, analytic study was conducted from 1998-2004, and included all the pregnant patients including miscarriage and ectopic pregnancies, presenting during this period to Gynae B Unit, Lady Reading Hospital Peshawar. The records of maternal deaths were reviewed from 1998-2004 retrospectively and causes of direct deaths were analyzed. Deaths in non-pregnant patients and indirect deaths in pregnant patients were excluded.

**Results:** Total number of live births during the time period was 23720 and total number of maternal deaths was 311. The maternal mortality ratio (MMR) was calculated as 1311/100,000 live births. Out of 311 maternal deaths, 268 (86.2%) had direct causes and 43 (13.8%) had indirect causes of maternal mortality. Haemorrhage was responsible for 42.16% (113/268) of maternal deaths, followed by hypertensive disorders in 24.63% (66/268), ruptured uterus in 10.45% (28/268), septicemia in 9.7% (26/268), thrombo-embolism in 7.8% (21/268) and unsafe abortion in 3.4% (9/268) cases.

**Conclusion:** The study shows a very high MMR as compared to national figures. The leading cause of direct maternal death was hemorrhage, followed by pregnancy induced hypertension, ruptured uterus and septicemia. These conditions can be prevented by good antenatal, intranatal and postnatal care.

**Key Words:** Maternal Mortality Ratio, Direct Causes, Hemorrhage, Pregnancy Induced Hypertension, Ruptured Uterus, Septicemia.

## INTRODUCTION

Measuring maternal mortality is notoriously difficult and complex. This results in unreliable estimation of dimensions of problems and assessing progress is difficult. The methods to measure maternal mortality differ considerably, so it is difficult to compare the data obtained from different sources. In most of the developing countries where maternal mortality is high, vital statistics do not exist thus underestimating the problem.

Maternal death is defined as “death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.”

Maternal deaths may be direct or indirect:

**Direct maternal deaths:** Those deaths that result from obstetric complications of the pregnant state (pregnancy, labour and puerperium) from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above. Deaths due to hemorrhage, sepsis, pregnancy induced hypertension, obstructed labour, abortion and complication of anesthesia all fall into this category.

**Indirect deaths:** These results from previous existing disease or diseases that developed during pregnancy but, which were aggravated by physiologic effects of pregnancy e.g. deaths due to anemia, heart disease, diabetes mellitus etc.

**Maternal mortality ratio (MMR)** is the number of maternal deaths / 100,000 live births. It measures the risk women face of dying once pregnant.

**Maternal mortality rate** is the number of

**MATERNAL MORTALITY RATIO AND DIRECT AND INDIRECT CAUSES OF MATERNAL DEATH**

| Year | Total deaths | Direct causes | Indirect causes | Total live births | Maternal mortality/ 100,000 live births |
|---|---|---|---|---|---|
| 1998 | 42 | 32 | 10 | 2740 | 1532 |
| 1999 | 24 | 20 | 4 | 2434 | 986 |
| 2000 | 36 | 34 | 2 | 2812 | 1280 |
| 2001 | 48 | 46 | 2 | 3552 | 1351 |
| 2002 | 50 | 41 | 9 | 3465 | 1443 |
| 2003 | 59 | 51 | 8 | 3827 | 1541 |
| 2004 | 52 | 44 | 8 | 4890 | 1063 |
| Total | 311 | 268 | 43 | 23720 | 1311 |

Table 1

maternal deaths per 100,000 women aged 15 49 years. The rate reflects both the maternal mortality ratio and the fertility rate (birth per 1000 women of reproductive age).

In many developing countries, complications of pregnancy and childbirth are the leading causes of death among women of reproductive age. More than one woman dies every one-minute from such causes, 585,000 women die every year. Less than one percent of these deaths occur in developed countries, demonstrating that they could be avoided if resources and services were available.[1] Estimates of MMR for Pakistan range from 204-4740 maternal deaths/100,000 live births in different studies[2,3]. Studies conducted in NWFP shows MMR of 1343/100000 in 1982-6 and 1420/100000 in 1992.[4]

This retrospective study was conducted to analyze the direct causes of maternal deaths during seven years in a tertiary care hospital of NWFP.

## MATERIAL AND METHODS

This retrospective analytical study was conducted in Gynaecology and Obstetrics B unit Lady Reading Hospital from 1998 2004. The purpose of study was to analyze the direct causes of maternal mortality. The age and gravidity of each patient was also recorded. Live births were deliveries after 28 weeks of pregnancy. Total number of maternal deaths, indirect causes, and direct causes of maternal deaths were recorded.

Maternal mortality ratio was calculated as maternal deaths /100,000 live births.

**Exclusion criterion** was indirect or fortuitous deaths, and deaths in non-pregnant patients in this time period.

**Inclusion criterion** was to include only direct causes of maternal mortality in the analysis.

Direct causes of maternal deaths were analyzed year wise and then total number of direct deaths due to each cause was calculated.

## RESULTS

Total number of live births during the 7 years time period was 23720 and total number of maternal deaths was 311. The maternal mortality ratio (MMR) was calculated as 1311/100,000 live births. Maternal mortality per 100,000 live births was also calculated year wise form 1998 to 2004.

Out of 311 maternal deaths, direct maternal deaths constituted 268 (86.17%) and indirect deaths were responsible for of 43 (13.83%) deaths.

Out of 268 direct maternal deaths, 82 (30.6%) were primigravida, 60 (22.4%) were multigravidas and 126 (47%) were grand-multigravidas, thus supporting higher number of maternal mortality in grand multigravidas.

Age range was 15 45, 71 patients were in age range of 15 20, 154 were 21 35 years old and 43 patients were in age range of 36 45.

Hemorrhage both (APH and PPH) was number one cause of maternal death followed by pregnancy-induced hypertension. Hemorrhage was responsible for 42.16% (113/268) of maternal deaths and pregnancy induced hypertension was responsible for 24.63% (66/268). Rupture of uterus was seen in 28 patients (10.44%), septicemia was responsible for 9.7% (26/268) of deaths, thrombo-embolic disorders were seen in 21 patients i.e. 7.8%, miscarriages associated with hemorrhagic shock and septicemia in induced abortion was seen in 9 patients i.e. 3.3%. Five direct maternal deaths were due to complication of anesthesia i.e. aspiration pneumonia followed by cardio-pulmonary arrest (Table-2).

**DIRECT CAUSES OF MATERNAL MORTALITY (YEAR WISE DISTRIBUTION)**

| Year | Postpartum hemorrhage | Hypertensive disorders of pregnancy | Antepartum hemorrhage | Ruptured uterus | Genital tract sepsis (excluding abortions) | Thrombo-Embolism | Abortions | Anesthesia |
|---|---|---|---|---|---|---|---|---|
| 1998 | 10 | 5 | 5 | 8 | 1 | 1 | 2 | - |
| 1999 | 6 | 6 | 1 | 1 | - | 1 | 5 | - |
| 2000 | 7 | 10 | 8 | - | 8 | 1 | - | - |
| 2001 | 15 | 16 | 5 | 3 | 3 | 4 | - | - |
| 2002 | 13 | 4 | 5 | 6 | 5 | 7 | - | 1 |
| 2003 | 11 | 15 | 5 | 8 | 4 | 6 | - | 2 |
| 2004 | 20 | 10 | 2 | 2 | 5 | 1 | 2 | 2 |
| **Total** | **82** | **66** | **31** | **28** | **26** | **21** | **9** | **5** |

Table 2

## DISCUSSION

This study shows a high MMR i.e. 1311/100000 LB. The figure is consistent with estimates of MMR of 1300 in a study conducted in Lahore[5] and MMR of 1274 in a tertiary care hospital in Abbotabad.[6] However is much lower as compared to estimates of MMR in a study conducted in Larkana which reported MMR as 4740/100000 [3].The MMR reported in our study is much higher as compared to estimates of MMR by United Nations which reports MMR in Asia to be 280 / 100000 live births. The global figure is estimated to be 400 / 100000 live births, highest MMR figure is 1000 in Africa and lowest is in Northern America (11 / 100000).[7] In 2003, WHO,UNICEF and UNFPA produced a report with statistics gathered from 2000.The world average was 400, the average for developed regions was 20, and for developing region was 440.The worst countries were Sierra Leone ( 2,000 ), and Afghanistan (1,900)[8]. For every 100,000 live births in Indonesia as many as 400 women die.[9] Our study shows a very high MMR, because Lady Reading Hospital is a tertiary care hospital, with referral from all over the province. Patients arrive in moribund state with established complications and in irreversible hemorrhagic shock. The MMR in Pakistan is estimated to be 340 by WHO and UNICEF and by other sources it is estimated to be 400-500 / 100000.[10] The three countries, India, Pakistan and Bangladesh account for 28% of world births and 46% of maternal deaths.[11]

Direct maternal deaths constituted 86.17%, while indirect deaths were responsible for 13.82% of deaths. Globally around 80% of all maternal deaths are the direct results of complications arising during pregnancy, delivery or the puerperium. UNICEF and NCMH reports that in Pakistan less that 30% of the pregnant women have any antenatal care and 95% of home deliveries are conducted by untrained and illiterate TBA and less than a quarter of the delivered women receive any postnatal care[12]. Another analysis of maternal mortality in a tertiary care hospital showed that 40% of health care was provided by traditional birth attendant, 33% by lady health visitors, 10% by doctors and 17% had no health care.[6]

The maternal mortality was highest in grand multigravidas (i.e. women who have delivered more than five viable children 47.01%), followed by multiparas (22.38%) and in 30.59% of primigravidas. The MMR reflects a women risk of dying each time she becomes pregnant, because women in developing countries bear many children and obstetric care is poor, their life time risk of maternal death is much higher, almost 40 times higher than in the developed worlds[1].

In this study, 57.46% were 21-35 years old, 16.04% were 35-45 years old and 26.49 % were 15-20 years old. The frequency of medical disorders in pregnancy like hypertension, diabetes, and anemia rises with increasing maternal age, thus resulting in higher maternal mortality rate. The pattern of fertility in terms of age and parity is changing over recent years. These changes can make an important contribution to maternal mortality because maternal mortality risk becomes higher with increasing age and parity.[13]

The analysis of the study has shown hemorrhage to be responsible for direct maternal deaths in 42.16% of cases followed by hypertensive diseases in 24.62% of cases, ruptured uterus in 10.44%, sepsis in 9.7%, and thrombo-embolism in 7.8% and unsafe abortion in 3.3%.

WHO global estimates show that preventable problems such as hemorrhage (24%), sepsis (15%), eclampsia (12%), obstructed labour (8%) and unsafe abortions (13%) are the pre

dominant direct causes[10] In U.K hypertensive disease was found to be the leading cause of maternal death (18%) but amniotic fluid and pulmonary embolism combined (25%) resulted in more deaths. Hemorrhage (15%) was still sizeable problem but was not the most serious one [13].In the confidential enquiries, 1994-1996 thrombosis and thrombo embolism remain the major direct cause of maternal death i.e. 36%. Hypertensive disease is the second leading cause followed by amniotic fluid embolism, early pregnancy and sepsis. Together these account for 85% of all direct maternal deaths.[14] Al Meshari and colleagues results for Saudi Arabia showed hemorrhage (27%) was the leading cause of maternal death followed by pulmonary embolism (17%) which together with amniotic fluid embolism (7%) resulted in 24% of maternal death.[15]

The single most common cause accounting for a quarter of all maternal deaths is severe bleeding generally occurring postpartum (PPH). Hemorrhage especially PPH is unpredictable, sudden in onset and more dangerous when a women is anemic. Globally some 25% of all maternal deaths are due to hemorrhage. [12] In our study it was responsible for 30.59% of direct maternal deaths and all had come to hospital in irreversible hemorrhagic shock.

Ante partum hemorrhage was responsible for 11.56% of direct maternal deaths. These were total 31 patients who presented with Ante partum Hemorrhage, 23 had abruptio placenta and 8 had placenta previa. Ten patients with abruption had intrauterine death in association with coagulation failure.

Hypertensive disorders of pregnancy particularly eclampsia was responsible for 24.62% of maternal deaths in our study. Globally it contributes to 12% of all maternal deaths[12].

Eclampsia was reported as the top leading cause of maternal death at a study conducted in Lahore.[16] A study conducted in Peshawar has shown Eclampsia to be responsible for 48% of maternal mortality[17]. The revised management of eclampsia in 1996 by Royal Collage of Obstetrician and Gynecologist has considerably improved the morbidity and mortality associated with eclampsia.[18] Our study had 66 patients with hypertension. Two had pre-existing essential hypertension and 64 presented with eclampsia. The causes of death were cerebral hemorrhage, pulmonary edema, adult respiratory distress syndrome, coagulation disorders, and hepato-renal failure. One primigravida had pontine haemorrhage on CT scan. Deaths from hypertensive disorders can be prevented by careful monitoring during pregnancy and by use of anticonvulsants like Magnesium Sulphate in cases of eclampsia.

Sepsis was responsible for 9.7% of deaths in our study and was the third commonest cause of death. Two other studies have also shown it be the third commonest cause of maternal mortality.[19,20] Globally it accounts for 15% of maternal deaths. National figures for Pakistan are that sepsis is responsible for 15% of maternal deaths.[10] In U.K. it contributes to 4.83% of maternal deaths.[13] Sepsis is often a consequence of poor hygiene during delivery or of untreated sexually transmitted disease. Such infections can be effectively prevented by careful attention to clean delivery and by early detection and management of infections by appropriate antibiotics.

Rupture of uterus was responsible for maternal death in 10.44% of cases; all the patients had received Oxytocin by Traditional Birth Attendant or Midwives at home. Twenty-five patients were still undelivered when presented and 3 had delivered at home and presented with Postpartum Hemorrhage. Rupture of uterus is often a complication of prolonged or obstructed labour accounting for 8% of maternal deaths.[12] According to UNICEF and NCMH (National Committee for maternal health) rupture uterus contributed to 10% of maternal deaths in Pakistan.[10] In UK it was responsible for 1.38% of maternal deaths in 1988 to 1990.[13]

Thrombo-embolism contributed to 7.8 % of maternal deaths in our study. The national figure for Pakistan is 5%.[10] In UK it contributed to 25% of maternal deaths in 1998 1990,[13] while in Saudi Arabia it contributed to 24 % of maternal deaths.[15] In this study there were total 21 patients with thrombo-embolism, 6 patients had amniotic fluid embolism during first stage of labour and 14 had pulmonary embolism postnatal. The risk of thrombo-embolism can be minimized by greater awareness of the significance of sign and symptoms of thrombo-embolism, identification of high-risk women, early mobilization and prophylactic use of anticoagulants.

Complications of abortion mainly hemorrhagic shock and septicemia were seen in 3.3% of cases. Globally complications of unsafe abortions are responsible for a substantial proportion (13%) of maternal deaths.[12] Unsafe abortion accounts for more than a third of maternal deaths in some parts of the world [21]. In U.K. abortions was responsible for 6.21% of maternal deaths.[13] In our study 3.3% patients presented with complications of abortion, 7 patients had presented with septicemia and 2 had hemorrhagic shock. Eight patients had attempted to terminate pregnancy by unskilled attendants. These deaths

could be prevented by access to family planning services, care for abortion related complication, and safe abortion care.

Anesthetic complications contributed to 5 maternal deaths that is 1.8%. The National figures for complications of anesthesia resulting in maternal deaths are 8%.[10] In U.K. it contributed to 2.76% of maternal deaths.[13]

## CONCLUSION

The analysis of all these deaths reveal following conclusion:-

95% of women had not received proper antenatal care, labour and postnatal care. None of these patients had antenatal care by doctor. The major cause of direct maternal death was hemorrhage that can be prevented by treatment and prophylaxis of anemia during pregnancy, referral of all cases of ante partum hemorrhage to hospitals in time, blood transfusion facilities in peripheral hospitals and training of all health personnel in the emergency management of post partum haemorrhage. The second cause of direct maternal death was pregnancy-induced hypertension, mainly eclampsia and its complications. Eclampsia and its complications can be minimized by good antenatal care facilities, by timely referral to tertiary care hospitals, availability of trained staff and anticonvulsants in emergency management of eclampsia in peripheral hospitals. Septicemia and its complications were responsible for a significant number of maternal deaths and can be prevented by safe hygienic practices during and after delivery.

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