

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20191961>

## Original Research Article

# A study of maternal mortality due to non-obstetric causes

Tejal N. Kansara\*, Tushar M. Shah, Foram R. Lalcheta

Department of Obstetrics and Gynecology, B. J. Medical College, Civil Hospital, Ahmedabad, Gujarat, India

**Received:** 08 March 2019

**Accepted:** 08 April 2019

**\*Correspondence:**

Dr. Tejal N. Kansara,

E-mail: drtejalkansara12@gmail.com

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### ABSTRACT

**Background:** Pregnancy, although being considered a physiological state, carries the risk of serious maternal morbidity and at times mortality, due to various complications that may arise during pregnancy, labour or thereafter. The existing medical condition, infection, and surgical condition which is collectively called as non-obstetric cause pre disposes a women for more complication than a non-pregnant women, so much so that it can lead to maternal mortality. Thus, Pregnancy is more vulnerable state and present study was carried out to study, analyse and review various non-obstetrics causes of death of women during pregnancy or within 42 days of termination of pregnancy in Tertiary care centre.

**Methods:** This was an Observational study, conducted in the department of obstetrics and gynaecology, at a tertiary care hospital attached with medical college, from October 2016 to October 2018. The details of maternal deaths were collected from various departments with non-obstetric causes and analyzed.

**Results:** The total number of deliveries in my study period was 15,208. There were 197 maternal mortality in our study period, of which 51 women died of non-obstetric causes. The most common cause of maternal mortality in our study was hepatic cause i.e. 33.33% amongst which viral hepatitis was the most common cause followed by respiratory (19.60%), infectious (15.18%), heamoglobinopathy (13.72%), cardiac (5.88%), neurological (5.88%), surgical (5.88%) causes.

**Conclusions:** Looking into our study, maternal mortality can be reduced by identifying various different indirect medical causes which are preventable by proper pre-pregnancy evaluation for pre-existing comorbid conditions.

**Keywords:** Live births, Maternal mortality, Non-obstetric cause, Rural population, Viral hepatitis

### INTRODUCTION

Maternal mortality is the death of a woman in relation to pregnancy. According to World Health Organization (WHO), "A maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by pregnancy or its management" (ICD-10).<sup>1,2</sup>

Pregnancy and childbirth are joyful events but sometimes may land up with complications and death if risk factors

are not identified and corrected at proper time. Death of a woman and mother is a tragic loss to the child, community and nation as whole. The young surviving children left motherless are unable to cope with daily living and are at increased risk of death. Also maternal mortality is just a tip of iceberg, for every woman who dies. Pregnancy, although being considered a physiological state, carries the risk of serious maternal morbidity and at times mortality, due to various complications that may arise during pregnancy, labour or thereafter. The existing medical condition, infection, and surgical condition which is collectively called as non-

obstetric cause pre disposes a women for more complication than a non-pregnant women ,so much so that it can lead to maternal mortality. Thus, Pregnancy is more vulnerable state and present study was carried out to study all such non-obstetric causes of maternal mortality.

According to WHO:

- Everyday 830 women die from preventable causes related to Pregnancy and child-birth
- 99% deaths occur in Developing countries
- Maternal Mortality is higher in women living in rural areas and belong to poorer communities
- Young adolescents face a higher risk of complication and deaths as a result of pregnancy than other women
- Between 1990 and 2015, Maternal mortality dropped by about 44%
- Between 2016 and 2030, as a part of the Sustainable Development Goals, the target is to reduce the Global maternal Mortality ratio to less than 70 per 1, 00,000 live births.

Improving maternal Health is one of the eight United Nations millennium developmental goals that target the reduction of 75% in the maternal mortality.<sup>3</sup>

One target under sustainable development goal is to reduce the Global maternal mortality ratio to less than 70 per 1, 00,000 births.

Maternal death audits are conducted at institutional level, district level. Various delays in care are being identified. While the increased attention has clarified which interventions are more effective than others and promoted critical assessments of strategies, the main challenge remains the delivery of interventions to those areas of greatest need. The present study was conducted to Analyse and review various different non-obstetric causes leading to maternal deaths at a tertiary care centre, so that corrective steps can be taken.

To study, analyse and review various non-obstetrics causes of death of women during pregnancy or within 42 days of termination of pregnancy in tertiary care center.

The objective of this study was to know the incidence of maternal mortality due to non-obstetric causes in our Institute. To ascertain influence of factors such as age, location, parity, economic status, period of admission, Regular antenatal care, Outcome of pregnancy with Non-Obstetric causes of maternal deaths.

## METHODS

This was an observational study, conducted in the department of obstetrics and gynaecology, at a tertiary care hospital attached with medical college, from October

2016 to October 2018. The details of maternal deaths were collected from various departments with non-obstetric causes and analysed with respect to the following parameters:

- Locality and socioeconomic status wise distribution of maternal deaths
- Literacy wise distribution of maternal deaths
- Parity wise distribution of maternal deaths
- Causes of maternal deaths.

Data collected from the cases were analyzed, computed and tabulated according to standard proforma.

Total No of Maternal deaths from October 2016 to October 2018 were 197, Out of which 51 cases were due to Non-Obstetric causes. All 51 cases which were analyzed computed and tabulated according to standard proforma. The details of number of live births of 2 year duration were collected which was 15,208.

## Inclusion criteria

- All patients who expired while pregnant or within 42 days of termination of pregnancy
- Any gestational age or site of the pregnancy
- For Non- obstetric causes which were not related to Pregnant State (pregnancy, peuperium, labour) from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above
- From causes that result from previous existing disease or from disease that developed during pregnancy and which was not due to direct causes, but which was aggravated by physiological effects of pregnancy.

## Exclusion criteria

- Those who expired because of accidental or incidental causes were excluded from the study
- For obstetric causes which were related to Pregnant State (pregnancy, peuperium, labour) from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

## RESULTS

The study duration was from October 2016 to October 2018. The total number of deliveries in my study period were 15,208.

There were 197 maternal mortality in our study period, of which 51 women died of non-obstetric cause which were included in the present study. Thus Maternal Mortality Ratio of our Tertiary Care centre was 130/1, 00,000 live births.

Approximately 64.70% mortality occurred in the age groups from 21-30.

**Table 1: Age wise distribution of the study population.**

Age	Number	Percentage
15-19	02	3.9
20-24	21	41.17
25-29	12	23.5
30-34	11	21.5
35-40	05	9.8
Total	51	100

**Table 2: Relationship of economical status of the patient with maternal mortality.**

Economic status	Number	Percentage
Lower	34	66.66
Middle	17	33.33
Higher	0	0
Total	51	100

In the present study, 66.66% of the patients were from lower socio-economical class, while rest 33.33% of the patients were from middle socio-economical class. There was no patient from the higher socio-economical class in the study.

**Table 3: Relationship of residency with maternal mortality.**

Population	Number	Percentage
Urban	15	29.41
Rural	36	70.58
Total	51	100

In the present study, maximum numbers of the patients i.e. 70.58% were from rural region.

**Table 4: Relationship of maternal mortality to mode of admission.**

Cases	Number	Percentage
Booked	18	35.29
Emergency	33	64.70
Total	51	100

64.70% of the patients were unbooked/emergency cases which were brought to CHA in emergency hours, while only 35.29% were booked cases of CHA.

**Table 5: Relationship of type of care provider from where patient was referred with maternal mortality.**

Reference centre	Number	Percentage
Private	20	60.60
District	10	30.30
Rural	03	5.88
Total	33	100

Approximately 60.60% of the patients were referred from the private hospital across Gujarat and Rajasthan, followed by district hospital from various different cities i.e. 30.30.

**Table 6: Relationship of parity with maternal mortality.**

Gravida	Number	Percentage
Primi gravida	18	35.29
Multi gravida	28	54.90
Grand multi gravida	05	9.80
Total	51	100

In the present study, 54.90% of the patients were multigravidas with a maximum number, followed by 35.29% were primigravida and 9.80% of the patients were grand multi gravida.

**Table 7: Period at the time of admission.**

Period	Number	Percentage
Antenatal <20 weeks	05	9.80
Antenatal >20 weeks	31	60.78
Postnatal <24 hours	07	13.72
Postnatal 24 hours to 1 week	06	11.76
Postnatal 1 week to 42 days	02	3.92
Total	51	100

Maximum numbers of patients were in the Antenatal > 20 weeks group with 31 followed by postnatal < 24 hours with 7 numbers.

**Table 8: Mode of delivery.**

Mode	Number	Percentage
Undelivered	14	27.45
Vaginal delivery	21	41.17
Abortus	05	9.80
LSCS	10	19.60
Instrumental delivery	01	1.96
Total	51	100

In our present study, 21 of the patients were delivered vaginally followed by 14 which were undelivered. 10 of the patient underwent LSCS followed by 5 of the patients in which abortion was done. In the study there was only 1 patient who underwent instrumental delivery.

**Table 9: Outcome of pregnancy.**

Outcome	Number	Percentage
IUD	16	31.37
Live birth	16	31.37
Undelivered	14	27.45
Abortus	05	9.80
Total	51	100

In the present study, 16 of the patients were delivered being IUD and live birth with 16 each, followed by 14 in the undelivered group and 5 patients were aborted.

**Table 10: Phase of labour at which the patient died.**

Phase of labour	Number	Percentage
Fourth stage of labour	02	3.92
Antenatal <20 weeks	01	1.96
Antenatal >20 weeks	15	29.41
Postnatal <24 hours	09	17.64
Postnatal 24hours to 1 week	18	35.29
Postnatal 1 week to 42 days	06	11.76
Total	51	100

In the present study, 35.29% of patients died when they were in postnatal period 24 hours to 1 week followed by 29.41% of patients in Antenatal >20 weeks.

**Table 11: Maternal deaths in relation to time interval from delivery to death.**

Delivery death interval	Number	Percentage
<24 hours	11	21.56
24 hours to 1 week	12	23.52
1 week to 42 days	13	25.49
Undelivered	15	29.41
Total	51	100

In our study, delivery to death interval almost equal in all the 4 groups with maximum in undelivered group i.e. 29.41% and 25.49% in 1 week to 42 days time group.

**Table 12: Cause of death.**

Cause of death	Number	Percentage
Hepatic causes	17	33.33
Respiratory causes	10	19.60
Cardiac causes	03	5.88
Neurological causes	03	5.88
Infectious causes	08	15.68
Haemoglobinopathy	07	13.72
Surgical causes	03	5.88

The most common cause of maternal mortality in our study was hepatic cause i.e. 33.33% amongst which viral hepatitis was the most common cause followed by hepatic encephalopathy with Acute Liver Failure. The second most common system involved was the respiratory system which was 19.60%, of which H1N1 infection was the most common cause. Cardiovascular system and Central vascular system compromised 5.88% each.

## DISCUSSION

Total numbers of maternal deaths from October 2016 to October 2018 were 197, out of which 51 cases were due

to Non-Obstetric causes. All 51 cases which were analysed, computed and tabulated according to standard proforma. The details of number of live births of 2 year duration were collected which was 15,208. The largest number of maternal deaths, approximately 64.70% occurred in the age groups from 21-30, largely because those are the ages at which women are most likely to give birth, so efforts directed at this age group would most effectively reduce the number of deaths, which is in comparison to the study done by Puri A et al, which is 71.53%.<sup>4</sup> Although maximum number of maternal deaths occur in 20-34 age groups, it is necessary to identify the 'at risk' population to re-direct resources and fine-tune greater effectiveness in efforts to reduce maternal mortality Table 1.

As per Table 2, in the present study, 66.66% of the patients were from lower socio-economical class, while rests 33.33% of the patients were from middle socio-economical class. There was no patient from the higher socio-economical class in the study. This results were in close relation to the study done by Blank AK et al, which was 58%, 33% and 9% in lower, middle and upper socio-economical class respectively.<sup>5</sup> A study by Urmila M et al, had similar results to our present study i.e. 78%, 18% and 3% in lower, middle and upper socio-economical class.<sup>6</sup> Poverty influences a woman's utilisation of health services and also has indirect effects on her general health by way of malnutrition. Women belonging to low socioeconomic strata are likely to be less privileged in the fields of education, nutrition, housing and antenatal care. Unawareness about contraceptive measures and high fertility rates also account for the mortalities in these women.

In the present study, maximum number of the patients i.e. 70.58% were from rural region (as per Table 3) which is in relation to the other studies done by Bellad MB et al, Urmila M et al, and Usharam et al, which were 69%, 76% and 75% respectively.<sup>6-8</sup> Maternal mortality is higher in rural population because of illiteracy, inadequate antenatal visits, inaccessible emergency health care services, lack of transportation facilities and late referral. Many patients are referred very late, in critical condition, unaccompanied by health care worker. Emergency transport facility in the form of 108 is available but people living in rural areas fail to benefit from it because of lack of knowledge.

Booked patients are those who have taken at least 3 antenatal visits in our institute or any private or government hospital. As per Table 4, 64.70% of the patients were unbooked/emergency cases which were brought to CHA in emergency hours, while only 35.29% were booked cases of CHA. Beyond doubt it is proven that unbooked emergency patients have more morbidity and mortality. The result of our study was in comparison to the study done by Bellad MB et al, and the UNICEF data which showed 69% and 66% of unbooked cases.<sup>7,9</sup> However, findings of the studies done by Puri A et al,

and Urmila M et al, were in near correlation were 92.3% and 89% of the patients were unbooked.<sup>4,6</sup>

Approximately 60.60% of the patient were referred from the private hospital across Gujarat and Rajasthan, followed by district hospital from various different cities i.e 30.30% (as per Table 5). In the study done by Bangal VB et al, the patient referred from private hospital were only 22% which is in contradiction to our study were almost 60% of the patients were referred from private hospital.<sup>10</sup>

In the present study, 54.90% of the patients were multigravidas with a maximum number, followed by 35.29% were primigravida and 9.80% of the patients were grand multi gravid (as per Table 6). In the other studies done by Usharam et al, and Bangal VB et al, showed similar results to our present study with maximum in multigravida group i.e. 49.2% and 55.2% respectively.<sup>8,10</sup> Probable explanation for higher percentage of deaths among multigravida patients is that too many and too close pregnancies together adversely affect the mother's health and have its roots in the social status of the woman. Multiparity increases the chances of anaemia, abnormal presentations, antepartum haemorrhage, post-partum haemorrhage, rupture uterus, less compliance to antenatal care.

As per Table 7, Maximum numbers of patients were in the Antenatal > 20 weeks group with 31 followed by postnatal < 24 hours with 7 numbers.

In our present study, 21 of the patients were delivered vaginally followed by 14 which were undelivered. 10 of the patient underwent LSCS followed by 5 of the patients in which abortion was done. In the study there was only 1 patient who underwent instrumental delivery (as per Table 8). The findings were similar to the other study done by Nair M et al, with 46.5% of the patient being delivered vaginally.<sup>5</sup>

In the present study, 16 of the patients were delivered being IUD and live birth with 16 each, followed by 14 in the undelivered group and 5 patients were aborted (as per Table 9). The other studies done by Nair M at al, Bangal VB et al, and Puri et al, showed similar results with maximum in delivered group i.e. 79%, 81.5% and 63% respectively.<sup>4,10-12</sup>

In the present study, as per Table 10, 35.29% of patients died when they were in postnatal period 24 hours to 1 week followed by 29.41% of patients in antenatal > 20 weeks. Highest number of deaths in postpartum period indicates the need for continuous vigilance in postpartum period and prompt action in case of problems.

In our study, delivery to death interval almost equal in all the 4 groups with maximum in undelivered group i.e.

29.41% and 25.49% in 1 week to 42 days time group (as per Table 11). The findings of our study were in correlation to the study done by Usharam et al, i.e. 24% and 29% in undelivered group and 1 week to 48 days group.<sup>8</sup>

According to Table 12, the most common cause of maternal mortality in our study was hepatic cause i.e. 33.33% amongst which viral hepatitis was the most common cause followed by hepatic encephalopathy with acute liver failure. Acute viral hepatitis is a major public health problem in the developing countries. Most of the cases of Hepatitis in India have been attributed to Hepatitis E, for which it is an endemic zone. This infection can spread in epidemics or sporadically, especially during the warm and rainy weather seasons. The presentation of Hepatitis E during pregnancy may range from the asymptomatic to fatal in different endemic areas.

Various reports evaluating etiological spectrum in individuals with acute hepatitis during both epidemic and sporadic settings indicate three distinct observations in India:<sup>12-14</sup>

- HEV is the commonest cause of AVH (Acute Viral Hepatitis) in both sporadic and epidemic settings
- The frequency of HEV as the cause of AVH is significantly higher among pregnant females than in non-pregnant females and males
- The frequency of ALF (Acute Liver Failure) is significantly higher in pregnant females than in non-pregnant females and males with HEV infection.

In the other studies done by Bangal VB et al, and Puri et al, showed that the leading indirect cause of maternal mortality was hepatitis which was in relation to our present study.<sup>4,10</sup>

The second most common system involved was the respiratory system which was 19.60%, of which H1N1 infection was the most common cause. Findings from the study done by Rojas-Suarez J et al, suggest that none of the non survivors of H1N1 disease had received prenatal influenza vaccine and most had a delay in the initiation of antiviral therapy after the development of symptoms and profound hypoxemia with challenges related to mechanical ventilation in all cases.<sup>15</sup> Despite the known epidemic (after mid-2009), one-third of patients failed to receive antiviral therapy. Women who were pregnant at the time of H1N1 diagnosis and died from the disease had high rates of stillbirths and preterm births.

Cardiovascular system and central vascular system compromised 5.88% each. In the present study, 8 patients died due to infectious diseases, of which 5 patients had positive falciparum malaria infection, two patients were immune-compromised and one had PUO associated with septicaemia. There were 7 patients with severe anaemia and with sickle cell crisis. There were 3 patients in the

present study that died due to surgical cause in form of sigmoid colon perforation, cecal perforation and sigmoid

volvulus respectively.

**Table 13: Comparison of cause of death to other studies.**

Cause	This study	Puri et al <sup>4</sup>	Bangal VB et al <sup>10</sup>
Hepatic causes	33.3%	15%	36.3%
Respiratory causes	19.60%	9.1%	-
Cardiac causes	5.88%	1.6%	22.7%
Neurological causes	5.88%	0.8%	22.7%
Haemoglobinopathy	13.72%	14.1%	4.5%
Infectious diseases	15.68%	25%	13.6%
Surgical Cause	5.88%	1.6%	-

## CONCLUSION

We conclude from our studies that out of 197 total maternal deaths. 51 Maternal deaths were due to non-obstetric causes. That was 25.8% out of total maternal deaths and most common non- obstetric cause of maternal death is Hepatitis (33.3%). Pregnancy itself is “Immuno-compromised” state that makes pregnant women more susceptible to infections. Previous existing condition or infection that develop during pregnancy which is not a result of direct obstetric cause, but which is aggravated by physiologic effect of pregnancy complicates the obstetric conditions leading to maternal mortality. The complications leading to maternal death can occur without warning at anytime during pregnancy and childbirth. Looking into our study various different indirect medical causes in descending order of frequency like hepatitis, respiratory disorders, cardiovascular disorders, anaemia and infectious/ communicable diseases. All these are preventable by proper pre-pregnancy evaluation for pre-existing comorbid conditions. Rest can be decreased by identifying high risk pregnancies and appropriate intrapartum and postpartum monitoring. If the GDP of our country will grow, the economic standards will increase, which will help in reducing maternal mortality by proper allocation of resources to individual as a whole.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Kansara TN, Shah TM, Lalcheta FR. A study of maternal mortality due to non-obstetric causes. *Int J Reprod Contracept Obstet Gynecol* 2019;8:2027-33.