Pathological Study of Maternal Deaths - Experience from a Tertiary Care Centre in Central India

Sandhya Vivek Poflee[1], Rekha Narendra Patil[2], Waman K Raut[3]

ABSTRACT

Introduction: Maternal death (MD) is defined as death of a woman occurring while pregnant or within 42 days of termination of pregnancy irrespective of the duration or its management. Accidental or incidental causes are not included. Maternal mortality rate (MMR) of the region indicates the quality of maternal health care, availability of health care facilities and overall socio-economical status of the population in general. It is essential to know the exact cause responsible for maternal death which is possible by detailed autopsy and careful pathological study under expert guidance.

Material and Methods: Autopsy study was performed in 100 consecutive cases of maternal deaths, over a period of 22 months. Detailed gross and microscopic examination of the visceral organs that included uterus, placenta was carried out in all cases of maternal deaths. Analysis of pathological findings was done in the light of available clinical data.

Results: Out of the 100 cases of maternal deaths 87% belonged to age group of 21 to 30 years. There were 52% deaths in antenatal period. Direct causes were responsible for maternal deaths in 52% cases, indirect causes in 43% cases and in 5% cases the causes were coincidental.

Conclusion: Direct causes of MD were more frequent than indirect causes in the present study. Haemorrhage being the most common direct cause of MD. Lesser accessibility to health care facilities at peripheral health centres for the prospective mothers is highlighted by the present study.

Keywords: Maternal Death, Pathological Study, Autopsy, Causes of Maternal Death.

INTRODUCTION

Somewhere in the world every minute a woman dies of pregnancy and child birth. In India there is one maternal death every five to seven minutes.[1,2] Millennium Development Goal five (MDG) is focusing on the reduction in the maternal deaths, which is a global struggle.[3,4]

Maternal mortality rate (MMR) is the number of maternal deaths per 100,000 live births. MMR is an indicator of the quality of maternal health care, nutritional level and overall socioeconomic status of the community in general. There is a vast difference between the MMR of developed and developing countries. South Asian countries and Sub-Saharan Africa account for nearly 86-90% of global maternal deaths. Maternal mortality is an indicator of the availability and utilization of the health care services in the community. It differs from region to region.[5,6]

The causes of maternal mortality can be classified as direct, indirect and coincidental causes.[7] Direct causes are those that are directly related to obstetric complications due to pregnancy, labour or puerperium. The indirect causes are resulting from pre-existing diseases or disease aggravated by the physiological effects of pregnancy.[8]

The present study was carried out with the aim to explore the causes of maternal deaths in the Tertiary Health Care Centre of Central India with the objective to identify causes of maternal death (MD) which may help in reducing preventable maternal deaths.

MATERIAL AND METHODS

This Retrospective Observational study was carried out in the Department of Pathology of a Tertiary Health Care Centre and a Teaching Institute. The study period was 22 months from January2017 to October 2018.

Pathology Department receives specimens of the medico-legal cases chiefly from the Forensic Department of the Institution. Medico-legal specimens are also referred for the histopathological examination to the Pathology Department from the hospitals within the radius of 150 kilometres.

Hundred consecutive specimens from the cases with the antemortem diagnosis of pregnancy and sent as maternal deaths for histopathological examination were included in the analysis with the aim to know causes of maternal death. Non- maternal deaths were excluded from the study.

Detailed gross and microscopic examination of the organs or part of the organs including the female genital organs and placenta was carried out. Condition of the specimens was noted for tissue preservation. Gross changes of partial and complete autolysis of the specimens were noted. Completely autolysed tissues were not included in the analysis. Gross sectioning of the organs like placenta, uterus was done as per the standard guidelines. Routine processing with paraffin embedding was followed by Haematoxylin and Eosin staining. The microscopic findings were noted.

Cause of maternal death in each case was evaluated and

[1]Associate Professor, Department of Pathology, Government Medical College, Nagpur, [2]Assistant Professor, Department of Pathology, Government Medical College, Nagpur, [3]Professor and Head, Department of Pathology, Government Medical College, Nagpur, India

Corresponding author: Dr Rekha Narendra Patil MD Pathology, Assistant Professor, Department of Pathology, Government Medical College, Nagpur, India

categorised as direct, indirect and coincidental. Pathological findings were analysed in the light of available clinical data.

RESULTS

The present study included 100 cases. Table number 1 shows the demography of the study of 100 cases of Maternal Deaths Maximum number 87 of cases were in the age group of 21 to 30 years. There were 52 cases in the antenatal care period, which included ten cases in the first trimester and 21 cases each in the second and third trimester.

Forty eight cases of maternal deaths (MD) had occurred in the post natal care period. In the post natal care period maximum 42 cases were in the first 15 days period. There were three cases of MD each in the next 16 to 30 days and 31 to 42 days periods.

The causes of maternal deaths were categorised as direct, indirect and coincidental.[7]Table number 2 shows categorization of causes of Maternal Deaths

In the study 52% maternal deaths (MDs) could be attributed to direct causes and 43% cases were due to indirect causes. In 5% cases of MD the exact cause could not be ascertained and these cases were included in the category of coincidental causes.

As seen from table 2, amongst direct causes haemorrhage was the most frequent cause responsible for maternal deaths in 15 cases- 28.85%.followed by Puerperial Sepsis in 13 cases i.e. 25%. Eclampsia and abortion related causes accounted for 11.53% deaths each. Pulmonary embolism made 3.85% of total direct causes of MD.

The most common indirect cause of MD was respiratory disease in 22 cases amounting to 51.16% of total indirect causes. The most common respiratory disease was pneumonia. The lung tissue sections showed alveolar spaces filled with neutrophils and some macrophages. Sections did not show evidence of granulomas.

The second most common indirect cause of MD was presence of severe anaemia in the mother in ten cases ie 23.25% of total indirect causes. There were two diagnosed cases of sickle cell disease. The tissue sections from various organs showed congested blood vessels packed with sickled erythrocytes on microscopic examination in these cases of sickle cell disease. One case of sickle cell disease had associated ischemic heart disease and the patient succumbed in the second trimester. The other case of sickle cell disease died on day two of lower segment cesarean section (LSCS). Renal diseases were present in four cases (9.30% of total indirect causes).There were three deaths due to hepatic diseases (6.97% of total indirect cause). One of the patients was a case of Hepatitis E virus infection. The patient developed acute fulminant hepatitis with hepatic encephalopathy. Microscopic examination of the liver sections showed massive liver parenchymal necrosis in the case of Hepatitis E virus infection.

In two cases of cardiovascular diseases (4.66% of total indirect cause), one patient had ischemic heart disease and the other was a diagnosed case of rheumatic heart disease. There was one case each of central nervous system disorders and dengue shock syndrome.

When the occurrence of maternal deaths was considered in relation to gestational age, the most common cause in the first trimester was related to abortion and accounted for 11.53% cases of total direct causes. One of these cases developed

Parameters	No of cases			Percentage
Total no of cases	100			100%
10-20 years	04			04%
21-30 years	87			87%
31-40 years	09			09%
ANC (52 cases)	1st Tri	2nd Tri	3rd Tri	52%
	10	21	21	
PNC (48 cases)	1-15 days	16-30 days	31-42 days	48%
	42	03	03	
Direct causes	52			52%
Indirect causes	43			43%
Coincidental causes	05			05%
Table-1: Showing demography of the study of 100 cases of Maternal Deaths.				

Direct causes Total no of cases	No 52	% 100%	Indirect Cause Total no of cases	No 43	% 100
Haemorrhage	15	28.85	Respiratory diseases	22	51.16
Puerperial Sepsis	13	25	Severe anaemia	10	23.25
Eclampsia and preeclampsia	06	11.53	Renal diseases	04	9.30
Abortion related	06	11.53	Hepatic diseases	03	6.97
Hepatic diseases of pg	05	9.62	Cardiovascular diseases	02	4.66
IUD	04	7.69	Central nervous system diseases	01	2.33
Pulmonary embolism	02	3.85	Dengue shock syndrome	01	2.33
Ruptured ectopic	01	1.93			
Table-2: Showing categorization of causes of Maternal Death as Direct and Indirect causes.					

perforation peritonitis and had to undergo exploratory laprotomy and the patient succumbed due to septicaemia.

In the second trimester, there were four cases of intra uterine death of the foetus leading to deaths of prospective mothers in 7.69% cases. There was a single case of ruptured right tubal ectopic pregnancy that amounted to 1.93% of total direct causes.

In the post natal care period (PNC) 42 cases of maternal deaths occurred during the first fifteen days. The cause of death in these cases included post partum haemorrhage, septicaemia and eclampsia. The various reasons for haemorrhage included cases of placenta abruption, retained placenta and uterine rupture.

There were two cases of maternal deaths due to pulmonary embolism that occured during the first 15 days of PNC.

DISCUSSION

Maternal mortality is a leading cause of death in women of reproductive age group. There is a significant high maternal mortality in Asian and African countries.[2,9,10]

Reducing maternal death (MD) is the important intention of millennium development goal five (MDG). One of the main objectives of the National Family Welfare Program is preventing maternal deaths.[2]

The WHO and MDG initiative of "make every mother and child count" highlights the significance given to the reduction in maternal mortality. There is a prime concern of the international community for reduction in maternal mortality. A woman dies of pregnancy or child birth in world every minute and one women dies every five to seven minutes in India.[1,2,10,11]

Maternal death is defined as death of a lady occurring while pregnant or within 42 days of termination of pregnancy, regardless of the duration and site of pregnancy, occurring from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes.[1,9,12-14]

The catastrophe of the mother dying during child birth extends beyond her own death. The death of the mother is disastrous for the infant, other children in the family, community and the nation as a whole.

In the present study maximum number of MD occurred in the age group of 21 to 30 years as seen in other studies.[10,14] In the study of Khumanthem Pratima Devi et al maximum MD occurred in the age group of 30 to 40 years. In the study of Lima Hazarika et al the MD were maximum in the early age group of 15 to 20 years.[3,5]

In the present study maternal deaths during post natal care period (PNC) cases were 48%. In the study of Surekha N. Khandale et al it was 53.84% and the study of Khumanthem Pratima Devi et al PNC cases were 70%.[2,3]

The direct causes were responsible for more number of cases of MD as compared to the indirect causes in the present study. This finding is in concordance to the other studies.[2,3,9]

Indirect causes of MD were more frequent in the studies by Jashnani K D et al and Panchabhai T S et al.[7,8]

In the present analysis, hemorrhage and sepsis were predominant causes followed by eclampsia and abortion related MD. The principle direct causes of MD were hemorrhage, sepsis and eclampsia in other studies[3,9,10,14] Eclampsia was a quoted as main cause of MD in other studies.[8,14,15]

Haemorrhage, infections, eclampsia, unsafe abortion and obstructed labour accounted for a large number of maternal deaths due to direct causes in the study of Gina Marie Piane.[15] Large number of MDs are due to the complex influencing factors like social and health care delivery. The precise cause of MD is established by correlating the clinical diagnosis with the finding of pathological autopsy. The pathophysiological changes in various organs can describe the sequence of events leading to death and autopsy studies can impart vital information.[8]

The reasons for haemorrhage in the present study were placenta abruption, retained placenta, uterine atony similar to the study of Panchabhai TS et al. In the present study one of the patients underwent subtotal obstetric hysterectomy but succumbed to haemorrhage. In the study of Jashnani K D et al three cases succumbed to haemorrhage after hysterectomy.[7]

Significant percentage of maternal deaths due to haemorrhage, occurred during transport of the patient to the referral centres as transfusion and other emergency treatment could not be provided at the rural health centre. In haemorrhage deaths happen within two hours if proper treatment is not made available while in eclampsia and obstructed labour deaths occurs within ten and 72 hours respectively if not treated on time.[3]

Sepsis was the next preventable cause of MD. As per the history given by the relatives, patients had delivery at home in most of these cases. Non availability of hygienic conditions during delivery could explain the development of sepsis in these cases.

Pulmonary embolism, hepatic disease of pregnancy, ectopic pregnancy, abortion related death were the other causes of MD as seen in the other studies[8,16]

In pregnancy hepatitis E virus infection has a bad prognosis. It leads to fulminant hepatic failure and death in up to 60% cases. There was a single case of Hepatitis E virus infection in this study. Estimation of viral markers should be carried out in all cases of jaundice in pregnant women to know the type of viral hepatitis and take due precautions.[7]

In the study of Jashnani K D et al. acute fulminant viral hepatitis was the main indirect cause of MD.[7]

Sickle cell disease is prevalent in this part of Central India. Sickle cell disease was responsible for two cases of MD in the present study. MD due to sickle cell disease was noted in the studies from Central India by Khandale SN et al and the study from Jharkhand by Lal Rita et al.[2,14] Due to hemo-dilution there is decrease in the haemoglobin concentration both in haematologically normal and sickle cell anaemia pregnant females. The vaso-occlusive crisis may have adverse consequences on both foetus and mother with fatal consequences in few cases.[17]

Pathology plays an important role in the elaboration and confirmation of the clinical diagnosis. There is a lack of

autopsy assessment of MD worldwide. Detailed autopsy study of MD should be performed in each case of MD.[18]

Jashnani K D et al have stressed that sections from the uterus, placenta, pituitary gland should be studied in addition to other organs, as the study of these organs gives good understanding of pathophysiology of pregnancy related diseases.[7]

This analysis amalgamated the available clinical and laboratory data, autopsy finding, gross and microscopic findings to provide the final cause of death in majority of MDs. The autopsies were done in different places and hence following of the standard guidelines for autopsy procedure cannot be ascertained.

Limitations of study- Record of all investigations done before occurrence of death was not available in most cases. Genetic study of foetuses was not done. Sections from the placenta, uterus could be studied in only few cases. Pituitary gland was not studied.

The strong point of present study is analysis of large number of consecutive cases of maternal deaths. A significant number of MD could be studied highlighting the causes in large number of maternal deaths. The preventable causes of MD could be studied making way for the prospective studies in future to achieve the millennium development goal.

Study of these MD and autopsy findings along with the clinical details provided can prove to be one of the most useful sources to identify pregnancy related deaths and elucidating the emerging trend and prevalence of MD.

In the developing countries there are a large number of maternal deaths. The causes of MD are multi factorial and preventable to a large extent. To decrease MD there is a need of multi disciplinary and a well organised approach.

A significant number of maternal deaths can be lowered by proper and adequate number of prenatal tests for identifying various causes of MD. Region wise studies of MD will identify the causes and plan the strategies in a more holistic manner to reduce MD.

During the lifetime the risk of woman dying due to pregnancy and child birth is about one in six in Afghanistan as compared with one in 30000 in Northern Europe. In India the risk is one in 190 women, in Pakistan it is one in 170 and one in 1400 in Sri Lanka.[6,11] In 2015 on an average around 830 maternal deaths occurred daily. In Sub-Saharan Africa MDs were 550, in Southern Asia MD were 180 and five in the developed world. There is a marked decline in the MMR in India and worldwide.[4,10]

Dedication from global public health leaders is required to recognise and implement the effective programmes for the perfect practices in decreasing MD. Around 80% of MDs can be averted if the mother has access to the basic and necessary health care services before, during and after the child birth.[11]

CONCLUSION

Recognition and early management of the high risk pregnancy should be the major focus of the future efforts to reduce maternal mortality. There should be availability of the trained health care providers, who are able to identify the early signs of obstetric and medical complications, treat and/or refer the cases promptly. Treatment should be made available at the peripheral health centres for all prospective mothers.

It is important that countries develop and implement effective methods to limit the preventable maternal deaths. There is a need to make sure that every maternal death counts and establish the cause and associated factors which can decrease similar deaths in future.

REFERENCES

1. Niranjan N Chavan, Smurti Kamble, Neha Raj, Pradnya Changede obstetric causes of maternal mortality at a tertiary care centre in Mumbai, Maharashtra and Technology November 2016; 21: 55-59
2. Khandale SN, Kedar K. Analysis of maternal mortality: A retrospective study at tertiary care centre. Int J Reprod Contracept Obstet Gynecol 2017;6:1610-3.
3. Khumanthem Pratima Devi, Chanam Manglem Singh, Samjetshabam Randhoni Devi Maternal Mortality and Its Causes in a Tertiary Center The Journal of Obstetrics and Gynecology of India 2012;62:168–17.
4. Taye MK, Alam A, Rakshita. Retrospective evaluation of causes and social correlates of maternal deaths at Assam Medical College and Hospital Dibrugarh, Assam, India. J Evolution Med Dent Sci. 2016;5:275-9.
5. Hazarika L, Phukan P, Sharma A, Das NK. Maternal mortality at a tertiary care teaching hospital in Dibrugarh district, Assam: a retrospective study. Int J Community Med Public Health 2017;4:3342-6.
6. Murthy BK, Murthy MB, Prabhu PM. Maternal mortality in a tertiary care hospital: A 10-year review. Int J Prev Med 2013;4:105-9.
7. Jashnani K D, Rupani A B, Wani R J. Maternal mortality: An autopsy audit. J Postgrad Med 2009;55:12-6
8. Panchabhai T S, Patil P D, Shah D R, Joshi A S. An autopsy study of maternal mortality: A tertiary healthcare perspective.J Postgrad Med 2009;55:8-11
9. Kumari J S, Revathi V, Reddy K S. A study of maternal mortality in Government Maternity Hospital, Sri Venkateswara Medical College, Tirupati. Indian J Obstet Gynecol Res. 2018;5:525-529.
10. Singh S, Singh N, Nagar JK, Jain S. Maternal mortality at a tertiary health care: a retrospective study. Int J Reprod Contracept Obstet Gynecol 2018;7:1773-7.
11. Doddamani U, Rampure N, Kaveri, Pooja. A study of maternal mortality in a tertiary care hospital. Int J Reprod Contracept Obstet Gynecol 2018;7:2446-8.
12. Park K. Park's textbook of preventive and social Medicine, 23rd ed.2015.pg557.
13. Parmar M, Shrivastava S, Kanhere A, Patel S. Maternal mortality: a retrospective analysis of 6 years in a tertiary care centre. Int J Reprod Contracept Obstet Gynecol 2018;7:224-8.
14. Lal R, Lal S, Mandal A. Births Should Not Cause Deaths: A Retrospective Analysis of Maternal Mortality at a Tertiary Care Hospital in Eastern India. Int J Sci Stud 2015;3:67-70.
15. Gina Marie Piane Evidence-based practices to reduce maternal mortality: a systematic review. Journal of Public Health 2008;31:26–31.

16. Ramola M, Jain S, Gupta V, Bansal N, Singh P. Analysis of maternal deaths over a period of three years at a tertiary care centre of Uttarakhand, India. Int J Reprod Contracept Obstet Gynecol 2018;7:1357-60.

17. Winfred C. Wang. Sickle Cell Anemia and Other Sickling Syndromes. In: John P. Greer, John Foerster, George M. Rodgers, Frixos Paraskevas, Bertil Glader, Bertil Glader, Daniel A. Arber, Robert T. Means Jr. Wintrobe's Clinical Hematology.12th Edition. 530 Walnut Street, Philadelphia, PA 19106 USA:Lippincott williams & wilkins, a wolters kluwer business;2009. pg1064

18. Lucas S. Maternal death, autopsy studies, and lessons from pathology. PLos Med 2008;5:e48