"FACILITY BASED STUDY OF NEAR MISS OBSTETRIC EVENTS IN TWO TERTIARY CARE HOSPITALS OF BELAGAVI"

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LIST OF ABBREVIATION USED

SL. No.	ABBREVIATION	EXPANSION OF THE ABBREVIATION
1	**WHO**	World Health Organization
2	**MNM**	Maternal Near Miss
3	**MD**	Maternal Death
4	**SMO**	Severe Maternal Outcome
5	**SMOR**	Severe Maternal Outcome Ratio
6	**MMR**	Maternal Mortality Ratio
7	**LMIC**	Low Middle - Income Countries
8	**SAMM**	Severe Acute Maternal Morbidity
9	**PLTC**	Potentially Life Threatening Condition
10	**WLTC**	Women with Life Threatening Condition
11	**MNMIR**	Maternal Near Miss Incidence Ratio
12	**MI**	Mortality Index
13	**CFR**	Case Fatality Rate
14	**APH**	Antepartum Hemorrhage
15	**PPH**	Postpartum Hemorrhage
16	**PIH**	Pregnancy Induced Hypertension
17	**HELLP**	Hemolysis Elevated Liver enzyme Low Platelet
18	**DIC**	Disseminated Intravascular Coagulation

19	**RHD**	Rheumatic Heart Disease
20	**DM**	Diabetes Mellitus
21	**GDM**	Gestational Diabetes Mellitus
22	**Hb**	Hemoglobin
23	**Rh**	Rhesus
24	**RBS**	Random Blood Sugar
25	**HIV**	Human Immunodeficiency Virus
26	**HbsAg**	Surface Antigen of Heaptitis B virus
27	**BP**	Blood Pressure
28	**PS**	Peripheral Smear
29	**LSCS**	Lower Segment Caesarean Section
30	**NFHS**	National Family Health Survey
31	**PHC**	Primary Health Centre
32	**CHC**	Community Health Centre
33	**ICU**	Intensive Care Unit
34	**CPI**	Consumer Price Index
35	**SD**	Standard Deviation
36	**AOR**	Adjusted Odd's Ratio
37	χ^2	Chi square

ABSTRACT

INTRODUCTION

Every year millions of women around the world suffer from pregnancy, childbirth and postpartum complication. Approximately 810 women die every day worldwide from preventable causes related to pregnancy and delivery. Maternal mortality is considered as 'Just the tip of iceberg' the base to iceberg is Maternal Near Miss (MNM) morbidity, that remains undescribed. The concept of Severe Acute Maternal Morbidityor near miss was aptly developed for the present health care system. World Health Organization (WHO) has defined "near - miss" as a woman, who being close to death, survives a complication that occurred during pregnancy, delivery or up to 42 days after the termination of her pregnancy. The WHO near-miss approach is a standardized method which is implemented based on organ system dysfunction which incorporates clinical, laboratory and management based criteria for identifying maternal near miss cases. This transition from studying maternal mortality to morbidity has created a worldwide trend since the absolute number of deaths is relatively less compared to the maternal morbidity cases with poor quality of life. The present study was planned to assess the occurrence of severe maternal morbidity in two tertiary care hospitals of Belagavi, Karnataka as proposed by the WHO near miss approach and to examine the implementation levels of key evidence based interventions in women expressing severe maternal morbidity and mortality.

OBJECTIVES

To study near miss obstetric events in two tertiary care hospitals of Belagavi and the factors associated with near miss obstetric events.

MATERIAL AND METHOD

A cross sectional study was conducted in two major tertiary care hospitals of Belagavi namely KLE DrPrabhakarKore Charitable Hospital and Belagavi Institute of Medical Sciences Hospital for a duration of one year amongantepartum, intrapartum and postpartum mothers experiencing Severe Maternal Outcome (SMO). A sample of 200 study participant were used based on the prevalence of previous maternal near miss incidence ratio to assess the Maternal Near Miss (MNM) cases using “Modified Facility Based Maternal Near Miss Review Form” for the identification of cases.

RESULTS

Out of 200 MNM cases, 145 (72.5%) subject belonged to the age group of 21 to 30 years, 38 (19.0%) were 18 to 20 years old and 17 (8.5%) of the women were aged≥ 31 years. The mean ± SD age of the study participant was 25.0 ± 4.45 years. Based on the obstetric profile of study subject, it was noted that 139 (69.5%) participant had presented to the study hospitals as unbooked case and 93 (46.5%) were primigravida whereas gravidity of ≥ 3 was seen in 54 (27.0%) women. Majority 177 (88.5%) of the study participant had received antenatal care during their pregnancy with almost half 77 (43.5%) having made ≥ 4 antenatal visits. Majority 160 (80.0%) of the MNM cases were referred, in which 97 (60.6%) were referred from a public health facility. Based on the clinical criteria, 34 (17.0%) had episodes of convulsion, 27 (13.5%) were in long standing unconscious state, 11 (5.5%) had cardio - respiratory failure, 6 (3.0%) had pulmonary edema and 4 (2.0%) suffered from jaundice in the presence of pre - eclampsia. Laboratory finding revealed that 50 (25.0%) of the MNM cases had hemoglobin level < 5 gm%. About 22 (11.0%) subject had abnormal computed tomography scan like presence ofintracerebral hemorrhage,

cerebral edema etc. Serum bilirubin > 6 mg/dL was recorded in 14 (7.0%) women, severe thrombocytopenia in 8 (4.0%) study subject and poor oxygen saturation was seen in 6 (3.0%) MNM cases. The interventional criteria highlighted intensive care unit admission in 101 (50.5%) study participant with mean ± SD duration of stay being 2.92 ± 2.37 days. Use of cardiotonic / vasopressor was noted in 77 (38.5%) cases. Blood / blood product transfusion was observed in 137 (68.5%) study subject with 65 (47.4%) being transfused with > 5 unit. Mechanical ventilation was required by 54 (27.0%) followed by 34 (17.0%) MNM cases who underwent laparotomy. According to the type of near miss event, 153 (76.5%) study participant had obstetric type of near miss events that included: 64 (32.0%) MNM cases with hypertensive disorder of pregnancy, 41 (20.5%) suffering from obstetric hemorrhage, 16 (8.0%) with ectopic pregnancy, 12 (6.0%) having obstetric sepsis etc. The non-obstetric events noted were: severe anemia in 17 (8.5%) subject, 14 (7.0%) with severe systemic infection, 12 (6.0%) with underlying cardiac disorder and 4 (2.0%) MNM cases had history of poisoning that further led to near miss event. Based on the type of organ dysfunction, reproductive / uterine system was most commonly 63 (31.5%) affected followed by neurologic 25 (12.5%) , multiple organ 17 (8.5%) , respiratory 16 (8.0%) etc. The maternal near miss incidence ratio in the present study was recorded as 12.05 / 1000 live births and severe maternal outcome ratio was found to be 15.75 / 1000 live births with a Maternal Mortality Ratio of 339 / 1,00,000 live births. Maternal near miss : maternal death ratio calculated was 3.3 : 1 and the mortality index was 23.5%. All types of delays were noted among the study participant in our study. Type I delay that consisted of lack of awareness and resources was seen in 134 (67.0%) MNM cases, followed by 130 (65.0%) being detected with Type II delay comprising of logistics delay between home to health care

facility and in between the health facilities along with lack of communication network and the third type of delay being observed at the referring health facility in all the referred study participant. Assessment of association between maternal outcome and the “3 delay model” by use of logistic regression analysis suggested that women who faced any kind of delay (I, II and III) during their pregnancy were 2.5 to 7 times more likely to end up with poor maternal consequences.

CONCLUSION

The present study aimed to assess the factors in depth that chronologically lead to maternal near miss event and poor maternal outcome. The current study revealed that hypertensive disorder of pregnancy and obstetric hemorrhage have been the most important direct obstetric event that pushes a woman towards moribund state. All the maternal near miss cases prove to be living lessons to us and the society by forming essential indicators of the current health care system. They show us the face of deficiencies that needs to be tackled and taken care of on an urgent basis. Hence there must be a multidisciplinary approach to manage the high risk maternal cases for timely intervention and management and reduce the burden of maternal morbidity and mortality on global scale.

KEYWORDS : World Health Organization, Maternal Near Miss, Severe Maternal Outcome, Obstetric event, Delay.

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INTRODUCTION

"Women are not dying because of diseases we cannot treat.

They are dying because societies are yet to make the decision that their lives are worth saving."

-- Prof. Mahmoud F. Fathalla,

World Health Organization (WHO)

Advisory Committee on Health Research

Millions of women around the world suffer from pregnancy, childbirth and postpartum complications each year. Worldwide approximately 810 women die every day from preventable causes related to pregnancy and delivery.[1] Since 1990, though maternal deaths world-wide have dropped by 47%, the number of maternal deaths in developing countries remains high.[2] The global Maternal Mortality Ratio (MMR) is 216/1,00,000 live births while it is 182/1,00,000 live births in South East Asian countries.[1] The MMR in low income countries in 2017 was 462/1,00,000 live births versus 11/1,00,000 live births in high income countries. MMR in India is measured to be 130/1,00,000 live births and Karnataka shows a MMR of 108/1,00,000 live births.[3] The MMR is found higher among women residing in rural areas and belonging to poor section of the community. As per WHO, 94% of maternal mortality occur in Low Middle - Income Countries (LMIC). The Millennium Development Goal 5 included 'improving maternal health'; consisting of two targets, one of which was to reduce maternal mortality by 75% between 1990 and 2015. But in 2015, the United Nations reported an estimated 45% decline, indicating that the target could not be

achieved. Hence it was followed by the Sustainable Development Goal 3 that aimed to reduce the global MMR to less than 70/ 1,00,000 live births by 2030.[4]

A case of maternal death is considered as one of the greatest devastating obstetric events that pose widespread implications on the family.[5] Traditionally, the evaluation of woman's health and determination of quality of obstetric care has always been analyzed by estimating the maternal deaths. But a pregnant woman's health status cannot be reflected by mortality indicators alone. Hence the concept of Severe Acute Maternal Morbidity (SAMM) or near miss was aptly developed for the present health providing system.[6] This transition from studying death to studying maternal morbidity has followed a worldwide trend because the absolute number of deaths is relatively small compared to the maternal morbidity cases. Also data on maternal morbidity is more accessible and reliable as the woman is herself a source of information and she holds greater acceptability among individuals and institutions since death did not occur. They give a better indication of care provided through the near miss events and useful information is transmitted to health practitioners and policy makers about the strengths and weaknesses of the emergency obstetric care provided at a facility.[7]

For every maternal death, there are many women who suffer from one or the other obstetric morbidity. Previous studies have reported obstetric morbidity to mortality ratio of 5:1 to 11:1.[8] Due to these morbidity, quality of life of these women tends to be poor. All women who have experienced an acute medical condition during antepartum, intrapartum or postpartum are labeled as 'near-miss' or SAMM cases. Women who survive life threatening conditions arising from complications related to

pregnancy and childbirth have many common aspects with those who die of such kind of complications.[9]

Maternal mortality is considered as 'Just the tip of iceberg' the base to iceberg is Maternal Near Miss (MNM) morbidity, that remains undescribed.[10] Both the indicators combined forms the basis of Severe Maternal Outcomes (SMOs).[5]

The important causes of maternal mortality and morbidity have been summarized as the three delays. These delays have been identified to understand the gap in access to adequate obstetric management. First delay is being undecided to seek care by woman or her family as danger signs are usually not identified early and they are unaware of the need of care. Second delay comprises of logistics causing delay in reaching the health care facilities. Third delay is the `delay in receiving adequate facility at the centre resulting from errors in diagnosis, clinical decision making, lack of medical supplies and of staff proficiency in the management of obstetric emergencies. In developing countries, about 75% of the women with severe obstetric morbidity are usually in a critical condition upon arrival, underscoring the significance of first two delays.[2]

There are many ways of identifying maternal near miss cases using various sets of criteria like disease specific, management specific and based on organ system dysfunction.[11] In 2009, WHO established a set of criteria for SAMM and for near miss in order to standardize data and calculate indicators for comparing different settings and identify cases of interest.[12] The WHO's system is based on organ system dysfunction which incorporates clinical, laboratory and management based criteria for identifying maternal near miss.[13] The organ system dysfunction based criteria have

been noted to be epidemiologically sound and less affected by bias in identifying maternal near miss cases.[11]

WHO has defined near miss as a woman, who being close to death, survives a complication that occurred during pregnancy, delivery or up to 42 days after the termination of her pregnancy. The WHO near-miss approach is a standardized method which is implemented in three steps in a cyclical manner: (1) baseline assessment / reassessment, (2) situation analysis and (3) intervention for improving health care. The baseline assessment can be performed in an individual health care centre or a health district and then scaled up to the entire health system. Identifying all eligible women is considered as the key to successful implementation of this approach.[14]

The WHO technical working group recommends the maternal near miss approach be considered in national plans for improving maternal health.[15] This approach has been suggested to evaluate and improve the quality of care provided by the health system. Severe morbidity data are vital for policy planners to know the requirements of essential and emergency obstetric care to manage these. The experiences are viewed as frightening along with a sense of imminent death by the mothers with MNM. The views regarding health care were affected by the promptness in delivering care, communication between the patients and the hospital staff, the information provided and condition of physical resources.

WHO planned to work in partnership with all the supporting countries to address the inequalities in access to quality health care and take into account the reasons for maternal morbidity and mortality and ensure optimal care of mothers experiencing acute complications during their pregnancy. They also aim towards

attainment of universal health coverage by strengthening health systems and services at all levels.

Near miss approach initiative by WHO to assess maternal morbidity was started in the year 2009. The surviving mothers would form a potential initiation point to understand the trauma faced by them throughout their course of journey with life threatening obstetric complications, the risks involved, inappropriate care that was objectively documented as well as their own perception towards the care received.[16]

Till date, not many studies have been carried out in this part of country with respect to determination of near miss cases. So this study aims to assess the occurrence of severe maternal morbidity in two tertiary care hospitals of Belagavi, Karnataka as proposed by the WHO near miss approach and to assess the implementation levels of key evidence based interventions in women expressing severe maternal morbidity and mortality. By reviewing near miss cases we can evaluate the processes and the deficiencies that are in place for the care of pregnant women. The circumstances that led to the gaps in the health system can be identified so that they may be addressed at the correct time and maternal complications leading to fatal outcomes during pregnancy and childbirth can be tackled in an efficient manner.

OBJECTIVES OF THE STUDY

1. To study near miss obstetric events in two tertiary care hospitals of Belagavi.

2. To study the factors associated with near miss obstetric events.

REVIEW OF LITERATURE

Millions of women in reproductive age group are affected by maternal morbidity every year. Identification of cases of severe maternal morbidity has emerged as a promising complimentary or even alternative to the investigation of maternal deaths over the last decade.[5] Morbidity during pregnancy represents a part of continuum between the extremes of good health and death.[17] Maternal morbidity and mortality continues to remain high in India, despite concerted efforts being made during the past decades.[18] The very low figures of maternal mortality and the absence of reliable registration system have therefore stimulated an interest in investigating cases of life threatening obstetric morbidity or 'maternal near-miss'.[9] Identification of Severe Acute Maternal Morbidity (SAMM) has gained importance in recent few years in view of falling maternal death rates and thrust on improving the quality of maternal health care.[17] Maternal near miss indicators have become relevant in developing world and low resource setting as it indicates the gaps in the existing health system.[13] Improvement in the maternal health can be achieved only if barriers that limit access to quality maternal health services are identified and addressed at all levels of the health system. Hence the World Health Organization (WHO) near-miss approach is being used widely across continents with the purpose to reduce preventable morbidity and mortality by using of evidence-based practices.

An audit was conducted for a period of two years in Kasturba Hospital in Karnataka to determine the frequency of Maternal Near Miss (MNM), analyze the nature of near miss events with that of maternal mortality and to see the trend of near miss events during the study period. The study tool used was the WHO 2009 criteria that included a set of clinical, laboratory and management-based criteria. There were

7390 deliveries during the study period and 7330 live births, 131 near miss cases, and 23 Maternal Deaths (MDs) were noted. The mean age ± Standard Deviation (SD) of MNM cases was 27.0 ± 4.7 years. Primipara formed slightly greater bulk of the total near miss cases. More than half of the near miss cases (57.2%) were in their third trimester. About 96.2% of the MNM cases and 86.96% of MD were referred. More than half of the cases required Intensive Care Unit (ICU) admission (62.6%). MNM incidence ratio was calculated to be 17.8/1000 live births. MNM to mortality ratio was 5.6 : 1 and the mortality index (MI) was 14.9%. The leading cause of MNM was hemorrhage (44.2%), followed by hypertension (23.6%), sepsis, and cardiac disease. H1N1 infection with Acute Respiratory Distress Syndrome (ARDS) cases were identified. Therefore new-onset viral infections emerged as the leading cause of maternal mortality. The drawback to this study was as the ICU facilities were available, few potentially life threatening conditions could have been selected and treated before going on to near miss stage. This was a single audit study, hence data collection spanning over a few years would have given a better picture of the improvement in obstetric care and also the long-term effects of SAMM.[19]

In order to highlight the determinants of MNM to contribute effectively to the adoption of measures to reduce maternal morbidity and mortality, a retrospective facility based case-control study was conducted for a period of 2 months in Hubballi district of Karnataka. WHO near miss approach 2009 was used as the study tool. Out of 82 members enrolled in the study, 27 were cases and 55 were controls. Majority of the cases were literate (74%), however, the proportion of illiterate women was significantly higher among near-miss cases than controls (26% vs. 2.27%, $p < 0.05$).

A higher proportion of near-miss cases belonged to Muslim religion in comparison to control group (74% vs. 42%, $p < 0.05$). The mean age of case and control group were 24.41 ± 4.70 years and 24.02 ± 2.75 years respectively. Majority of the cases had ICU admissions (85%) as the criterion for considering as a near miss, followed by severe anemia, hypertensive complications, hospital stay for > 7 days due to complications and hemorrhage. The study had few limitations such as the follow-up time used by WHO to define maternal near miss was duration of 42 days postpartum but due to feasibility concerns, the follow up time was limited only to duration of hospital stay. Also determinants related to obstetric interventions could not be found out as interventions were not dealt in detail.[20]

A prospective observational study was conducted in a Rural Medical College Hospital of Assam for a period of four months to know the causes of maternal near miss, maternal mortality and proper interventions taken to treat the patients. The WHO near miss approach for maternal health and their inclusion criteria were used in the study. During the study period, there were 1729 deliveries of which 1567 were live births and 162 were stillbirths. Total number of MNM cases were 66 with 17 MD. Hence there were 83 number of Severe Maternal Outcome (SMO) cases found. Among near miss cases, 59% cases were primipara and 37.8% cases were in the age group of 15 - 20 years. Majority of the cases were unbooked (92%) and all the maternal deaths belonged to the unbooked category (100%). The maternal death to near miss ratio was 1 : 3.9. MI was calculated as 20.4%. The most common types of near miss events were hemorrhage, eclampsia and severe anemia (non-hemorrhagic) responsible for 42.4%, 39.4% and 18.2% cases respectively. Eclampsia and anemia was the common combination with a poor prognosis.

In the mortality group, the most common complications were severe anemia (non-hemorrhagic), eclampsia, postpartum hemorrhage and puerperal sepsis responsible for 47.1%, 29.4%, 17.6% and 5.9% cases respectively. The quality of antenatal care received during pregnancy was not discussed in the study. There was no mention about the need of blood transfusions as an intervention mode during the critical phase. Also the various levels of delays that would have led to MNM and MDs have not been summarized.[21]

A retrospective study was conducted in a tertiary care hospital of Lucknow to evaluate the Obstetric Near miss and MDs. The study was conducted for a period of one year using the WHO near miss criteria that consisted of clinical, laboratory and management based criteria. A total of 6,357 deliveries were conducted and 5,273 live births, 633 MNM cases and 247 MD were noted. Prevalence of MNM was about 10 % of all deliveries, MI was found to be high in liver disorder (51.9 %), respiratory diseases (46.2 %), and sepsis (36.5 %). Maternal Mortality Ratio (MMR) of 4,684/100,000 live births was calculated. On analysis of MNM cases as per the WHO criteria, shock, raised serum bilirubin, and continuous use of vasoactive drugs were the commonest clinical, laboratory-based and management based parameter respectively. Hemorrhage and hypertensive disorders of pregnancy were found to be the leading cause of MNM. It was found that 66 % did not receive any antenatal care during their pregnancy and 6.5 % underwent prior intervention at home by an untrained personnel / dai. Though there has been an increase in institutional deliveries, most pregnant women don't receive any antenatal care and are at risk for obstetric complications. It was observed that the large magnitude of MNM cases might be attributed to improper management of obstetric emergencies at referring hospitals, poor referral practices, inefficient transport system, limited availability of

blood products, and poor access/utilization of health care services. Being a retrospective study resulted in a major limitation. The probability of clinical bias increased due to poor documentation that interfered with case identification and data collection. Hence prospective surveillance of severe maternal morbidity would permit epidemiological surveillance and aid in generating interventions to reduce unnecessary maternal deaths.[7]

To determine the prevalence of demographic determinants of maternal 'near miss' cases in rural Uttarakhand, a cross-sectional study was planned for a period of 12 months as per the WHO criteria for 'near-miss'. The study included all the women attending health care facilities at all levels - primary, secondary and tertiary level. Out of 937 pregnant women, 231 (24.6%) had one or more Potentially Life Threatening Condition (PLTC). The total live births were 688 with 51 cases of maternal 'near miss' and 10 cases of maternal deaths recorded. Majority of deliveries (81.8%) and PLTC (81.4%) occurred in the age group between 20-29 years. A significant association between maternal outcome and age of study population was found for age groups 15-19 and 40-44 years. The mean age of 'near miss' and MD in the study population was 25.94 and 26.1 years respectively. Half of the near miss cases (52.94%) had gestational age ranging between 24-36 weeks. In the cases of MD, 50% of the death occurred in women with more than 36 weeks of gestation. The study was largely based on information obtained from medical records, thus forming an important drawback to the study.[18]

A hospital based cross sectional study was conducted at a tertiary level teaching hospital in Kolkata to determine the incidence and direct causes of postpartum SAMM along with measurement of relevant new indicators on maternal

health. The study was conducted for a period of one year by evaluating the participants based on the clinical criteria. There were 6100 live births during the study period and a total of 109 women were included in the study. Out of which, 99 women had SAMM and 10 were MD. Mean age of postpartum SAMM mothers was 23.55 years. The MD to SAMM ratio was 1:9.9. Primi mothers were most affected. SAMM ratio was 16.22/1000 live births and mortality index was calculated to be 9.17%. Eclampsia and hemorrhage were the most common cause of SAMM and maternal mortality. However the Case Fatality Rate (CFR) was higher for sepsis (20.0%) followed by Postpartum Hemorrhage (PPH) 15.79%. The social profile of the participants could not be standardized since the weaker section was self-selected as study participants. This formed a limitation to this study.[17]

There is a need to analyze maternal near miss cases in developing countries like India that will help in understanding health system failures in obstetric care and thus executing necessary action. Hence a study was performed for a period of two years in a Rural Medical College in India to assess the number of MNM cases, MNM incidence ratio, MNM to mortality ratio, and MI. A total of 2409 deliveries were conducted and there were 2385 live births. The cases with PLTC were identified and those meeting the WHO criteria for maternal near miss were selected. Majority were less than 25 years of age (72.7%) and were in their third trimester of pregnancy (77.2%). Approximately 82% of the women were referred in severe morbid condition. MNM incidence ratio was 9.2 per 1000 live births, MNM to maternal mortality ratio was 11:1 and MI was 8.3%. The direct and indirect causes of MNM were 77% and 23% respectively. Severe pre eclampsia and related conditions (eclampsia, abruption, HELLP syndrome) predominated the list of PLTC accounting to 81.1% followed by ectopic pregnancy (9.4%). The leading causes of maternal near miss were abruption

and rupture uterus requiring emergency hysterectomy with higher morbidity in unbooked cases. The quality of antenatal care that was provided to the maternal cases have not been discussed in the study. Also the type of delay that would have led to the life threatening experiences by the mother was not mentioned in the study.[13]

Another prospective observational study was conducted in a medical college hospital in Orissa for a period of 2 years. The study tool used to identify the cases was the WHO 2009 near miss criteria. There were 17977 deliveries of which 201 were MNM cases and 116 were MDs. More number of maternal deaths and morbidity occurred in the age group of 20 - 30 years, in primigravida, among illiterate people staying in rural area and belonging to lower socioeconomic status. MNM incidence was 1.18 per 1000 live births, and MMR was found to be 681 per 1, 00,000 live birth. MD to MNM ratio was 1:1.73. The Severe Maternal Outcome Ratio (SMOR) was 18.62 per 1000 live birth and mortality index was 36.59%. The direct leading obstetric cause was hypertensive disorder of pregnancy (37.4%) followed by hemorrhage (17.4%). For diagnosis of near miss cases, 101 cases fulfilled clinical criteria, 61 subject fulfilled laboratory criteria and 131 participant had met with management based criteria. Type 1 delay was most commonly seen among near miss (80.6%) and maternal mortality cases (71.6%). This was followed by Type 3 and Type 2 delay.[6]

Since most of the obstetrical complications can be prevented or managed provided a timely intervention is taken, a prospective observational study was conducted in a Medical College of Uttar Pradesh with the objectives to determine the frequency, the demographic characteristics, causes, interventions and feto - maternal outcome of the MNM cases. The study was conducted for a period of one year among women who qualified the WHO's near miss criteria. There were 2817 deliveries and

2697 live births were noted during the study period. Total number of MNM cases were 122. MNM incidence ratio obtained in this study was 45.2 per 1000 live births. The most common age group affected was 20 to 35 years (71.3%) with most of them being multipara (61.5%). Maximum cases had not received any antenatal care (98.4%). Almost all the cases were in near miss status at admission (98.4%). This study concluded hemorrhage (44.3%) and hypertensive disorders (34.4%) to be the leading causes. Neurological dysfunction (10.7%) was the most common organ system dysfunction involved followed by hematological system (9.8%). Hence, evaluation of the circumstances surrounding near miss can give an idea of exact etiology, treatment in early stage and prevention of death.[11]

A retrospective study was conducted in a Government hospital of Punjab for a period of one year to determine the maternal near miss cases. WHO MNM identification criteria was used to identify the study participant. It consisted of clinical criteria, laboratory markers and management based proxies with respect to organ dysfunction system. There were 4399 deliveries conducted and 4387 live births were recorded. Out of them 96 MNM and 62 MD were identified. Maximum patients were in 18-25 years age group. About 58.3% near miss cases were multipara whereas maternal deaths were more among primipara (51.6%). Also majority of the women developed life threatening conditions in third trimester leading to 64.6% of MNM and 64.5% of MD cases. The maternal near miss mortality ratio came out to be 1.5: 1 with 39.2% MI. As per WHO criteria, shock (14.6%), acute severe thrombocytopenia (17.7%) and multiple transfusion of blood or red cells (62.5%) were the commonest parameters among clinical criteria, laboratory marker and management based proxies respectively. The main cause of maternal morbidity was obstetric hemorrhage (41.6%) whereas hypertensive disorders of pregnancy (43.5%) was primary causative

factor for maternal mortality. An important limitation to this study was its retrospective nature. The delays in treatment at three levels could not be assessed due to the lack of data.[10]

A cross sectional study was done in a Government Medical College in Kerala for a period of 15 months to identify the cases of near miss. The women who fit into the WHO's near miss criteria were included in the study. The maternal and perinatal outcomes were assessed. There were 3581 deliveries and 3451 live births during the study period. MNM incidence ratio was 9.27/1000 live births. About 37.5% were primigravida and 84% were in the third trimester. Majority (84%) women belonged to below poverty line (BPL) category and 84% of the cases were referred from peripheral centers. The direct obstetric causes were severe pre eclampsia (40.6%), abruptio placenta (21.8%), and severe sepsis (12.5%). Almost half of the women (43.7%) had a scarred uterus from previous cesarean section or myomectomy. Multisystem involvement was present in most of the women. Only 5 MDs were recorded during the study period and MMR was calculated to be 144.9/100,000 live births. The causes included placental abruption, disseminated intravascular coagulation (DIC), suspected pulmonary embolism, and cardiac arrest following manual removal of placenta. Delays were identified in almost two-thirds (65.6%) of the near-miss cases. The delays were more common at the point of access to care (delay 2) identified in 40.6% of women and in receiving adequate treatment (delay 3) that was identified in 21.8% of the total maternal cases. This was a preliminary study with a small sample size especially to estimate the frequency of delay in each of the three stages. Also, all the mothers were not followed up through their postpartum period after discharge from hospital posing a drawback to the study.[22]

A cross sectional study was done in Sir Sayajiro General Hospital of Central Gujarat for a period of 6 months. The tool used for identification of the study participants were WHO and Mantel et al. criteria. During the study period, 2104 patients delivered at the hospital and the total number of live births were 1929. Out of that 46 MNM cases were identified and 18 MDs were noted. Among the MNM cases, 57 near miss events were identified. The MNM incidence ratio was found to be 23.85/1000 live births and MMR was 933/100,000 live births. The ratio of MD to MNM events was 1:2.6 and overall mortality index was calculated as 28.1%. Among the near-miss cases, percentage of preterm delivery was found to be 42 % and stillbirth rate was recorded as 35 %. Antepartum eclampsia was the most common reason for ICU admission followed intrapartum eclampsia, Antepartum Hemorrhage (APH), Pregnancy Induced Hypertension (PIH) with heart disease, Rheumatic Heart Disease (RHD), chorioamnionitis and hepatic coma. Various lacunae to the study involved shorter study duration (6 months) providing limited data and the socio-demographic factors that were not included into the study. The referral status and delays that could have occurred at the peripheral level have not been discussed.[23]

A prospective observational study was conducted in Index Medical College, Indore to evaluate the incidence of maternal near miss and mortality cases using "The WHO near miss approach for maternal health" criteria. The study was conducted for a period of one year. During the study period there were 4786 deliveries, out of that 4533 were live births, 74 were near miss cases and 15 MDs were recorded. Near miss to mortality ratio was 3.5:1 and MI was calculated as 22.10%. About 29 (39.1%) of near miss cases were found in 15-20 year age group while 53.33 % cases of MD were found in the same age group. Primipara were affected the most. The MNM incidence ratio was calculated to be 16.32/1000 live births. Hemorrhage being the major cause,

accounting for 40.5% of the total maternal near miss cases, followed by eclampsia (24.3%) and sepsis (13.5%). The high MI was due to inadequate utilization of resources, poor antenatal care, delayed referrals, poor transport facilities and lack of skilled personnel at subcentre, Primary Health Centre (PHC) and Community Health Centre (CHC) levels.[5]

Another study conducted at Lady Hardinge Medical College, New Delhi identified a MNM ratio of 8.43/1000 live births. The WHO near miss criteria was used to investigate maternal morbidity and mortality. Data was extracted retrospectively from the case records by members of study team in a structured proforma. Total number of 19,077 deliveries were conducted during the study period. Out of the total deliveries, 18631 were live births, 161 near-miss cases and 35 MDs were noted. MMR was 188/1,00,000 live births. Maternal mortality to near miss ratio was calculated as 1:4.6. MI was highest for septicemia (33.8%). Most of the affected women belonged to the age group of 21 - 25 years. Majority (67%) arrived in their third trimester of pregnancy and illiteracy rate was very high for MNM cases (72%) and MD cases (81%) respectively. Hemorrhage accounted for the most common near miss event (39%), followed by infection (28.5%) and anemia (19.2%) and hypertensive disorders (13.3%). Most common causes of maternal mortality were septicemia (65.7%), followed by hemorrhage (8.6%) and hypertensive disorders (8.6%). The weakness of retrospective method of data collection with respect to the quality of records formed an important limitation to this study. In addition the delays in referrals that formed a major cause of morbidity and mortality could not be assessed.[24]

Another prospective observational study was conducted in Dr. Bhimrao Ambedkar Memorial Hospital, Raipur to identify and record the Maternal near miss cases based on WHO maternal near miss criteria 2009. There were 13,895 live births, consisting of 211 maternal near miss and 102 maternal deaths. MNM incidence ratio was calculated to be 15.18/1000 live births. The ratio of MNM to MD was 2:1 and MI was 32.58%. The near miss events were more common in primipara women (39 %), belonging to age group 21 to 30 years and in third trimester of pregnancy at the time of admission. Hypertensive disorders of pregnancy (38.8%) and hemorrhage (22.2%) were the most common direct obstetric causes of near miss morbidity. Indirect causes were seen in 30% of the women with anemia being the most common cause of MNM and MDs. Delay was seen in 68.8% of cases with Type 1 and Type 2 delay being more common.[25]

With an aim to identify the obstacles and gaps in the health system and a coordinated approach to improve health system and reduce mortality, a prospective observational study was undertaken in a tertiary care center in Maharashtra for one year. The total number of deliveries conducted were 4571 and total number of near miss cases identified were 98. The patients were classified as near miss based on disease specific, organ system dysfunction, and management criteria. The prevalence of MNM cases reported in the study was 2.19%. The mean ± SD of age of the study participants was 27.84 ± 3.43 years. Most of the cases belonged to rural area (63.26%), had received only primary education (62.25%), belonged to lower socioeconomic status (66.33%), were unbooked cases (80.62%) and 69 cases were referred from periphery. The mean ± SD duration of hospital stay was 13.44 ± 2.19 days and mean ± SD duration of ICU stay was 5.49 ± 1.95 days. Antepartum admissions constituted the majority of cases (89.8%), whereas postpartum cases were

8 (8.16%), and post-abortion cases were 2 (2.04%). Half of the patients were diagnosed with hypertensive disorder of pregnancy (51.02%), out of which 29.59% had severe pre-eclampsia, 16.32% had eclampsia, and 5.1% had HELLP syndrome. Obstetric hemorrhage was found in 43.87% of women. Among non-obstetric conditions, one MNM case suffered from complicated malaria and there were 2 cases of viral hepatitis with hyperbilirubinemia. About 64.28% of the patients required ICU admission. Multiple management strategies included platelet and blood transfusions, use of vasopressors and furosemide, mechanical ventilation, dialysis, and hysterectomy.[26]

A cross sectional study was conducted in a Medical College Hospital in Western Rajasthan for a period of 18 months to provide insight into the problem of MNM and mortality. For identifying near-miss cases five-factor scoring system as described by Geller et al. was used. It showed specificity of 93.9% and sensitivity of 100%. It comprised of organ-system failure, ICU admission, transfusion >3 units of blood, extended intubation (>12 hour), and surgical intervention (hysterectomy, re laparotomy). There were a total of 27,958 deliveries with 26,734 live births during the study period. MNM accounted for 112 patients whereas there were 54 MDs. The MNM rate was 4.18/1000 live births. The maternal death to near-miss ratio was 1:2.07. The mean age of the near-miss patients was calculated as 24 ± 3.11 years, while it was 26 ± 2.44 years in the mortality group. Majority of the patients had presented as unbooked cases in both near-miss and maternal deaths group. Most of the critical obstetric events occurred in postpartum period. The most common complications were hemorrhage (56%) and hypertension (17.8%) of the total near miss cases. The secondary complications included infections (5.35%), ruptured uterus (8.92%) and certain medical conditions (11.2%).[8]

To determine the demographic characteristics of near miss patients and the indicators of severe maternal morbidity and mortality, a cross sectional study was planned along with facility based retrospective secondary data analysis for a period of 2 years in four tertiary care hospitals of Ahmedabad. WHO's MNM criteria 2009 was applied as the study tool. The total number of live births of all the four hospitals under surveillance was 21,491 and SMO cases were 326. Out of those, 247 (75.8%) were MNM cases and 79 (24.2%) were MD cases. The MMR was calculated as 367/100,000 live births and MNM incidence ratio was found to be 11.49/1000 live births. Near miss death ratio was found to be 3.1:1 and MI noted was 24.23%. The mean age of MNM and MDs was 25.79 ± 3.70 and 26.33 ± 4.41 respectively. Eclampsia was the leading cause of PLTC (29.45%) followed by pre-eclampsia (25.46%) and severe PPH (22.39%) respectively. The lacunae were the lack of assessment of the booking status of the cases and the level of delays that contributed towards maternal morbidity and mortality.[27]

A retrospective observational study was planned to analyze the maternal near miss obstetrics events and maternal mortality in a tertiary care centre of Uttar Pradesh for a period of 3 years by reviewing the medical records. A total of 3744 deliveries were conducted during the study period, of which 3331 were live births. Identification of the MNM cases were done by using the WHO 2009 set of severity markers for acute maternal morbidity. There were 159 MNMs and 83 MDs were noted. MNM incidence ratio was found to be 47.73 per 1000 live births and MI was calculated as 34.29%. About three fourth of the total cases (75.76%) belonged to the age group of > 20 years. Illiteracy was seen in 71% of the women and 74.8% came from rural area. First delay was identified in 33.96% of cases followed by the second and third type of delay. Most patients reflected more than one delay (46.54%). Hypertensive disorders

(29.55%), hemorrhage (20.75%) and rupture uterus (20.12%) were the most common causes of MNM. ICU admission was required in 33.96% and cardiopulmonary resuscitation was done in 8.17% of cases.[28]

Another study was done in Egypt at Assiut University, as a part of large case control prospective study using the WHO MNM identification criteria as the study tool for the assessment of cases. During the 12 month period of the study, there were 17503 deliveries, 16972 live births, 342 maternal near miss cases and 47 MDs were observed. MNM incidence ratio was 20/1000 live births and MMR was calculated to be 276/1,00,000 live births. The mean age was 28.46 ± 8.5 years. Nearly 83% MNM cases presented with near miss at the time of admission, 10.3% developed near miss within 12 hours of admission and 6.7% developed after 12 hours of admission. The most common obstetric cause was found to be Pregnancy Induced Hypertension (60.5%) followed by obstetric hemorrhage (49.8%) and the most common non obstetric complication was cardiac disorders (48.8%). Main reason for ICU admission was cardiovascular or respiratory dysfunction. A major limitation to the study was that it was record based. Poor quality medical records would yield incomplete information and data and hence generalization to the whole community would become questionable.[29]

Another cross sectional study was done in Mozambique for a period of 5 months with a purpose to assess the prevalence of near miss cases and maternal deaths along with analysis of avoidable factors associated with various delays in receiving appropriate care. Out of 27,916 live births, 564 MNM cases and 71 MDs were identified with MNM ratio of 20/1,000 live births and MMR of 254/100,000 live births, respectively. Near miss fatality rate was 11.2%. Hemorrhage accounted for the

most common event (58.0%), followed by eclampsia (35.5%); Human Immunodeficiency Virus (HIV) sero-prevalence was 22.3%. It was found that 23.6% of near miss cases were adolescents (14 - 19 years of age). Third delay was identified in 69.7% of the participants. Lack of blood derivatives and unavailable operating room were reported in 42.0% and 35.0%, respectively. Near miss cases were related to delays in reaching and receiving adequate care. In this study laboratory constraints were the reason to use the clinical approach to define the inclusion criteria. Thus the exclusion of the management indicators in the process of identifying severe cases formed a major limitation to the study. Also the third delay and the evaluation of the care given could have been improved by including clinical audit both at the peripheral and central level which was not done.[16]

A facility based retrospective review of pregnant women was conducted for 3 years in a Nigerian tertiary centre. The aim was to determine the frequency of severe acute maternal morbidity, nature of near-miss events, and analysis of near-miss morbidities and MDs. A total of 1501 deliveries were conducted with 211 MNM cases and 44 MDs. Overall 242 near-miss events were identified among the near-miss cases. MMR was 2931.4 per 100,000 deliveries. Majority of the cases of MNM (82.5%) and MD (88.6%) were unbooked for antenatal care and delivery in the hospital. The overall MD to MNM ratio was 1:4.8 Hypertensive disorders in pregnancy and hemorrhage were responsible for 61.1% of near-miss cases and 50.0% of maternal deaths. Only 4.3% of near miss cases were managed in the ICU. The most common organ dysfunction was noted in renal and vascular systems consisting of 7 cases in each group. According to this study, the quality of care received by critically ill obstetric patients was found to be sub-optimal. Being a retrospective study was a major limitation. Besides the possibility of underestimating the near miss cases as a

result of incomplete documentation in case files, the methodology also discouraged assessment of sub-standard care with respect to the health workers or health administration and patient-orientated missed opportunities.[30]

Another facility-based, cross-sectional study was conducted in 6 public hospitals in Baghdad, Iraq over a period of 4 months to study the characteristics and quality of care provided to women with severe complications through the use of the WHO near-miss approach for maternal health. There were 25,472 live births, 212 women with PLTC and 145 SMO that included 129 near-miss cases and 16 maternal deaths. MNM incidence was calculated as 5.06 per 1,000 live births, SMOR was 5.69 per 1,000 live births and the MMR was 62.8 per 100,000 live births. The overall maternal near miss : mortality ratio was 9:1 in this study. The most common organ dysfunction was cardiovascular dysfunction (55.8%) followed by uterine dysfunction (53.5%) leading to hysterectomy. Among women with PLTC, 85.4% had underwent critical interventions, like blood product transfusion in 55.7%, laparotomy in 36.8% and ICU admission was noted among 34.4% of the MNM cases. This study presented data in an aggregate form, however an in-depth analysis would have been more beneficial to assess the causes and contributory factors in individual hospitals to improve quality of care. Only the quality of care and subsequent findings were evaluated, but the study didn't cover the ongoing efforts to improve care based on the results. The socio - demographic aspect of the study participants were not discussed in the study. It was also noted that data was collected up to 7th day postpartum, whereas the WHO near miss definition include cases up to 42 days. These factors formed important setbacks to the study.[31]

Despite global efforts to reduce maternal morbidity and mortality, the prevalence remains high in sub-Saharan Africa. In order to lower maternal morbidity and mortality in the immediate term, reduction of delay in the provision of quality obstetric care must be of prime importance. With this idea, a prospective cross sectional study was planned in a rural referral hospital in Tanzania for a period of 2 years. WHO's near miss approach was applied as the standard study tool. According to the study there were 216 maternal near miss cases and 32 maternal deaths. The MNM incidence ratio was 23.6 per 1,000 live births, with an overall case fatality rate of 12.9%. The MMR was 350 per 100,000 live births. The SMOR was 27.1 per 1000 live births. Majority belonged to the age group of 20 - 35 years (MNM = 69%, MD = 63%) and had a parity of ≥ 3. The major cause of morbidity and mortality was PPH (27%) of all underlying causes, followed by abortion related complications (17%), obstructed labor seen among 12% of women, APH in 11% and hypertensive disorders among 9% of the total MNM cases. The results showed a gap between actual and optimal use of evidence-based interventions in women experiencing severe maternal morbidity and mortality. The study gathered information from hospital files, therefore data quality was dependent on the quality of record keeping. Modified WHO near miss criteria was used to study the MNM cases instead of the original WHO near miss criteria hence more near miss cases were collected and thus may reflect higher incidence rate of maternal morbidity and mortality than present.[32]

A nested case-control study was done in five selected public hospitals of Ethiopia using the WHO's near miss criteria to identify the MNM cases. A total of 216 MNM cases and 648 controls were included in the study. Majority of the cases belonged to urban region (73.6%). Compared to the control groups, women with maternal near-miss case had lesser antenatal checkups, had more than five children,

positive history of stillbirth and experienced an early marriage. The contributing factors were history of chronic hypertension [Adjusted Odd's Ratio (AOR) = 10.80)], rural residency (AOR = 10.60), history of stillbirth (AOR = 6.03), no antenatal attendance (AOR = 5.58) and history of anemia (AOR = 5.26). This study had a few limitations. The age groups of the study participants were not defined and no information was mentioned about the same. The puerperium period defined by the WHO to define MNM last for 42 days postpartum but the participants were followed up only till hospital discharge. Hence, the occurrence of other events such as maternal death occurred after maternal discharge could not be investigated. This would underestimate the number of MNM cases reported during the study period.[33]

According to a retrospective study done in Kassala Maternity Hospital in Sudan over a 2 year period using the disease specific criteria to identify the near miss events as described by Filippi et al. There were 9578 deliveries, 9262 live births, 205 MNM cases and 40 MDs. The mean age and gestational age of MNM cases were 25.5 ± 6 years and 34.8 ± 8 weeks respectively, with illiterates constituting about 53.7% of the total participant. Antenatal care was not received by 67.8% of the participant. MNM incidence ratio and MMR were 22.1/1000 live births and 432/100,000 live births respectively. The total MI for near-miss cases was 19.5% (near-miss/fatality ratio 1:5.1). The most common event was hemorrhage (40.8%), followed by infection (21.5%), hypertensive disorders (18.0%), anemia (11.8%) and dystocia (7.9%). There was no case of organ dysfunction reported. An important limitation to this study was the weakness of retrospective method of data collection with respect to the quality of those records, the availability of all records, the coding of diagnosing and the correctness of diagnosis. In addition, the fetal outcome was also not determined in the study.[34]

WHO's MNM approach was used to assess the incidence of MNM and quality of care in Rwanda. A facility based, prospective cohort study was conducted at a district hospital in rural Rwanda for a period of 19 months at the facility. In 3979 deliveries conducted, there were 3994 live births. SMO was noted to be 99 that comprised of 86 MNMs and 13 MDs. MNMIR was 21.5 per 1000 live births, MMR was 325 per 100 000 live births and MI of 13.1%. Hemorrhage (57%) and hypertensive disorders (31.4 %) were the commonest MNM conditions. Eclampsia (30.7%) was the leading cause of maternal mortality while sepsis following cesarean section (33.3%) had the highest mortality index. Most common organ dysfunction among MNM cases was cardiovascular dysfunction (65.1%) followed by multiple organ dysfunction (40.7%). There was lack of follow up after discharge that would have led to under reporting of actual MNM and maternal deaths. In addition, the quality of medical records were occasionally found poor. Also, the WHO criteria could not be applied completely due to limited resources at the facility. Some women had severe complications, which did not fulfill any clinical criteria, while laboratory criteria could not be tested for an important part. This caused additional under estimation of MNM and increased the limitations to the study.[35]

An in depth review was done across the literature of various National as well as International research studies that have been conducted in the past decade. Most of the studies used The WHO's Near Miss Approach 2009 criteria to identify the life threatening complications that led to maternal morbidity and mortality. We have reached to the understanding that most of the studies highlighted the critical need for proper training of healthcare personnel to combat these life threatening events at the grass root level and prompt referral from the primary health care level must be of utmost importance to save the life of both baby and the mother. Creation of awareness

regarding the importance of routine antenatal checkups and improvement in the availability of resources at community level must be taken into consideration. The studies also recommended that a sincere audit all over the country would allow the exposure of the quality of maternal health care and will help tremendously in "Resource Allocation" in a particular place.[25]

MATERIAL AND METHOD

Belagavi is an important district located in northwest part of Karnataka, India. The population of the district is 47,79,661 according to Census 2011 data. The district has two major tertiary care hospitals comprising of public as well as private sector to cater to the health needs of the people.

SOURCE OF DATA: The present cross sectional study was planned in two major tertiary care facilities of Belagavi city. "KLE Dr. Prabhakar Kore Charitable Hospital" - a multispeciality hospital that caters to the population of North Karnataka, Goa and southern part of Maharashtra. The total number of beds in the hospital is 1250 and the bed strength in Obstetrics & Gynecology Department is 160. Secondly, the "Belagavi Institute of Medical Sciences Hospital", commonly known as the "Civil Hospital" caters to the rural and marginalized population of Belagavi district. It includes population inflow from Gokak and Ramdurg regions. The total number of beds in the hospital is 750 and the bed strength in Obstetrics & Gynecology Department is 60. Both the hospitals are located in a radius of approximately 2 kilometers from each other inside the city limits and provides specialized health care facilities to the people across different strata in and around Karnataka, Maharashtra and Goa states.

STUDY POPULATION: The study population consisted of Antepartum, Intrapartum and Postpartum mothers experiencing Severe Maternal Outcome (SMO) in the two tertiary care hospitals ("KLE Dr. Prabhakar Kore Charitable Hospital" and "Belagavi Institute of Medical Sciences Hospital").

STUDY DESIGN: Hospital based descriptive study.

SAMPLE SIZE was calculated on the basis of incidence ratio of Maternal Near Miss (MNM) in India.

According to previous studies conducted in India, the incidence ratio of MNM was approximately 20 / 1000 live births.[5,23&25]

The number of live births at KLE Dr PK Charitable Hospital per year and the number of live births at Belagavi Institute of Medical Sciences Hospital per year is 5000 each.

Therefore, the Sample size was 200.

INCLUSION CRITERIA

a) The women who suffered severe life threatening complications arising out of their pregnancy in antenatal, intranatal, postnatal or post abortive period.

b) The women who were defined as MNM cases as per the World Health Organization (WHO) MNM criteria were enrolled.

ETHICAL CLEARANCE was obtained from the Institutional Ethics Committee from Humans Subjects' Research of the Jawaharlal Nehru Medical College dated 24/11/2018 vide under letter (MDC / DOME / 23) and from the Institutional Ethics Committee from Humans Subjects' Research of the Belagavi Institute of Medical Sciences dated 14/11/2018 vide under letter (BIMS - IEC / 47 / 2018 - 19).

PILOT STUDY was conducted in the month of August 2018 in both the tertiary care facilities to assess the feasibility and sensitivity of the data collection tool. Data from

10 MNM cases was collected. The tool was validated. The information of pilot study has not been added in final compilation of data.

STUDY PERIOD: The present study was conducted for a period of one year from 1st January to 31st December 2019 among women in reproductive age group residing in Belagavi district and presenting to the above mentioned multi-speciality hospitals with maternal complications resulting in SMO.

DATA COLLECTION was done by means of personal interview by the researcher in the hospital setting. Written informed consent was obtained from all the study participant before the onset of data collection and data confidentiality was maintained. Socio-demographic profile of the study participants were collected using a pre-designed pre-tested proforma. Various characteristics were noted like the age, religion, qualification status, occupation, income, booking status, parity, whether she presented to the hospital as a self or a referred case, level of antenatal care received, duration of hospital stay and type of discharge. To assess the MNM, "Modified Facility Based Maternal Near Miss Review Form" was adopted for the identification of cases. The form is based on the WHO MNM Criteria 2009 which is a comprehensive system consisting of clinical, laboratory and intervention aspects for the management of MNM mothers. All the women who suffered severe life threatening conditions and fulfilled WHO's MNM criteria were identified and included during their course of hospital stay.

For diagnosis of Near Miss, the patient should meet Minimum 3 criteria: one each from-

1) Clinical Finding (Either Symptom Or Sign),

2) Investigation &

3) Intervention Done

Or any one criteria denoted with a "❤" symbol in the WHO MNM 2009 (criteria list attached in Annexure III).

DATA ANALYSIS: Analysis was done by entering the collected data into the Excel sheet and master chart was prepared. Coding system was used for each option in the questionnaire. Data was analyzed using SPSS software Windows (Trial version 24). The study population were characterized using descriptive statistics and expressed as mean and standard deviation (SD) and percentages for quantitative variables. Frequency and proportion was used for categorical variables. Chi square test was used to know the association between two categorical variables and P value < 0.05 was considered as statistically significant. Univariate and mulitivariate logistic regression models were applied to find the association between maternal outcome and the three delays.

DEFINITION OF STUDY VARIABLES:

AGE - Recorded to the nearest completed years, corresponding to participant's last birthday.

EDUCATION:

Classified in our study as per Census of India criteria 2011[36]

- **Illiterate** - A person who cannot read and write and has completed seven years of age.
- **Primary** - A person who has studied from first to fifth standard.
- **High School** - A person who has studied from sixth to tenth standard.
- **Graduate** - A person who has completed a course of study in higher education at a college or university.

OCCUPATION - The activity to which one regularly devotes oneself, especially one's regular work or means of getting a living.

Classified in our study as:

- **Homemaker** - A woman who takes care of the household day to day duties and not gainfully employed.
- **Agriculture** - A person who works in a farm or a field.
- **Labourer** - A person doing unskilled manual work for wages.
- **Government employee** - one who works in the public sector.
- **Private employee** - one who works in private sector like IT company, private firms etc.
- **Business** - one who is self-employed like owning a shop or a small firm.

SOCIOECONOMIC STATUS:

Information regarding the family size (total number of family members residing in a house) and the per capita monthly income of the family were recorded and socioeconomic status was calculated using the Modified B.G. Prasad's classification for the study period (2019). This was calculated by the usage of Multiplication factor with 1961 original Prasad's classification values.[37]

The Consumer Price Index (CPI) by old base for the original scale (1960) is 100. The scale was modified in 1982 and 2001 by introduction of linking factors to convert CPI (1982 and 2001) from the new base of 100 to the old base CPI (1960). The linking factor between 1960 and 1982 series was 4.63. The linking factor between 1982 and 2001 series was 4.93.

Average Consumer Price Index value for January to December 2019 (by 2001 base) is 307[38]

Therefore multiplication factor = current index value / base index value in 2001

= 3.07

Here current index value = 307

Base index value = 100

New income value = multiplication factor X old income value X 4.63 X 4.93

= 3.07 × 100 × 4.63 × 4.93

= 7007.55

Prasad's Social Classification (1961)		**Modified B.G. Prasad's Classification (2019)**
Social Class	**Per capita monthly income limit**	**Revised for 2019 (in Rs / month)**
I	100 and above	7008 and above
II	50 - 99	3504 - 7007
III	30 - 49	2102 - 3503
IV	15 - 29	1051 - 2101
V	Below 15	1050 and below

DEFINITION OF OBSTETRIC STUDY VARIABLES:

- **GRAVIDA** - A pregnant state both present and past, irrespective of the period of gestation.[39]
- **PRIMIGRAVIDA -** Defined as a woman who is pregnant for the first time.[39]
- **MULTIGRAVIDA -** Defined as a woman who has been pregnant more than once. She may have aborted or delivered a viable baby.[39]
- **PARITY** - The number of times a woman has given birth to a fetus with a gestational age of 24 weeks or more, regardless of whether the child was born alive or was stillborn.[39]
- **ABORTION** - Defined as expulsion or extraction from its mother of an embryo or fetus weighing 500gm or less when it is not capable of independent survival.[39]
- **PERIOD OF GESTATION -** Fetal development period from the time of conception until birth.[39]
- **FIRST TRIMESTER** - as completion of 12 weeks of gestation.[39]
- **SECOND TRIMESTER** - Above 12 weeks to completion of 28 weeks of gestation.[39]
- **THIRD TRIMESTER** - Above 28 weeks of gestation.[39]
- **ANTENATAL PERIOD** - Refers to the period after conception and before birth.
- **INTRANATAL PERIOD** - Refers to the period during or at the time of birth.
- **POSTNATAL PERIOD -** The period subsequent to child birth and up to 42 days post-delivery.

- **LIVE BIRTH** - Complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, the breaths or shows any other evidence of life.[40]
- **STILLBIRTH** - Referred to a baby born with no signs of life at or after 28 weeks of gestation.[41]
- **ECTOPIC PREGNANCY** - Fertilized ovum is implanted and develops outside the normal endometrial cavity.[39]
- **ANEMIA IN PREGNANCY** - Pregnant woman having blood hemoglobin concentration below 11 g/dL.[42]
- **ANTEPARTUM HEMORRHAGE (APH)** - Bleeding from or into the genital tract after the 28th week of pregnancy but before the birth of the baby.[39]
- **PLACENTA PREVIA -** Partial or complete implantation of placenta over the lower uterine segment (over and adjacent to the internal os).[39]
- **ABRUPTIO PLACENTA -** Condition wherein the bleeding occurs due to premature separation of normally situated placenta.[39]
- **POSTPARTUM HEMORRHAGE -** Genital bleeding after delivery, with at least one of the following: perceived abnormal bleeding (500 ml or more) or any bleeding with hypotension or blood transfusion.[39]
- **PREGNANCY INDUCED HYPERTENSION (PIH)** - A sustained rise of blood pressure to 160/110 mm Hg (WHO MNM 2009 criteria) or ≥ 2 occasions ≥ 4 hours apart beyond the 20th week of pregnancy in first 24 hours after delivery in a previous normotensive woman. This develops as a direct result of the gravid state. It includes Gestational Hypertension, Pre- eclampsia and Eclampsia.[39]

- **PRE-ECLAMPSIA** - A multi-system disorder of unknown etiology characterized by development of hypertension to the extent of 160/110 mm Hg or more with proteinuria after the 20th week in a previously normotensive and non-proteinuric woman.[39]
- **SEVERE PRE-ECLAMPSIA** - Persistent systolic blood pressure of 160 mmHg or more or a diastolic blood pressure of 110 mm Hg; proteinuria ≥ 5 gm in 24 hours; oliguria (< 400 ml) in 24 hours; and presence of Hemolysis Elevated Liver enzyme Low Platelet (HELLP) syndrome or pulmonary oedema. This condition excludes eclampsia.[14]
- **HELLP SYNDROME -** A rare complication of pre-eclampsia consisting of Hemolysis (H), Elevated Liver enzymes (EL) and Low Platelet count (LP) [< 1,00,000/mm^3].[39]
- **ECLAMPSIA** - Generalized fits in a patient without previous history of epilepsy.[14]
- **SEVERE SYSTEMIC INFECTION OR SEPSIS** - Presence of fever (body temperature >38°C), a confirmed or suspected infection (e.g. chorioamnionitis, septic abortion, endometritis, pneumonia), and at least one of the following: heart rate > 90bpm, respiratory rate > 20cpm, leucopenia (white blood cells < 4000 / cu mm blood), leucocytosis (white blood cells >12,000 / cu mm blood).[14]
- **GESTATIONAL DIABETES MELLITUS** - Defined as carbohydrate intolerance of variable severity with onset or first recognition during the present pregnancy. RBS > 200 mg/dL is considered as per WHO MNM 2009 criteria.[39]

- **GESTATIONAL TROPHOBLASTIC DISEASE** - A spectrum of proliferative abnormalities of trophoblast associated with pregnancy.[39]
- **OBSTRUCTED LABOR** - Condition wherein despite good contractions, the progressive descent of the presenting part is arrested due to mechanical obstruction.[39]
- **MATERNAL NEAR MISS (MNM)** - A woman, who being close to death, survives a complication that occurred during pregnancy, delivery or up to 42 days after the termination of her pregnancy.[14]
- **MATERNAL DEATH (MD)** - The 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 or aggravated by the pregnancy or its management but not due to accidental or incidental causes.[14]
- **SEVERE MATERNAL OUTCOME (SMO)** - Refers to a life-threatening condition (i.e. organ dysfunction), including all maternal deaths and maternal near-miss cases.[14]
- **WOMEN WITH LIFE THREATENING CONDITION (WLTC)** - women who either qualified as MNM cases or those who died (i.e. women presenting a severe maternal outcome). It is the sum of maternal near-miss and maternal deaths.[14]

Those who survived till the discharge were considered as the MNM cases as per the WHO criteria. However those who could not survive were noted as MD that occurred as a result of near miss. MD was considered in the present study in order to calculate the SMO.

RESULT

The results of the present study will be presented under following headings:

I. Socio-demographic profile of the study participant

II. Obstetric profile of the study participant

III. Maternal Near Miss (MNM) profile of the study participant

IV. Maternal and fetal outcome of MNM cases

V. Comparison of maternal morbidity and mortality

VI. Three delays in maternal mortality and morbidity

RESULT

I. Socio-demographic profile of the study participant

Table 1: Age distribution of the study participant

Age (in years)	Number	Percentage
18 - 20	38	19
21 - 25	83	41.5
26 - 30	62	31
≥ 31	17	8.5
Total	**200**	**100**

In the present study, out of 200 study participant, 38 (19.0%) women belonged to the age group of 18 - 20 years, 83 (41.5%) belonged to 21 - 25 years, 62 (31.0%) were aged between 26 - 30 years and 17 (8.5%) participant were above the age of 30 years.The mean ± SD age of the study subject was 25.0 ± 4.45 years with a range of 18 - 40 years and median age was 24.0 years.

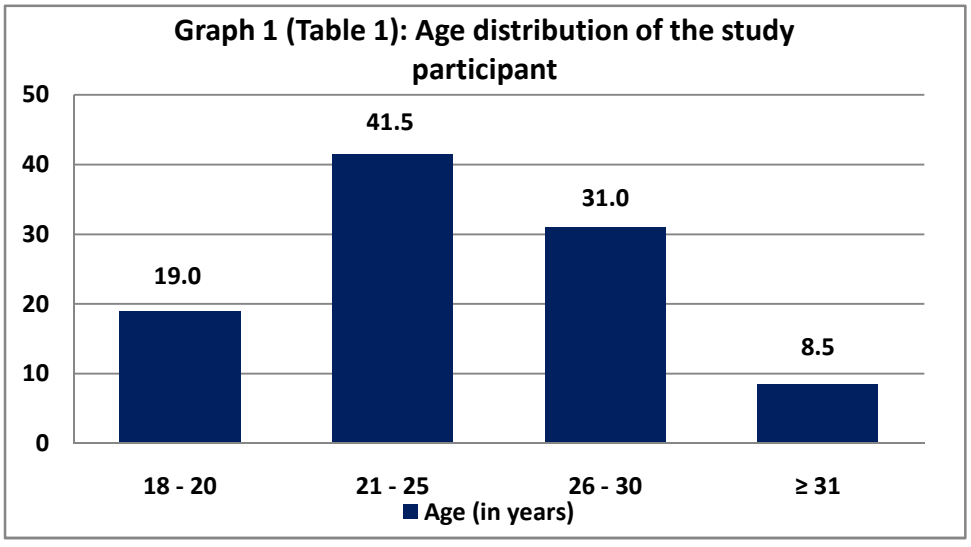


Table 2: Age distribution of the husband's of the study participant

Age (in years)	Number	Percentage
≤ 20	3	1.5
21 - 25	33	16.5
26 - 30	100	50
31 - 35	48	24
> 35	16	8
Total	**200**	**100**

Among the husband's of the study participant, it was noted that 100 (50.0%) belonged to the age group of 26 - 30 years, 48 (24.0%) to 31 - 35 years and 16 (8.0%) were above 35 years of age. Only 3 (1.5%) of the participant husbands' were less than 20 years of age and 33 (16.5%) were in age group of 21 - 25 years. The mean ± SD age was 29.3 ± 4.42 years with a range of 20 - 47 and median age was found to be 28.0 years.

Table 3: Distribution of study participant according to the place of residence

Place of Residence	Number	Percentage
Belagavi district		
Belagavi	49	24.5
Gokak	31	15.5
Khanapur	22	11
Bailhongal	22	11
Saundatti	16	8
Hukkeri	14	7
Chikodi	9	4.5
Raibag	6	3
Ramdurg	6	3
Athani	4	2
Other districts of Karnataka		
Bagalkot	5	2.5
Dharwad	4	2
Kalaburgi	2	1
Gadag	1	0.5
Maharashtra State		
Kolhapur	9	4.5
Total	**200**	**100**

Among the study subject, 49 (24.5%) belonged to BelagaviTaluka, followed by 31 (15.5%) from Gokak, 22 (11.0%) from Khanapur and Balihongal each, 16 (8.0%) from Saundatti, 14 (7.0%) from Hukkeri, 9 (4.5%) from Chikkodi and Kolhapur each, 6 (3.0%) from Raibag and Ramdurgtaluka each, 5 (2.5%) from Bagalkot, 4 (2.0%) from Dharwad and Athani each, 2 (1.0%) from Kalabargi and 1 (0.5%) from Gadag. About 11% of the women were from other district and state, because both of the study hospitals are tertiary care health centres.

Table 4: Distribution of the study participant according to religion

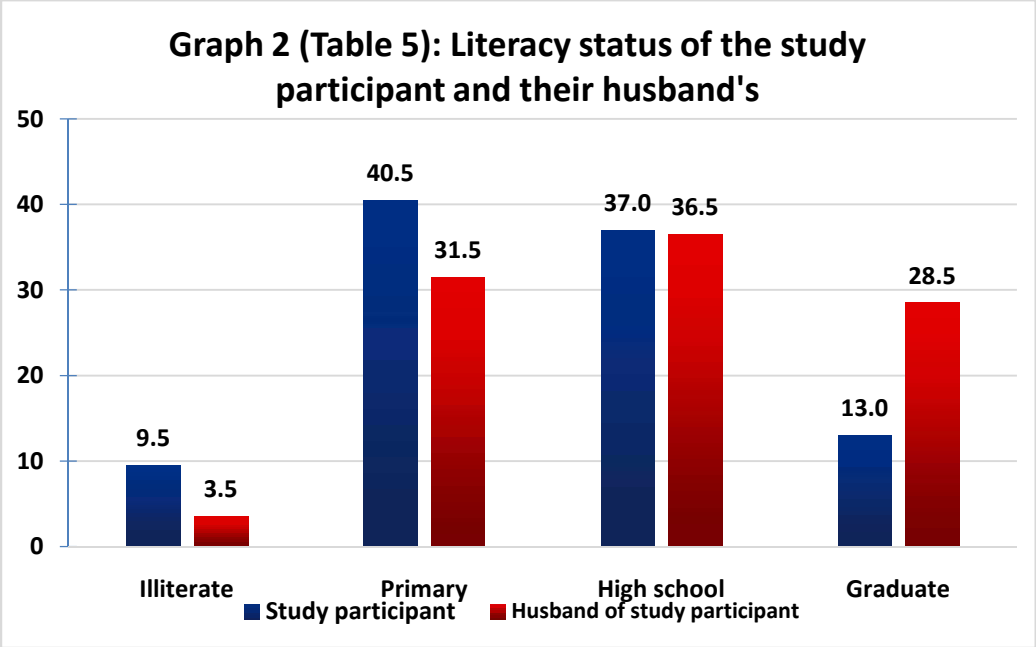
Religion	Number	Percentage
Hindu	139	69.5
Muslim	40	20.0
Christian	12	6.0
Jain	9	4.5
Total	**200**	**100**

Out of the total subject studied, majority 139 (69.5%) followed Hinduism, 40 (20%) were Muslim, 12 (6.0%) participant followed Christianity and only 9 (4.5%) followed Jainism.

Table 5: Literacy status of the study participant and their husband's

Literacy status	Study participant		Study participants' husband	
	Number	**Percentage**	**Number**	**Percentage**
Illiterate	19	9.5	7	3.5
Primary	81	40.5	63	31.5
High school	74	37.0	73	36.5
Graduate	26	13.0	57	28.5
Total	**200**	**100**	**200**	**100**

Literacy status of the study participant and their husbands revealed that 181 (90.5%) and 193 (96.5%) were literates respectively. Among the study participant, 81 (40.5%) had received primary level of education and 100 (50.0%) had received high school education and above. It was observed that 19 (9.5%) women were illiterates in our study with no formal education. Literacy status was slightly better among their husbands with 130 (64.9%) having completed high school education and above. It was noted that 63 (31.5%) had attained primary level of education and only 7 (3.5%) of them were illiterates.



Occupation of the study participant: Among the 200 study participant, it was observed that 185 (92.5%) were homemakers and 15 (7.5%) women were employed. Among the subject who were employed, majority were agricultural labourer or self-employed.

Table 6: Distribution of the study participant husband's according to occupation

Occupation	Number	Percentage
Private job	65	32.5
Agricultural labourer	45	22.5
Government job	33	16.5
Business	33	16.5
Self employed	24	12.0
Total	**200**	**100**

According to the husband's occupational status, 65 (32.5%) were employed in private sector, followed by 45 (22.5%) who worked as agricultural labourer, 33 (16.5%) were government employee, 33 (16.5%) were involved in business and remaining 24 (12.0%) were self-employed.

Table 7: Distribution of the study participant according to the socioeconomic status

Socioeconomic Status	Number	Percentage
Class I	12	6.0
Class II	29	14.5
Class III	54	27.0
Class IV	68	34.0
Class V	37	18.5
Total	**200**	**100**

Among the 200 study subject classified based on the Socioeconomic Status, 12 (6.0%) belonged to Class I, 29 (14.5%) to Class II, 54 (27.0%) to Class III, 68 (34.0%) to Class IV and 37 (18.5%) belonged to Class V socioeconomic status according to Modified B.G. Prasad's Classification.

II. Obstetric profile of the study participant

Antenatal Booking status: Out of 200 Maternal Near Miss (MNM) women studied, 61 (30.5%) were booked case of the study hospitals and remaining 139 (69.5%) were unbooked case. Nearly 70% of the MNM case were booked cases of primary health centre, taluka hospitals and private nursing homes. They were referred to the study hospitals due to inability to manage complications or financial constraints.

Table 8: Distribution of the study participant according to gravidity

Gravidity	Number	Percentage
Primi	93	46.5
2^{nd}	53	26.5
3^{rd}	32	16.0
4^{th}	14	7.0
$\geq 5^{th}$	8	4.0
Total	**200**	**100**

Out of 200 study participant, 93 (46.5%) were primigravida and 107 (53.5%) were multigravida. Among the multigravida, 53 (26.5%) were 2^{nd}gravida, 32 (16.0%) were 3^{rd}gravida, 14 (7.0%) were 4^{th}gravida and 8 (4.0%) were more than 5^{th}gravida.

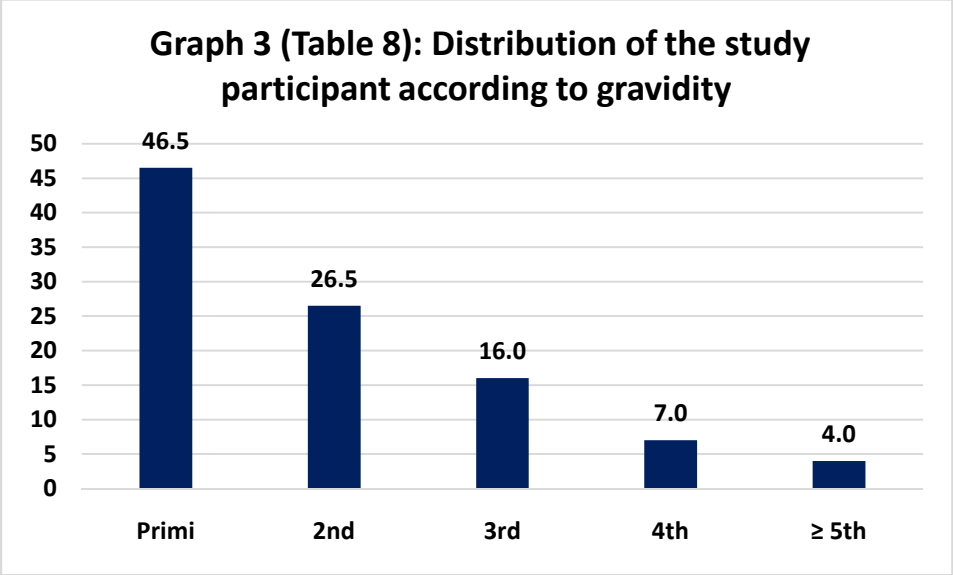


Table 9: Distribution of the study participant according to the number of living children

Number of living children	Number	Percentage
Nil	83	41.5
1	52	26.0
2	46	23.0
≥ 3	19	9.5
Total	**200**	**100**

Among the study subject, 83 (41.5%) did not have any living child. About 52 (26.0%) had one living child, 46 (23.0%) had two living children and 19 (9.5%) had more than three living children. Nearly 20 (10.0%) and 8 (4.0%) of the study participant had ≥ 2 female and male living children respectively. The compulsion to have both male and female child predisposes our study participant to repeated pregnancy.

Table 10: Distribution of the study participant according to birth interval

Birth interval (in years)	Number	Percentage
≥ 3	57	53.3
< 3	50	46.7
Total	**107***	**100**

***93 were primigravida**

Out of the 107 subject studied, 57 (53.3%) women had birth interval of more than or equal to three years whereas 50 (46.7%) women had birth spacing of less than three years.

Table 11: Distribution of the study participant according to significant past history

Significant Past history	Number	Percentage
Present	94	47.0
Absent	106	53.0
Total	**200**	**100**
If Yes, number of significant past history (n = 94)		
1	85	90.4
≥ 2	9	9.6
Total	**94**	**100**
If Yes, significant past history		
Obstetrical	53	51.5
Medical	42	40.8
Surgical	3	2.9
Family	3	2.9
Gynecological	2	1.9
Total	**103***	**100**

***multiple response obtained**

Among the 200 study participant, 94 (47.0%) had significant past history, which could affect the present pregnancy. Majority 85 (90.4%) women had one significant past history. The commonest obstetric cause noted in study participant was history of previous Lower Section Caesarean Section among 53 (51.5%) and 42 (40.8%) had positive medical history. About 10 (9.7%) women had cardiac illness like rheumatic heart disease and cardiomyopathy, 10 (9.7%) had infections like retroviral and hepatitis B. Nearly 9 (8.7%) women had thyroid disorder, 5 (4.8%) had primary hypertension, 4 (3.9%) were known case of epilepsy, 3 (2.9%) had Type II Diabetes and 1 (1.1%) had mental illness.

Table 12: Distribution of the study participant according to the antenatal care received

Antenatal care	Number	Percentage
Antenatal care received		
Yes	177	88.5
No	23	11.5
Total	**200**	**100**
If yes, Number of visits (n = 177)		
< 4	100	56.5
≥ 4	77	43.5
Total	**177**	**100**
Type of care provider (n = 177)		
Medical Officer	109	61.6
Specialist	35	19.8
Nurse	33	18.6
Total	**177**	**100**
Informed about complications in the present pregnancy		
Yes	130	73.4
No	47	26.6
Total	**177**	**100**

Out of 200 women studied, 177 (88.5%) had received antenatal care during the present pregnancy. Among the 177 women who had received antenatal care, more than and equal to four visits were made by 77 (43.5%) women. Medical Officer was the main care provider for 109 (61.6%) women, Specialist for 35 (19.8%) women and Nursing staff for 33 (18.6%) women. Majority 130 (65.0%) participant were informed about the presence of complication in the current pregnancy by the health personnel.

Table 13: Distribution of the study participant according to blood group

Blood group	Number	Percentage
O	73	36.5
A	64	32.0
B	48	24.0
AB	15	7.5
Total	**200**	**100**

Out of the participants studied, 185 (92.5%) were Rh positive whereas 15 (7.5%) women were high risk pregnancy as they were Rh negative. Nearly 2/3rd 73 (36.5%) and 64 (32.0%) women had blood group O and A respectively. This was followed by 48 (24.0%) women with blood group B and remaining 15 (7.5%) were group AB.

Table 14: Distribution of the study participant according to hemoglobin level

Hemoglobin level (in g/dL)	Number	Percentage
≥ 11	28	14.0
10 to 10.9	19	9.5
7 to 9.9	75	37.5
< 7	78	39.0
Total	**200**	**100**

The overall prevalence of anemia noted in our study was 172 (86.0%). Among the anemic mothers, 19 (9.5%) had mild anemia, 75 (37.5%) had moderate anemia and 78 (39.0%) had severe anemia. Out of 78 severely anemic study subject, 50 (25.0%) of them had hemoglobin level ≤ 5g/dL.

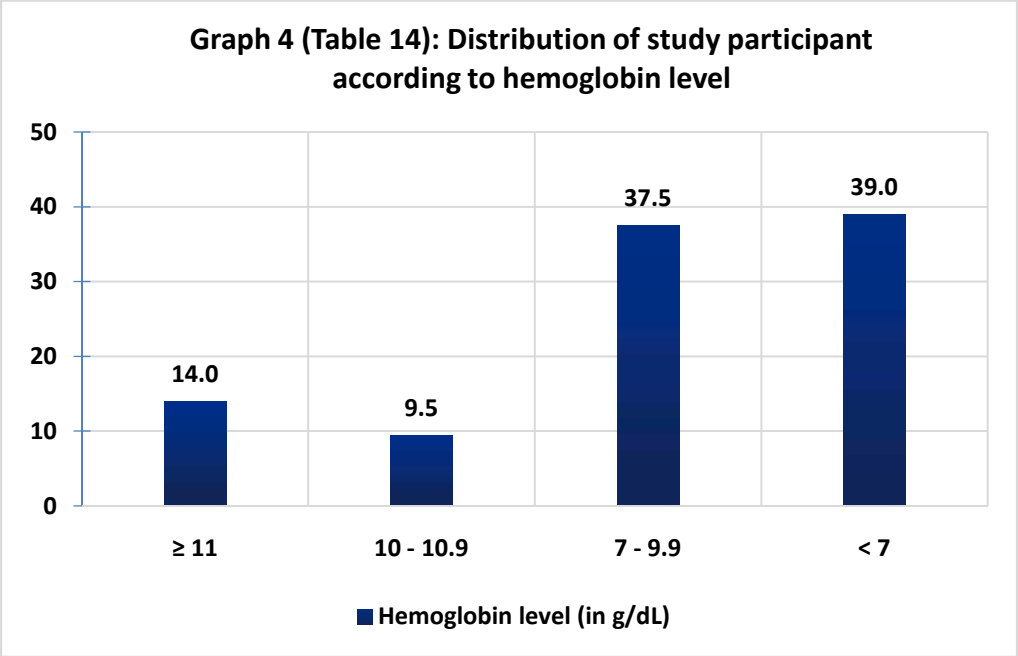


Table 15: Distribution of the study participant according to peripheral smear

Peripheral Smear	Number	Percentage
Microcytic hypochromic	72	36.0
Normocytic Normochromic	70	35.0
Dimorphic	20	10.0
Normal	38	19.0
Total	**200**	**100**

Among the study participant, 72 (36.0%) women showed microcytic hypochromic type of anemia in peripheral smear and 20 (10.0%) had dimorphic type of picture. Nearly 50% of the women had anemia features in the peripheral smear. About 70 (35.0%) women had normocytic normochromic picture suggesting anemia due to acute blood loss.

III. Maternal Near Miss (MNM) profile of the study participant:

Type of admission: Out of the total MNM cases studied, 160 (80.0%) were referred to the study hospital and 40 (20.0%) had presented directly to the hospital as self-referral case.

Table 16: Distribution of the study participant according to health facility

Health facility	Number	Percentage
Type of health facility		
Public	97	60.6
Private	57	35.6
Both	6	3.8
Number of hospital/ clinic visited		
1	151	94.4
≥ 2	9	5.6
Total	**160**	**100**

Among the 160 referred study subject, 97 (60.6%) were referred from public facility, mainly Primary Health Centre and Taluka Hospital. Referral status from private nursing homes and clinics constituted 57 (35.7%) women. Only 6 (3.8%) were referred from both the sectors. Majority 151 (94.4%) had visited one hospital/ clinic before coming to the referral facility. About 8 (5.0%) women had visited two hospital/ clinic and only 1 (0.6%) woman had visited three hospital/ clinic.

Table 17: Distribution of the study participant according to service received at health facility

Service received at health facility	Number	Percentage
Attended by		
Doctor	154	96.3
Staff Nurse or Female health worker	6	3.7
Referral slip received		
Yes	140	87.5
No	20	12.5
Transport facility received		
Yes	131	81.9
No	29	18.1
Total	**160**	**100**

Out of the referred study participant, 154 (96.3%) MNM cases were attended by Doctor at the facility followed by 6 (3.7%) women being attended by nursing staff or female health worker. Referral slip was available with 140 (87.5%) MNM cases. It was noted that 131 (81.9%) women were provided with ambulance facility for transportation to the referral centre.

Table 18: Distribution of the study participant according to time taken to reach the health facility

Time taken to reach the health facility	Number	Percentage
Illness to first health facility (in hour)		
< 6	61	30.5
6 - 12	76	38.0
13 - 18	25	12.5
19 - 24	13	6.5
> 24	25	12.5
Total	**200**	**100**
First health facility to current health facility (in hour)		
< 6	63	39.4
6 - 12	56	35.0
13 - 18	14	8.8
19 - 24	10	6.2
> 24	17	10.6
Total	**160**	**100**

According to the time taken by the study subject to reach the health facility, 61 (30.5%) MNM cases took less than 6 hours to reach the first health facility from their

home. This was followed by 76 (38.0%) women who took 6 to 12 hours, 25 (12.5%) 13 to 18 hours, 13 (6.5%) 19 to 24 hours and 25 (12.5%) MNM cases reached the health facility after a day. The mean ± SD duration taken by MNM case to reach the first health facility was 12.1 ± 10.24 hours and median time 9 hours. The range was 1 to 48 hours and 1.5 to 36 hours for referred case and self referred case respectively. Among the 160 referred cases, 63 (39.4%) MNM cases reached the current health facility from previous health facility in less than 6 hours, followed by 56 (35.0%) women who reached between 6 to 12 hours, 14 (8.8%) between 13 to 18 hours, 10 (6.2%) between 19 to 24 hours and 17 (10.6%) women reached the health facility after a day. The mean ± SD duration taken by MNM case to reach the current health facility was 12.01 ± 12.56hours and median time 8 hours. The range of duration was 0.5 to 72 hours.

Table 19: Distribution of the study participant according to the period of gestation at the time of admission

Period of gestation at the time of admission	Number	Percentage
Antenatal		
≤ 22 weeks	26	13.0
> 22 weeks to ≤ 34 weeks	42	21.0
> 34 weeks to ≤ 37 weeks	41	20.5
> 37 weeks to ≤ 42 weeks	34	17.0
> 42 weeks	1	0.5
Total	**144**	**72.0**
Intranatal	4	2.0
Postnatal	47	23.5
Post abortion	5	2.5
Total	**200**	**100**

Among the 200 study subject, nearly 2/3rd 144 (72.0%) MNM case were in their antenatal period of gestation. Out of these, 26 (13.0%) were ≤ 22 weeks of gestation, 42 (21.0%) were between > 22 weeks to ≤ 34 weeks, 41 (20.5%) were between > 34 weeks to ≤ 37 weeks, 34 (17.0%) were between > 37 weeks to ≤ 42 weeks and only 1 (0.5%) woman was > 42 weeks of gestation. Only 4 (2.0%) women were referred during intranatal period, followed by 47 (23.5%) in postnatal and 5 (2.5%) women in post-abortal period. Out of the 52 study participant who were

referred in the postnatal or post-abortal period, 20 (38.5%) of MNM cases had developed complication within 24 hours, followed by 13 (25.0%) between 1 to 7 days and 19 (36.5%) had developed complication between 8 to 42 days.

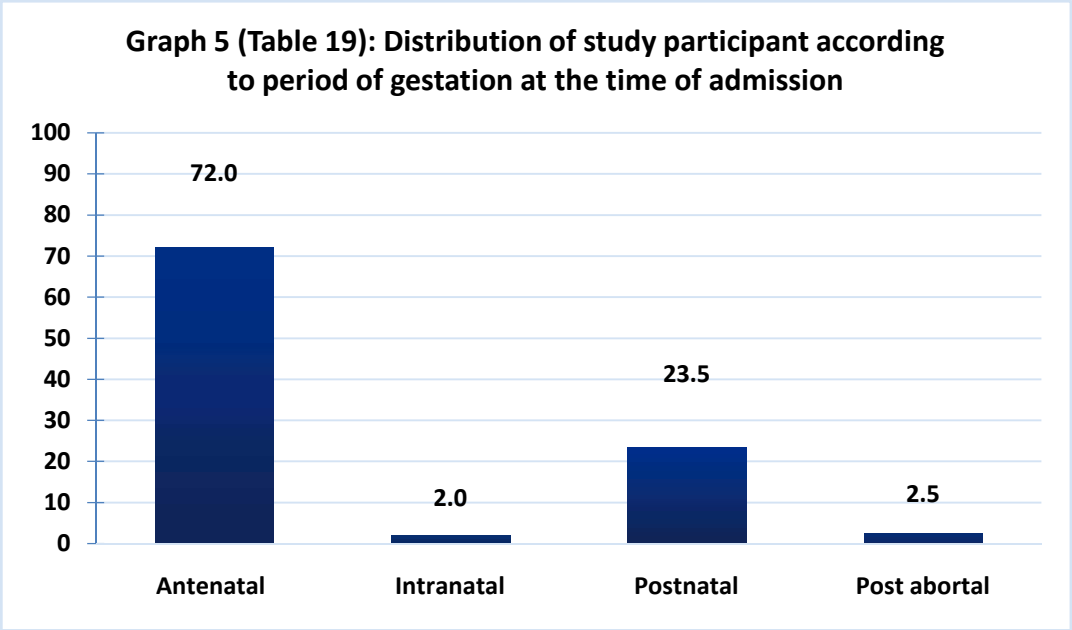


Table 20: Distribution of the study participant according to health condition at the time of admission

Health condition at the time of admission	Number	Percentage
Admitted with severe illness	167	83.5
Admitted with disorder, became near miss later	33	16.5
Total	**200**	**100**

Majority 167 (83.5%) women were admitted to the study hospitals as maternal near miss case and remaining 33 (16.5%) women who were admitted with underlying disorder related to gestation, became later maternal near miss case during the course of their hospital stay.

A. Clinical criteria for identification of MNM cases

Table 21: Distribution of the study participant according to the number of underlying health condition at the time of admission

Number of health condition	Number	Percentage
1	106	53.0
2	83	41.5
≥ 3	11	5.5
Total	**200**	**100**

Among the 200 MNM case, 106 (53.0%) were suffering from single underlying health condition at the time of admission, followed by 83 (41.5%) with two health conditions and 11 (5.5%) had ≥ three underlying health conditions at the time of admission.

Table 22: Distribution of study participant according to underlying health condition at the time of admission

Health condition	Number	Percentage
Medical illness	120	38.5
Hemorrhage	72	23.1
Hypertensive disorder of pregnancy	62	19.9
Infection	32	10.2
Conditions related to labour and management	18	5.8
Incidental/ Accidental cause	8	2.5
Total	**312***	**100**

***multiple response obtained**

Among the MNM case studied, underlying medical illness was observed in 120 (38.5%) women. This was followed by hemorrhage constituting of 72 (23.1%) women and 62 (19.9%) had hypertensive disorder of pregnancy. Infection was noted in 32 (10.2%) MNM cases followed by conditions related to labor and management among 18 (5.8%) and incidental or accidental cause in 8 (2.5%) women.

Graph 6 (Table 22): Distribution of study participant according to underlying health condition at the time of admission

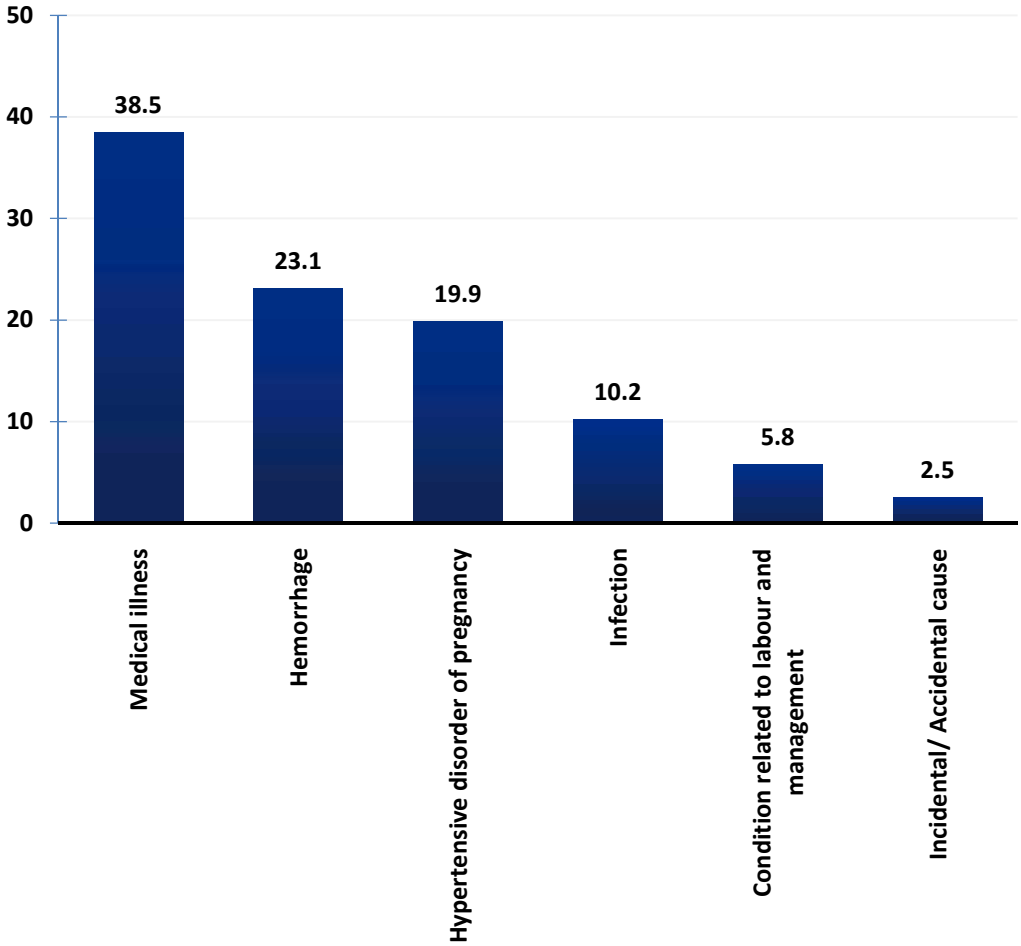


Table 23: Distribution of the study participant according to the underlying medical disorder at the time of admission

Medical disorder	Number	Percentage
Severe anemia	78	59.1
Cardiac disorder	16	12.1
Rh negative pregnancy	15	11.4
Gestational Diabetes Mellitus	7	5.3
Acute Kidney Injury	4	3.0
Pulmonary edema	4	3.0
Adult respiratory distress syndrome	3	2.3
Aspiration pneumonia	3	2.3
Hemolysis, Elevated Liver enzyme and Low Platelet (HELLP) Syndrome	2	1.5
Total	**132***	**100**

***multiple response obtained**

Out of 120 study participant who had underlying medical disorder at the time of admission, 78 (59.1%) were suffering from severe anemia. About 16 (12.1%) had cardiac disorder like rheumatic heart disease, cardiomyopathy, AV block, cardiomegaly etc. Rh negative pregnancy was noted among 15 (11.4%) women, gestational diabetes mellitus in 7 (5.3%) and acute kidney injury in 4 (3.0%). The respiratory conditions noted in our study were: 4 (3.0%) pulmonary edema, and 3 (2.3%) each adult respiratory distress syndrome and aspiration pneumonia. Hemolysis, Elevated Liver enzyme and Low Platelet Syndrome was noted in 2 (1.5%) participant at the time of admission.

Table 24: Distribution of the study participant according to type of hemorrhage at the time of admission

Type of Hemorrhage	Number	Percentage
Antepartum	43	59.7
Postpartum	24	33.3
Post abortal	5	7.0
Total	**72**	**100**

Out of 72 study participant, 43 (59.7%) presented with antepartum hemorrhage, 24 (33.3%) had postpartum hemorrhage and 5 (7.0%) came with post-abortal hemorrhage. Among the women who presented with antepartum hemorrhage, 16 (22.2%) had ectopic pregnancy, 15 (20.8%) had abruptio placentae, 6 (8.3%) had placenta previa, rupture uterus and molar pregnancy were present in 3 (4.2%) each of MNM cases. Among women who presented with postpartum hemorrhage, 16 (22.2%) had atonic postpartum hemorrhage, 2 (2.8%) MNM cases had traumatic and 6 (8.3%) women presented with secondary postpartum hemorrhage.

Table 25: Distribution of the study participant according to type of infection at the time of admission

Type of Infection	Number	Percentage
Lower respiratory tract infection	9	28.1
Sepsis	7	21.9
Retroviral	6	18.8
Hepatitis B	4	12.5
Dengue	3	9.4
Meningitis	1	3.1
Filariasis	1	3.1
Tuberculosis	1	3.1
Total	**32**	**100**

Out of 32 women who had infection at the time of admission, 9 (28.1%) were suffering from lower respiratory tract infection like bacterial bronchopneumonia and pleural effusion, 7 (21.9%) were suffering from septicemia, 6 (18.8%) were positive for retro viral infection, 4 (12.5%) were surface antigen positive, 3 (9.4%) had dengue infection, 1 (4.2%) woman each were suffering from filariasis, meningitis and tuberculosis.

Table 26: Distribution of the study participant according to hypertensive disorder of pregnancy at the time of admission

Hypertensive disorder of pregnancy	Number	Percentage
Eclampsia	33	53.2
Pre - eclampsia	18	29.1
Gestational hypertension	11	17.7
Total	**62**	**100**

Among 62 women presenting with hypertensive disorder of pregnancy, 33 (53.2%) had already developed eclampsia, 18 (29.1%) were in the pre-eclampsia stage and 11 (17.7%) women were suffering from gestational hypertension at the time of admission.

Table 27: Distribution of the study participant according to conditions related to labour and management at the time of admission

Conditions related to labour and management	Number	Percentage
Inversion of uterus	7	38.9
Retained placenta	5	27.8
Obstructed labour	4	22.3
Blood transfusion reaction	1	5.5
Anesthetic complication	1	5.5
Total	**18**	**100**

Among 18 study subject, 7 (38.9%) MNM cases presented with inversion of uterus at the time of admission followed by 5 (27.8%) with retained placenta and 4 (22.3%) women were referred with obstructed labour. Remaining 2 (5.5%) MNM cases had reaction following blood transfusion and anesthetic complication during cesarean section.

Table 28: Distribution of the study participant according to incidental / accidental cause at the time of admission

Incidental/ Accidental cause	Number	Percentage
Poisoning	4	50.0
Fall / Trauma	3	37.5
Domestic violence	1	12.5
Total	**8**	**100**

Out of the 8 study subject, 4 (50.0%) MNM cases had history of poisoning with organophosphorous and paraquet compound, 3 (37.5%) had history of fall leading to injuries and 1 (12.5%) woman was facing domestic violence by her husband and in-laws.

Table 29: Distribution of the study participant according to number of presenting symptom

Number of symptom	Number	Percentage
1	38	19.0
2	84	42.0
≥ 3	78	39.0
Total	**200**	**100**

Among the 200 study participant, 38 (19.0%) MNM cases presented with single symptom. This was followed by 84 (42.0%) women experiencing two symptoms and 78 (39.0%) presented with ≥ 3 symptoms.

Table 30: Distribution of the study participant according to presenting symptom

Presenting symptom	Number	Percentage
Abdominal pain	87	18.9
Vaginal bleeding	72	15.7
Breathlessness	55	12.0
Swelling of feet	37	8.0
Convulsion	34	7.4
High grade fever	33	7.2
Unconsciousness	27	5.9
Syncopal attack	26	5.7
Severe headache	22	4.8
Palpitation	20	4.3
Blurred vision	15	3.3
Decreased urine output	9	1.9
Chest pain	8	1.7
Jaundice	8	1.7
Vaginal discharge	7	1.5
Total	**460***	**100**

***multiple response obtained**

Among the study subject, 87 (18.9%) MNM cases presented with abdominal pain, 72 (15.7%) with vaginal bleeding, 55 (12.0%) had difficulty in breathing, 37 (8.0%) presented with swelling of feet, 34 (7.4%) had already thrown an episode of convulsion, 33 (7.2%) had high grade fever with chills and rigor, 27 (5.9%) women when brought to the study hospital were unconscious and 26 (5.7%) had history of syncopal attacks. About 22 (4.8%) women presented with severe throbbing headache, 20 (4.3%) had palpitation, 15 (3.3%) complained of blurring of vision and 9 (1.9%) gave history of passing scanty urine. Chest pain and jaundice were noted among 8 (1.7%) MNM cases each and vaginal discharge was presenting complaint in 7 (1.5%) women.

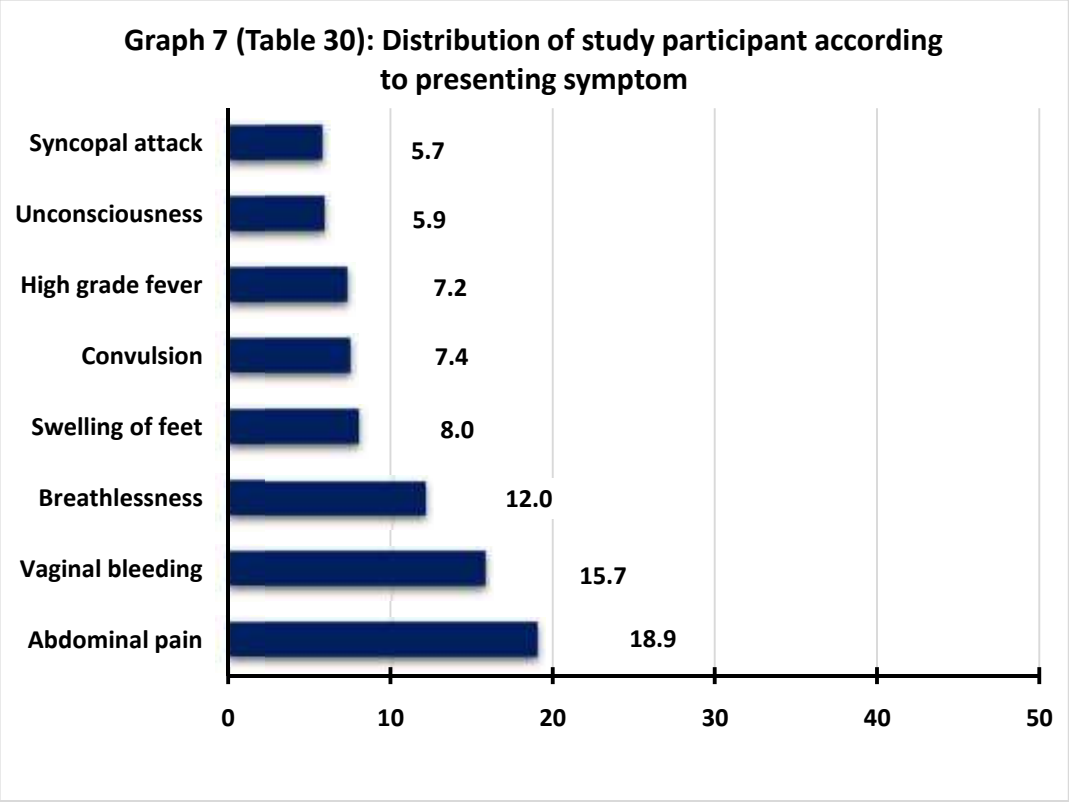
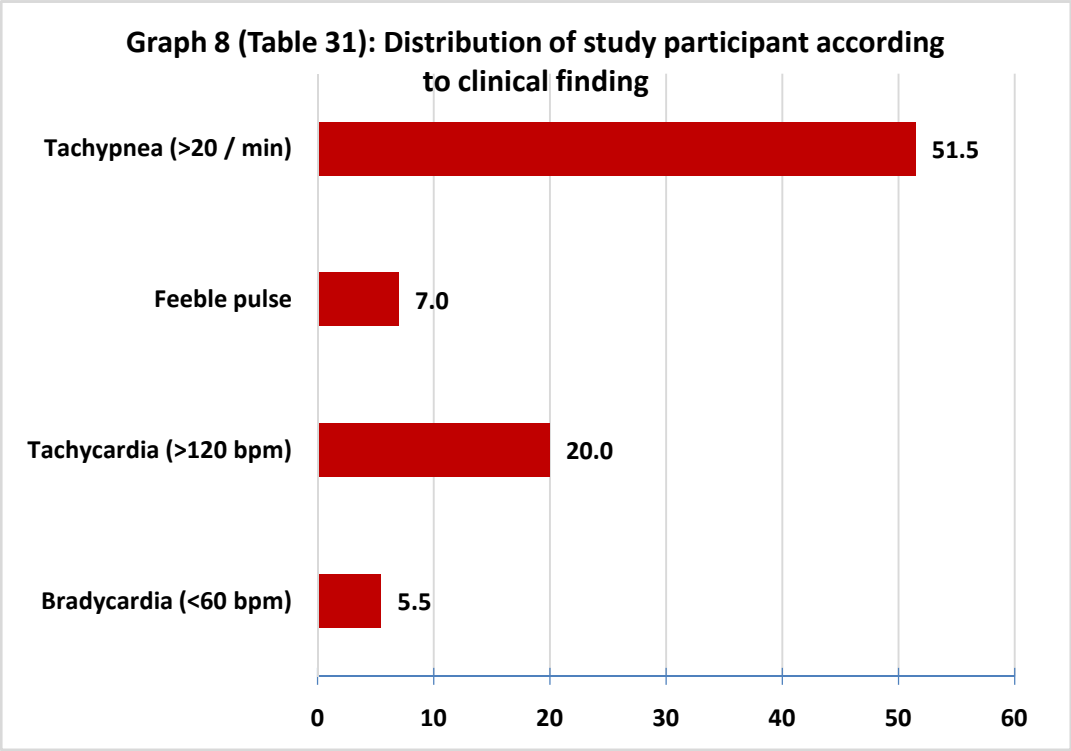


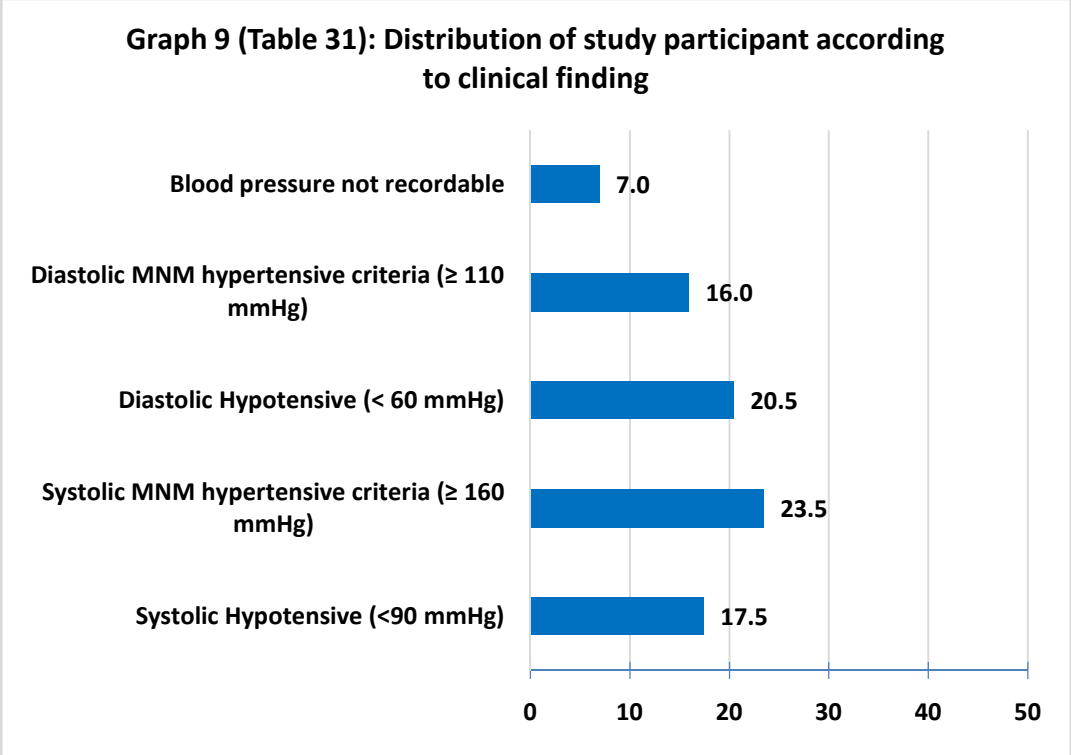
Table 31: Distribution of the study participant according to clinical finding

Clinical finding	Cut off value	Number	Percentage
Pulse rate (in bpm)	Bradycardia(< 60)	11	5.5
	Tachycardia (> 120)	40	20.0
	Feeble	14	7.0
	Normal	135	67.5
Respiratory rate (in cpm)	Tachypnea (> 20)	103	51.5
	Normal	97	48.5
Systolic Blood Pressure (in mm Hg)	Hypotensive (<90)	35	17.5
	Normotensive (90-120)	82	41.0
	Hypertensive (121-159)	22	11.0
	MNM hypertensive criteria (≥ 160)	47	23.5
	Not recordable	14	7.0
Diastolic Blood Pressure (in mm Hg)	Hypotensive (<60)	41	20.5
	Normotensive (60-80)	84	42.0
	Hypertensive (81-109)	29	14.5
	MNM hypertensive criteria (≥ 110)	32	16.0
	Not recordable	14	7.0
Total		**200**	**100**

Among the MNM case studied, it was noted that 11 (5.5%) had bradycardia at the time of admission, 40 (20.0%) had tachycardia and pulse was feeble in 14 (7.0%) of MNM cases. Although 55 women complained of breathlessness, but on examination it was observed that 103 (51.5%) women had tachypnea. Recording of blood pressure revealed that 35 (17.5%) MNM cases had hypotension (<90/60) at the time of admission, 32 (16.9%) women had hypertension (≥ 160/110) according to MNM criteria and blood pressure was not recordable among 14 (7.0%) subject. The findings of abdominal clinical examination were: presence of abdominal scar in 59

(29.5%), abdominal tenderness in 37 (18.5%), distension in 27 (13.5%) and guarding was noted in 21 (10.5%) women.





B. Laboratory criteria for identification of MNM cases

Table 32: Distribution of the study participant according to laboratory finding

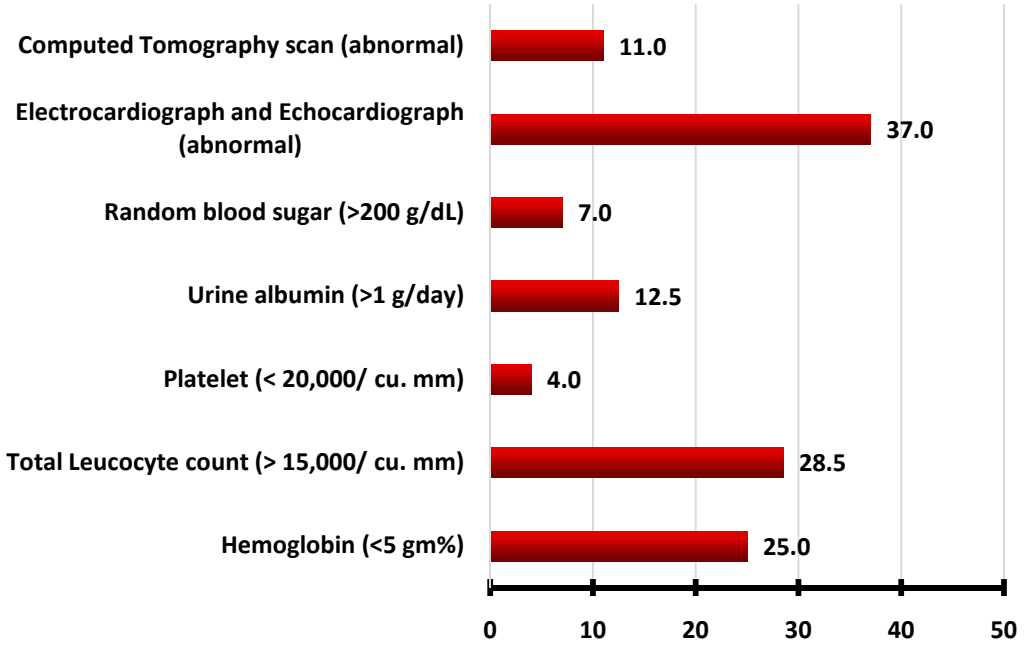
(n = 200)

Laboratory finding	Cut off value	Number	Percentage
Blood			
Hemoglobin	< 5 gm%	50	25.0
Total Leucocyte count	> 15,000/cu mm	57	28.5
Platelet	< 20,000 /cu mm	8	4.0
Urine			
Albumin (> 1 g/day)	3+	21	10.5
	4+	4	2.0
Blood Sugar			
Random Blood Sugar	> 200 g/dL	14	7.0
Pulse oximetry			
Oxygen saturation	<90%	6	3.0
Liver Function Test			
Alkaline Phosphatase	> 100 IU/L	130	65.0
Aspartate Aminotransferase	> 100 IU/L	29	14.5
Alanine Transaminase	> 100 IU/L	23	11.5
Serum Bilirubin	> 6mg/dL	14	7.0
Renal Function Test			
Creatinine	> 3.5 mg/dL	8	4.0
Sodium	< 129 mEq/L	6	3.0
Potassium	< 3.2 mEq/L	26	13.0
	> 5.5 mEq/L	12	6.0
Infectious disease screening			
Human immunodeficiency virus	Positive	6	3.0
Hepatitis B	Positive	4	2.0
Rapid Dengue	Positive	3	1.5
Imaging modality			
Electrocardiography and Echocardiography	Abnormal	74	37.0
Computed Tomography Scan	Abnormal	22	11.0

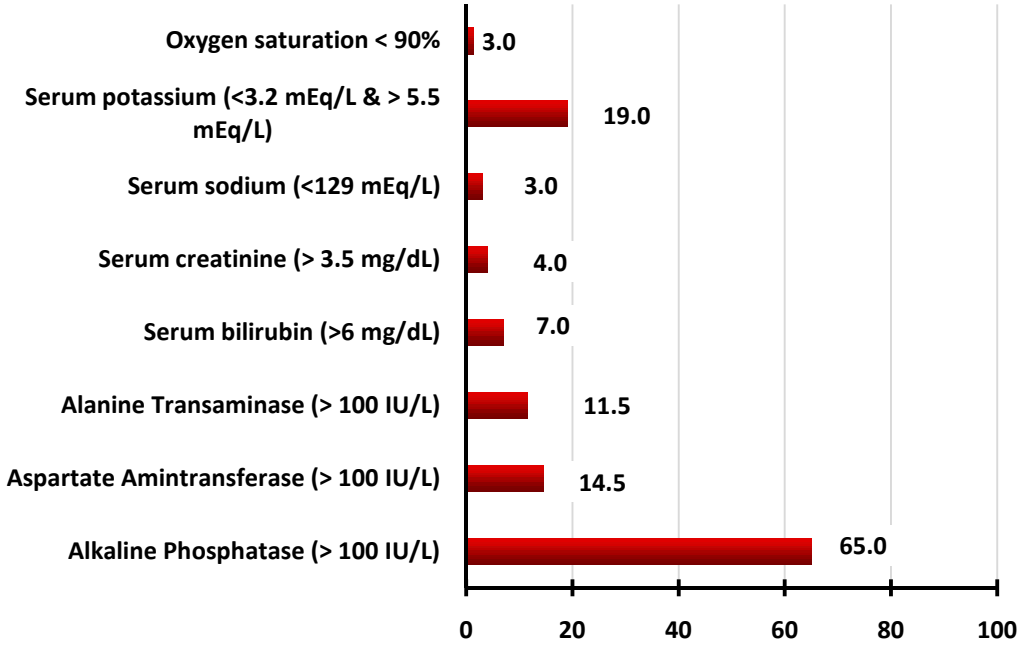
According to laboratory criteria to identify MNM cases, 50 (25.0%) women had hemoglobin level < 5 g/dL. Total leucocyte count was > 15,000 / cu mm of blood

in 57 (28.5%) women and 8 (4.0%)MNM cases had thrombocytopenia (<20,000/ cu mm of blood). Urine albumin excretion > 1g/dL was noted in 25 (12.5%) of MNM cases. About 14 (7.0%) women had random blood sugar > 200 g/dL. Fall in oxygen saturation below 90% was observed in 6 (3.0%) of women. According to liver function test, Alkaline Phosphatase enzyme level > 100 U/L was observed in 130 (65.0%), Aspartate Aminotransferase enzyme level > 100 U/L in 29 (14.5%) and Alanine Transaminase enzyme level > 100 U/L in 23 (11.5%) women. Serum bilirubin > 6 mg/dL was noted among 14 (7.0%) MNM cases. With regards to renal function test, creatinine> 3.5 mg/dL was noted in 8 (4.0%) subject. Electrolyte imbalance such as hyponatremia was noted in 6 (3.0%) MNM cases, followed by hypokalemia in 26 (13.0%) and hyperkalemia in 12 (6.0%) subject. With regards to infectious disease screening, 6 (3.0%) women were positive for human immunodeficiency virus, and 4 (2.0%) were positive for surface antigen and 3 (1.5%) were positive for rapid dengue test. Abnormal changes in Electrocardiography and Echocardiography were noted in 74 (37.0%) of the subject. The common changes observed in electrocardiography were: inverted T wave, sinus tachycardia with short PR interval, sinus bradycardia, abnormal asystole, poor r wave progression, non-specific T wave changes, flat T wave and features suggestive of heart failure. The common changes observed in echocardiography were: Tricuspid valve regurgitation, mitral stenosis, mitral regurgitation, pulmonary hypertension, supra-ventricular tachycardia and right atrial enlargement. Computed tomography scan was abnormal in 22 (11.0%) of MNM cases. The common findings were: intra-cerebral hemorrhage, cerebral edema, posterior reversible encephalopathy syndrome, cerebral hypodensities in various lobes and cerebral thrombosis and infarcts.

Graph 10 (Table 32): Distribution of study participant according to laboratory finding



Graph 11 (Table 32): Distribution of study participant according to laboratory finding



C. Interventional criteria for identification of MNM cases

Table 33: Distribution of the study participant according to history of receiving blood/ blood product transfusion

Blood/ blood product received	**Number**	**Percentage**
Yes	137	68.5
No	63	31.5
Total	**200**	**100**
If yes,		
Period of gestation	**Number**	**Percentage**
1	106	77.4
2	18	13.1
3	13	9.5
Total	**137**	**100**

Out of the 200 study participant, 137 (68.5%) women received whole blood or blood product transfusion during their stay in the hospital.Among the 137 MNM cases who received transfusion, 106 (77.4%) women had received blood/ blood product in any one of the period of gestation (antenatal / intranatal / postnatal), 18 (13.1%) received in any two periods: 10 in intranatal and postnatal period, 4 in antenatal and postnatal period, 2 in antenatal and intranatal and 2 women in antenatal and post-abortal period. It was noted that 13 (9.5%) women received blood/ blood product in all the three periods of gestation.

Table 34: Distribution of study participant according to number and type of component and quantity of blood/ blood product transfusion

Number of component	**Number**	**Percentage**
1	31	22.6
2	45	32.9
≥ 3	61	44.5
Total	**137**	**100**
Quantity of component (in unit)	**Number**	**Percentage**
≤ 5	72	52.6
6 to 10	48	35.0
11 to 15	9	6.6
≥16	8	5.8
Total	**137**	**100**
Type of component	**Number**	**Percentage**
Packed cell	92	31.4
Fresh frozen plasma	85	29.0
Whole blood	68	23.2
Platelet	48	16.4
Total	**293***	**100**

***multiple response obtained**

Among 137 MNM cases who received blood or blood product transfusion, 61 (44.5%) women had received ≥ 3 components, followed by 45 (32.9%) who had received two components and 31 (22.6%) women who had received one component. According to the quantity of blood and blood product transfusion, ≤ 5 units were received by 72 (52.6%) women and 65 (47.4%) of women had received > 5 units of blood or blood product, thus fulfilling the MNM criteria. Among those, 48 (35.0%) women had received 6 to 10 units, 9 (6.6%) 11 to 15 units and 8 (5.8%) had received ≥ 16 units of blood/ blood product. The commonest blood component received by the MNM cases was packed cell in 92 (31.4%), 85 (29.0%) received fresh frozen plasma, 68 (23.2%) received whole blood and 48 (16.4%) participant received platelet.

Graph 12 (Table 34): Distribution of study participant according to type of blood component received

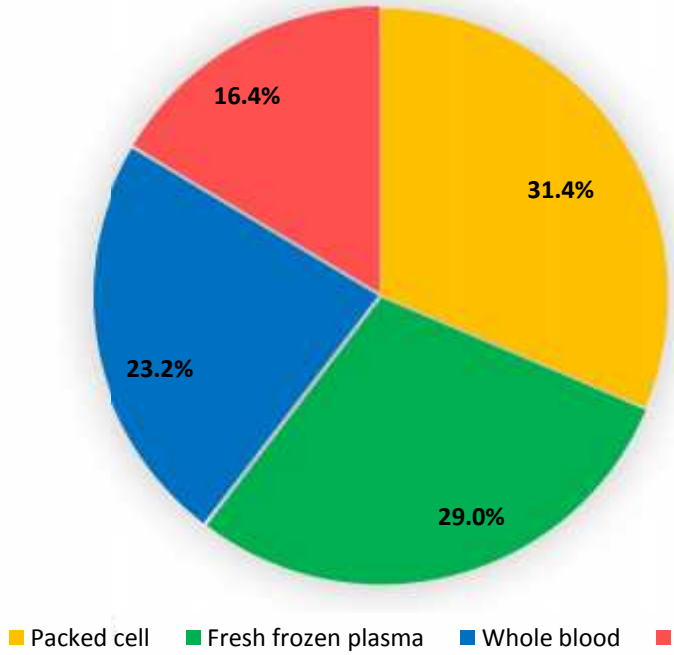


Table 35: Distribution of the study participant according to duration of Intensive Care Unit (ICU) stay

ICU admission	**Number**	**Percentage**
Yes	101	50.5
No	99	49.5
Total	**200**	**100**
If yes,		
Duration of ICU stay (in days)	**Number**	**Percentage**
< 2	32	31.7
2 to 4	52	51.5
5 to 7	12	11.9
> 7	5	4.9
Total	**101**	**100**

Out of 200 study participant, intensive care unit admission was noted in 101 (50.5%) MNM cases. Out of which, 32 (31.7%) MNM cases were admitted in ICU for < 2 days, 52 (51.5%) for 2 to 4 days, 12 (11.9%) for 5 to 7 days and remaining 5 (4.9%) women stayed for > 7 days. The mean ± SD duration of intensive care unit stay was 2.92 ± 2.37 days with a range of 1 to 13 days and median being 2 days.

Graph 13 (Table 35): Distribution of study participant according to duration of intensive care unit stay

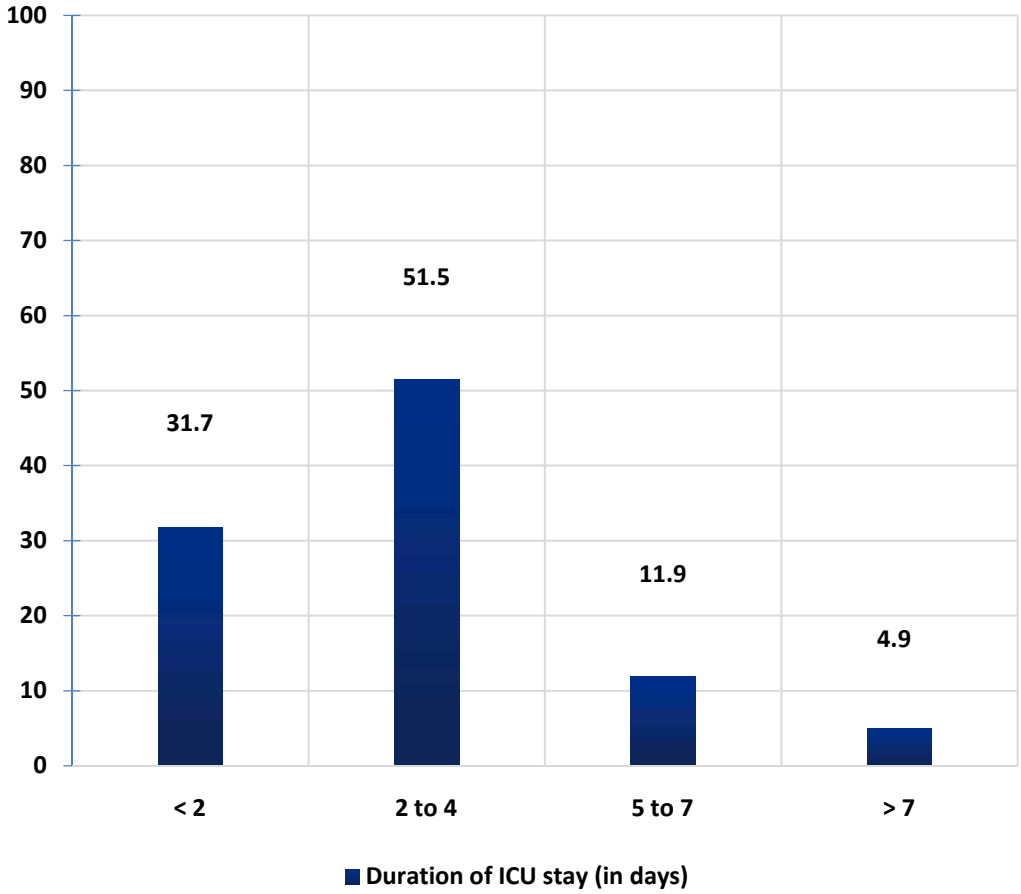


Table 36: Distribution of the study participant according to type of medical intervention

Type of medical intervention	Number	Percentage
Cardiotonic / Vasopressor	77	28.0
Intubation with mechanical ventilation	54	19.6
Mannitol	51	18.5
Anticoagulant	34	12.5
Ketoacidosis management	24	8.7
Dialysis	18	6.5
Digitalization	17	6.2
Total	**275***	**100**

***multiple response obtained**

Out of 101 MNM cases with intensive care unit admission, 275 medical interventions were undertaken in various combinations. Among them, 77 (28.0%) women were treated with cardiotonic / vasopressor drugs, 54 (19.6%) women were intubated and put on mechanical ventilator. This was followed by 51 (18.5%) women who received mannitol, 34 (12.5%) were put on anticoagulant and 24 (8.7%) women were managed for ketoacidosis. Dialysis was performed in 18 (6.5%) and 17 (6.2%) participant were treated with digitalis.

Table 37: Distribution of the study participant according to type of surgical intervention

Type of surgical intervention	Number	Percentage
Laparotomy	34	46.6
Genital injury repair	13	17.8
Hysterectomy	10	13.7
Manual removal of placenta	9	12.3
Repositioning of inverted uterus	7	9.6
Total	**73**	**100**

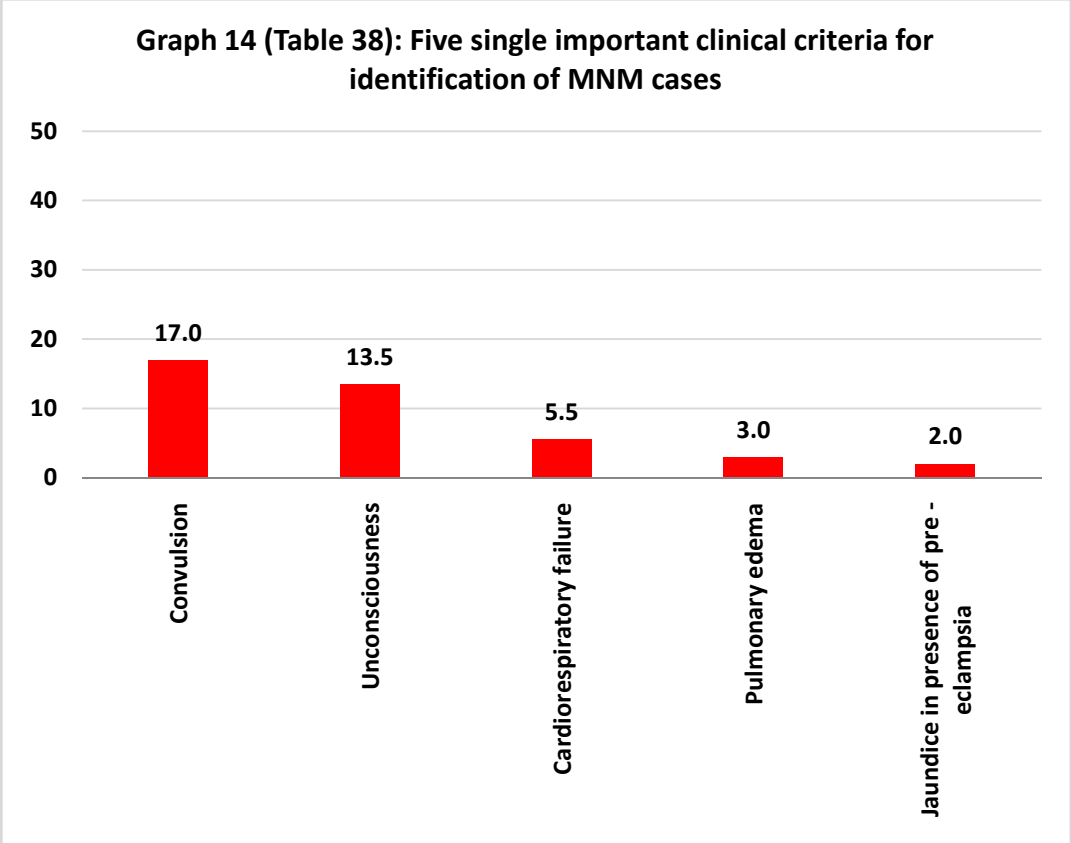
Out of the 200 MNM cases studied, 73 (36.5%) had undergone surgical intervention. Among them 34 (46.6%) had undergone laparotomy: the reason being ectopic pregnancy, internal iliac artery ligation and drainage of pus for sepsis. Hysterectomy was performed in 10 (13.7%) subject and the reason being postpartum hemorrhage and rupture uterus. About 13 (17.8%) of women had undergone perineal repair for genital injury, 9 (12.3%) had manual removal of placenta and in 7 (9.6%) women repositioning of uterus was done.

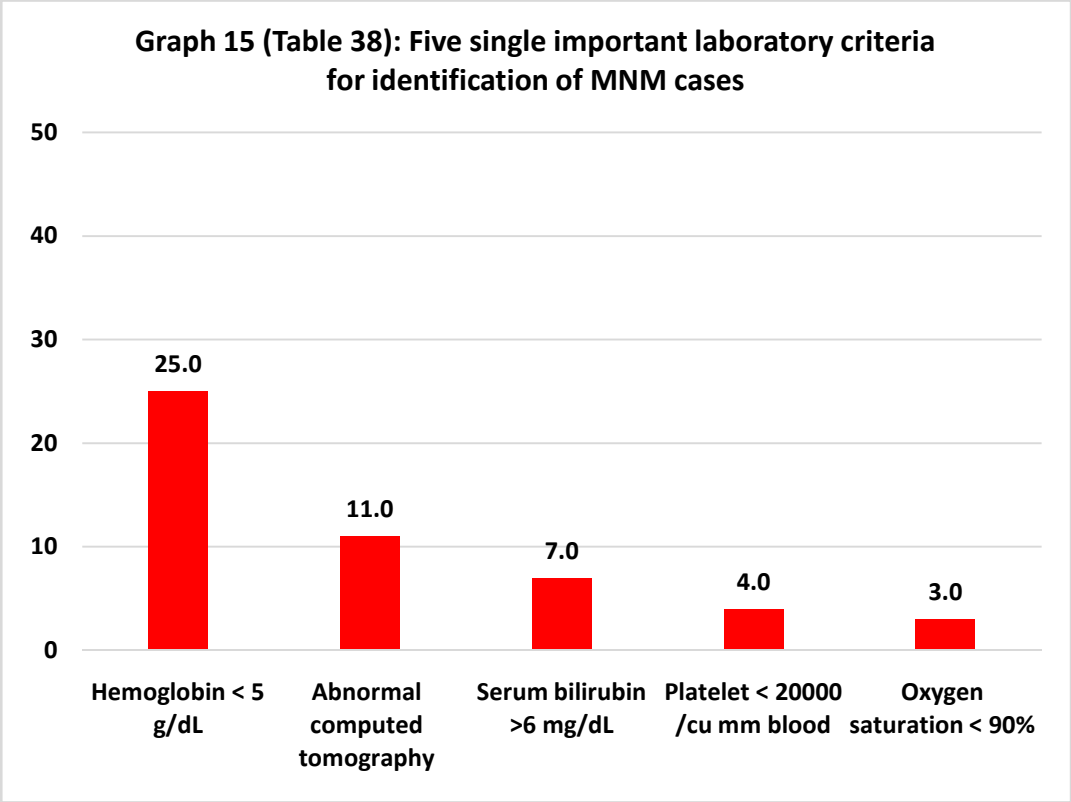
Table 38: Five important criteria for identification of MNM cases(n = 200)

Maternal near miss criteria	Number	Percentage
Clinical criteria		
Convulsion	34	17.0
Unconsciousness	27	13.5
Cardiorespiratory failure	11	5.5
Pulmonary edema	6	3.0
Jaundice in presence of pre - eclampsia	4	2.0
Laboratory criteria		
Hemoglobin < 5 g/dL	50	25.0
Abnormal computed tomography scan	22	11.0
Serum bilirubin > 6mg/dL	14	7.0
Platelet < 20,000/ cu mm blood	8	4.0
Oxygen saturation < 90% for 60 min	6	3.0
Interventional criteria		
Intensive care unit admission	101	50.5
Use of cardiotonic / vasopressor	77	38.5
Blood / blood product transfusion (> 5 units)	65	32.5
Mechanical ventilation	54	27.0
Laparotomy	34	17.0

For the diagnosis of near miss, the patient should meet minimum 3 criteria: one each from clinical, investigation and intervention. But there are some important single criteria which can be used for the identification of MNM cases. The five important single clinical criteria noted in our study were: convulsion 34 (17.0%),

unconsciousness 27 (13.5%), signs of cardio - respiratory failure 11 (5.5%), pulmonary edema 6 (3.0%) and jaundice in presence of pre - eclampsia 4 (2.0%). Similarly the five important single laboratory criteria observed were: hemoglobin level < 5 g/dL in 50 (25.0%), abnormal computed tomography scan in 22 (11.0%), serum bilirubin > 6 mg/dL in 14 (7.0%), platelet < 20,000/ cu mm of blood in 8 (4.0%) and oxygen saturation < 90% for 1 hour in 6 (3.0%) MNM cases. The important single interventional criteria seen were: intensive care unit admission in 101 (50.5%), use of cardiotonic / vasopressor in 77 (38.5%), blood / blood product transfusion (> 5 units) in 65 (32.5%), intubation with mechanical ventilation in 54 (27.0%) and laparotomy among 34 (17.0%) MNM cases.




Graph 15 (Table 38): Five single important laboratory criteria for identification of MNM cases
50
40
30
20
10
0
25.0
11.0
7.0
4.0
3.0
Hemoglobin < 5 g/dL
Abnormal computed tomography
Serum bilirubin >6 mg/dL
Platelet < 20000 /cu mm blood
Oxygen saturation < 90%

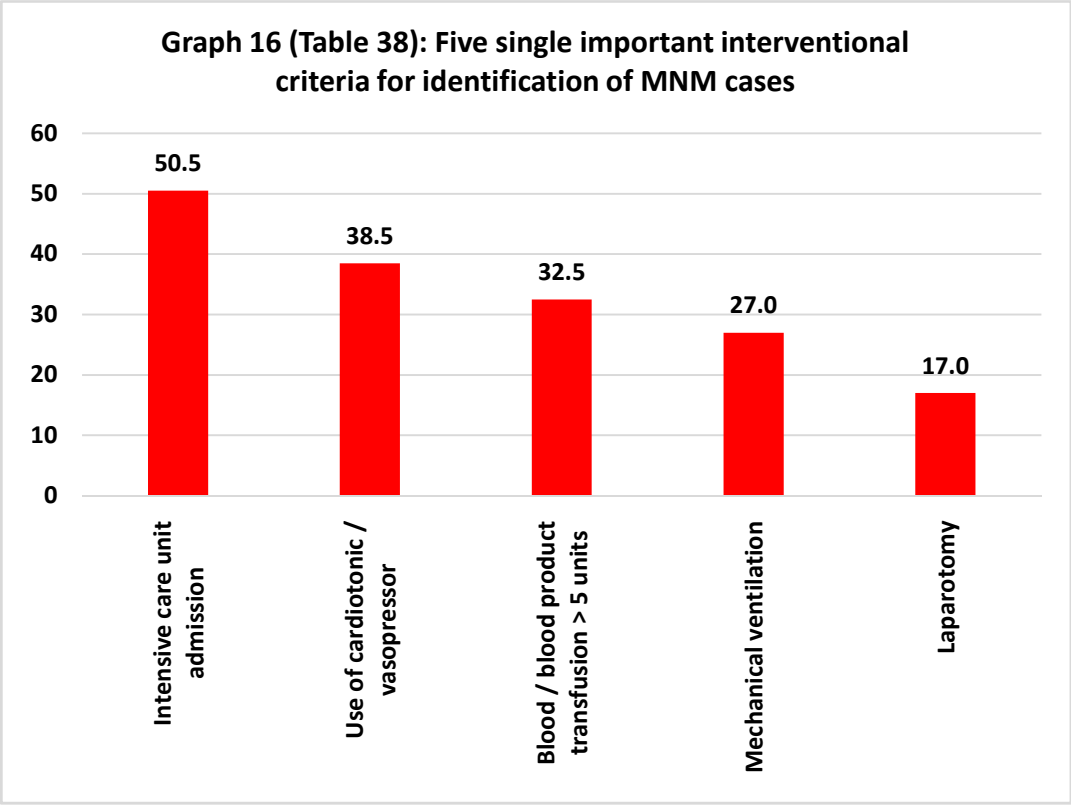

Graph 16 (Table 38): Five single important interventional criteria for identification of MNM cases
60
50
40
30
20
10
0
50.5
38.5
32.5
27.0
17.0
Intensive care unit admission
Use of cardiotonic / vasopressor
Blood / blood product transfusion > 5 units
Mechanical ventilation
Laparotomy

Table 39: Distribution of MNM case according to time of development of near miss event

Time of development of near miss event	Number	Percentage
1st trimester	18	9.0
2nd trimester	25	12.5
3rd trimester	101	50.5
During labour	4	2.0
Within 24 hours of delivery/ abortion	20	10.0
1 to 7 days of delivery/ abortion	13	6.5
8 to 42 days of delivery/ abortion	19	9.5
Total	**200**	**100**

Out of 200 MNM cases studied, 18 (9.0%) women had developed near miss event in the 1st trimester of pregnancy, 25 (12.5%) in 2nd trimester and 101 (50.5%) women developed in their 3rd trimester of pregnancy. About 4 (2.0%) women developed near miss event during labour. Near miss events within 24 hours post-delivery / abortion were noted in 20 (10.0%) MNM cases, 13 (6.5%) developed between 1 to 7 days post-delivery / abortion and 19 (9.5%) women developed between 8 to 42 days post-delivery / abortion.

Graph 17 (Table 39): Distribution of MNM cases according to time of development of near miss event

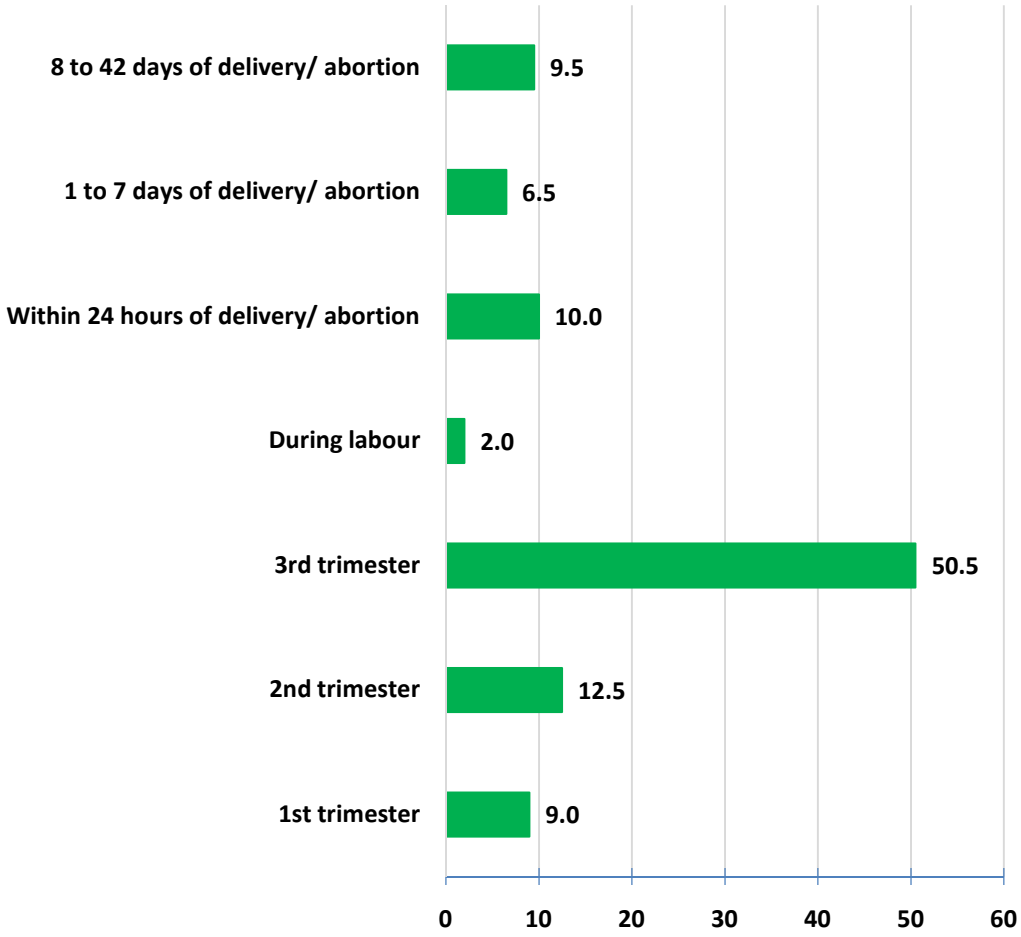
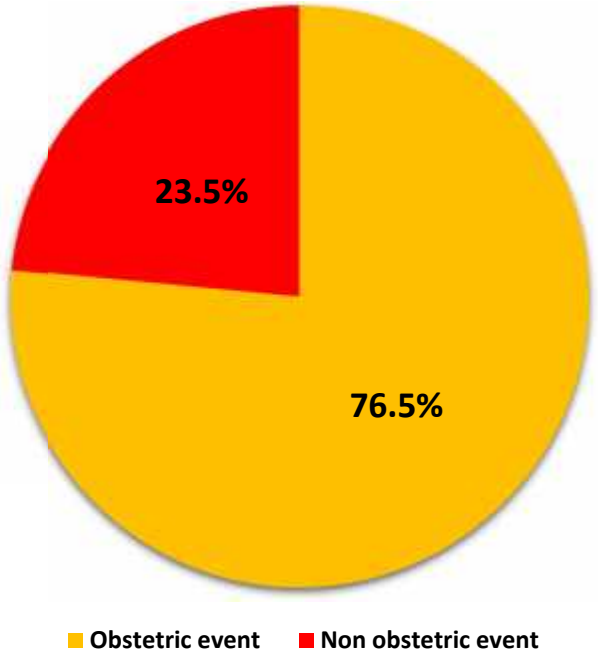


Table 40: Distribution of MNM cases according to obstetric and non-obstetric near miss event

Type of near miss event	Number	Percentage
Obstetric	153	76.5
Non obstetric	47	23.5
Total	**200**	**100.0**
Obstetric event		
Hypertensive disorders of pregnancy		
Eclampsia	33	16.5
Pre eclampsia	13	6.5
HELLP syndrome	11	5.5
Pregnancy induced hypertension	7	3.5
Obstetric hemorrhage		
Postpartum hemorrhage	28	14.0
Antepartum hemorrhage	10	5.0
Rupture uterus	3	1.5
Ectopic pregnancy	16	8.0
Obstetric sepsis	12	6.0
Abortion related complication	5	2.5
Obstructed labour	4	2.0
Embolism	4	2.0
Molar pregnancy	3	1.5
Gestational diabetes mellitus	2	1.0
Anaphylactic reaction	1	0.5
Anesthesia related complication	1	0.5
Non-obstetric event		
Severe anemia	17	8.5
Severe systemic infection	14	7.0
Cardiac disorder	12	6.0
Poisoning	4	2.0

Out of 200 MNM cases, in many of the patients, > 2 obstetric, > 2 non obstetric or obstetric and non-obstetric events occurred concurrently in the same patient. But in this table we have considered the primary event which led to the cascade of other events leading to maternal near miss. More than 2/3rd (76.5%) of the MNM cases had obstetric cause as the primary event. These obstetric primary events, eventually led to other secondary obstetric or non-obstetric maternal near miss events. The five leading obstetric near miss events noted were: Hypertensive disorder of pregnancy 64 (32.0%), obstetric hemorrhage 41 (20.5%), ectopic pregnancy 16 (8.0%), obstetric sepsis 12 (6.0%), and abortion related complication in 5 (2.5%) mothers. The non-obstetric maternal near miss events observed were: severe anemia 17 (8.5%), systemic infection 14 (7.0%) and underlying cardiac disorder in 12 (6.0%) mothers.

Graph 18 (Table 40): Distribution of MNM cases according to obstetric and non obstetric near miss event



Graph 19 (Table 40): Leading seven obstetric and non obstetric maternal near miss events

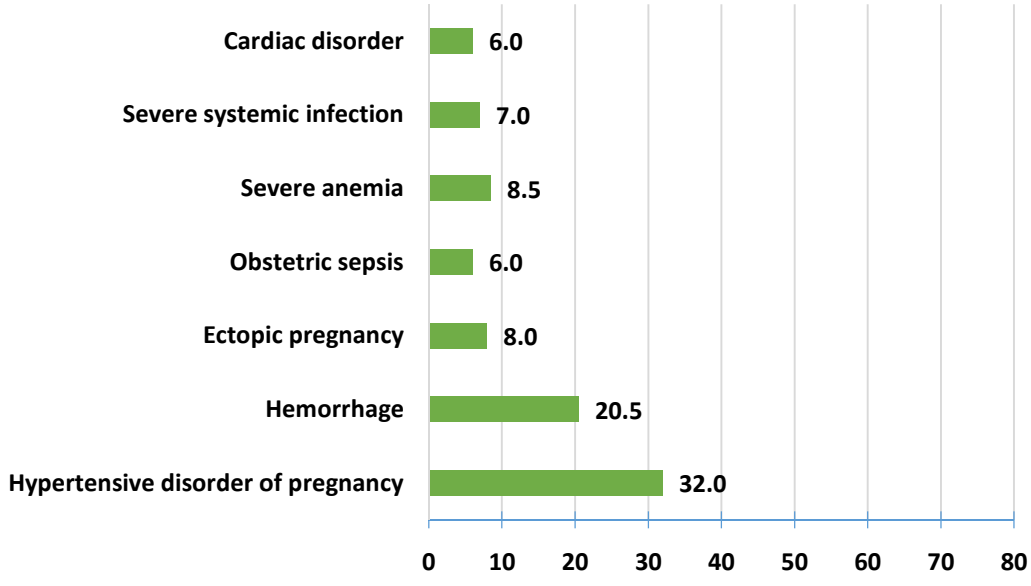


Table 41: Distribution of MNM cases according to type of organ dysfunction

Type of organ dysfunction	Number	Percentage
Reproductive and uterine	63	31.5
Neurologic	25	12.5
Multiple organ	17	8.5
Respiratory	16	8.0
Immunologic	15	7.5
Cardiovascular	13	6.5
Cardiopulmonary	11	5.5
Hematologic	11	5.5
Hepatic	10	5.0
Coagulation	9	4.5
Renal	5	2.5
Endocrine	5	2.5
Total	**200**	**100**

Out of the 200 MNM cases studied, many of them had > 1 organ system dysfunctional. But in this table we have considered the first organ system which was deranged and eventually it led to the other maternal near miss events. The most common organ dysfunction noted among women with MNM cases was reproductive and uterine 63 (31.5%), followed by neurological system 25 (12.5%), respiratory system 16 (8.0%) and immunological system in 15 (7.5%). The other organ

dysfunctions noted in our study were: cardiovascular in 13 (6.5%) followed by cardiopulmonary and hematological system in 11 (5.5%) each, hepatic in 10 (5.0%), coagulation system in 9 (4.5%) and 5 (2.5%) in renal and endocrine system each. About 17 (8.5%) of MNM cases had > 2 organ dysfunction, thus being considered as multiple organ deranged.

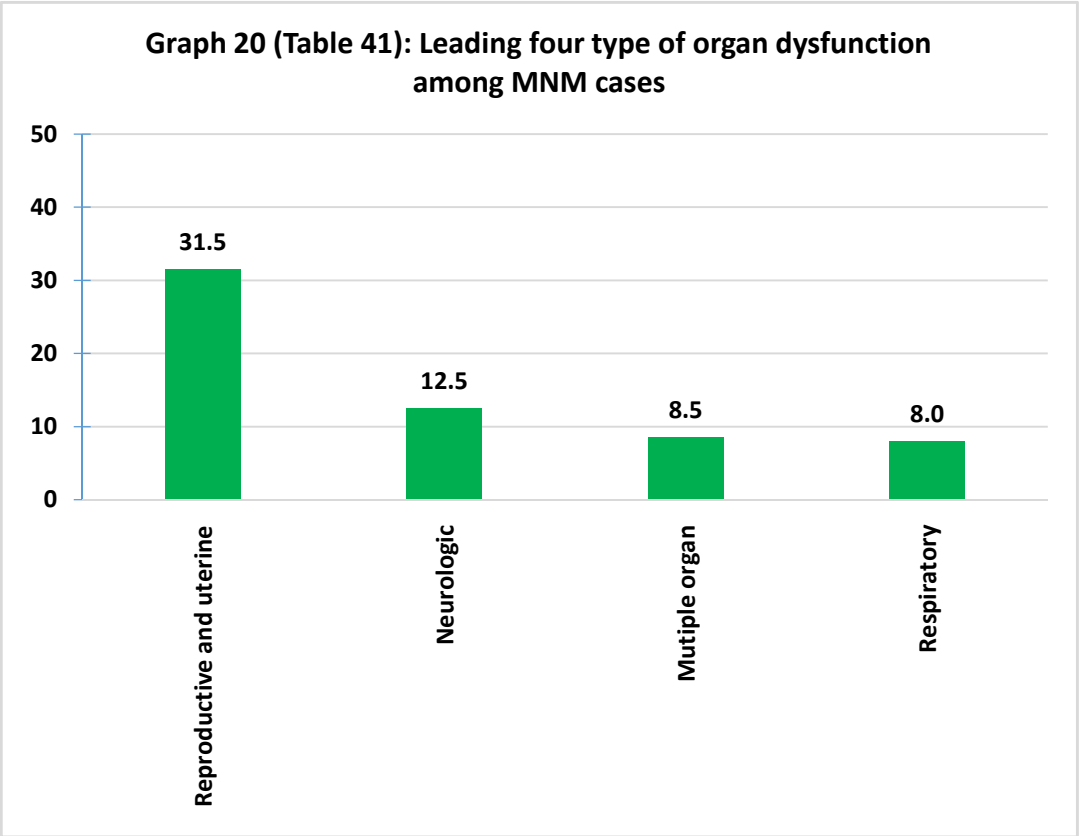


Table 42: Maternal morbidity and mortality indices

Name of the indicator	Value
Total deliveries in the study hospitals	14895
Total live birth in the study hospitals	12695
Severe maternal outcome	
Maternal death	47
Maternal near miss case	153
Women with life threatening condition (WLTC)	200
Prevalence rate of maternal near miss / 100 deliveries	200 x 100 / 14895 = 1.34
Near miss cases / 1000 deliveries On arrival During hospitalization	 167 x 1000 / 14895 = 11.21 33 x 1000 / 14895 = 2.21
Maternal near miss incidence ratio (per 1000 live births)	153 x 1000 / 12695 = 12.05
Severe maternal outcome ratio (per 1000 live births)	200 x 1000 / 12695 = 15.75
Maternal near miss : Maternal death ratio	153 : 47 = 3.3 : 1
Maternal Mortality Ratio (per 100,000 live births)	43 X 100,000 /12695 = 339
Mortality index	47 X 100 / 200 = 23.5%
Hospital access indicator	
WLTC at hospital arrival	167
Proportion WLTC at arrival among all women with life threatening condition	167 x 100 / 200 = 83.5%
Proportion of WLTC at arrival coming from other hospital	139 x 100 / 167 = 83.2%
WLTC at arrival mortality index (maternal death within 24 hours after arrival)	10 x 100 / 167 = 6.0%
Intra hospital care indicator	
Intra hospital WLTC case	33
Intra hospital WLTC rate (per 1000 live births)	33 x 1000 / 12695 = 2.60
Intra hospital mortality index	18 x 100 / 33 = 54.5%
Intensive care unit admission indicator	
Intensive care unit admission rate	101 x 100 / 14895 = 0.68%
Intensive care unit admission rate among women with severe maternal outcome	200 x 100 / 14895 = 1.34%
Proportion of maternal deaths occurred with intensive care unit admission	44 x100 / 47 = 93.6%
Proportion of maternal deaths occurred without intensive care unit admission	3 X 100 / 47 = 6.4%

The total number of deliveries conducted and live births delivered in the study hospitals were 14895 and 12695 respectively. Women with life threatening condition (WLTC) was 200 consisting of 153 maternal near miss cases and 47 maternal deaths. Allthe 200 study subject had one or the other life threatening condition in various combinations. Prevalence rate of maternal near miss / 100 deliveries was 1.34 followed by 11.21 near miss cases / 1000 deliveries on arrival and 2.21 near miss cases / 1000 deliveries during hospitalization. Maternal near miss incidence ratio was 12.05 per 1000 live births and severe maternal outcome ratio was 15.75 per 1000 live births. The maternal near miss : maternal death ratio in our study was 3.3:1, that means for every maternal death we have 3 women experiencing severe maternal morbidity. Maternal mortality ratio observed in our study was about 339 / 1,00,000 live births and mortality index noted was 23.5%. Among the hospital access indicators, WLTC at hospital arrival was 167, proportion WLTC at arrival among all women with life threatening condition was 83.5%, proportion of WLTC at arrival coming from other hospital was 83.2% and WLTC at arrival mortality index was 6.0%. Among intra hospital care indicators, the intra hospital WLTC cases noted were 33, out of which, intra hospital WLTC rate per 1000 live births was 2.60 and intra hospital mortality index noted was 54.5%. Among the intensive care unit admission indicators, it was noted that the intensive care unit admission rate was 0.68%, intensive care unit admission rate among women with severe maternal outcome was 1.34%, proportion of maternal deaths occurred with intensive care unit admission 93.6% and proportion of maternal deaths occurred without intensive care unit admission noted in our study was 6.4%.

Table 43: Process and outcome indicator among women with severe maternal morbidity and mortality

Process and outcome indicator	Number	Percentage
Treatment of severe postpartum hemorrhage		
Target population : women with PPH	28	100.0
Oxytocin use	28	100.0
Ergometrine	28	100.0
Misoprostol	28	100.0
Tranexamic acid	17	60.7
Hysterectomy	8	28.6
Internal iliac artery ligation	3	10.7
Blood product transfusion	28	100.0
Mortality (Case fatality rate)	**5**	**17.9**
Anticonvulsant for Eclampsia		
Target population : women with eclampsia	33	100.0
Magnesium sulfate use	33	100.0
Other anticonvulsant used	15	45.5
Mortality (Case fatality rate)	**11**	**33.3**
Prevention of caesarean section related infection		
Target population: women with caesarean section	74	100.0
Prophylactic antibiotics during caesarean section	74	100.0
Prevention of severe systemic infections and obstetric sepsis		
Target population : women with sepsis	26	100.0
Parenteral therapeutic antibiotics	26	100.0
Mortality (Case fatality rate)	**9**	**34.6**
Uterine rupture		
Target population : women with uterine rupture	3	100.0
Occurred out hospital	3	100.0
Laparotomy	3	100.0
Mortality (Case fatality rate)	**0**	**0**

Out of the MNM cases studied, process and outcome indicator for various important events were noted. Treatment of severe postpartum hemorrhage in 28 MNM cases where use of oxytocin, ergometrine, misoprostol and blood product transfusion was noted in all 28 (100%) MNM cases.Tranexamic acid was used for treatment in 17 (60.7%) cases, followed by 8 (28.6%) who underwent hysterectomy and 3 (10.7%) had internal iliac artery ligation procedure. Mortality was noted in 5 subject and the case fatality rate was 17.9%. Eclampsia was observed in 33 women and all (100%) cases were treated with magnesium sulfate, in addition to that in 15 (45.5%) cases they had used one or the other anticoagulants. Nearly 11 MNM cases ended with mortality and 33.3% was the case fatality rate. About 77 women underwent caesarean section and prophylactic antibiotic was used for the prevention of caesarean section related infection in all of them. About 26 MNM cases were identified with severe systemic infection and obstetric sepsis and it was noted that all of them had received parenteral therapeutic antibiotic. But the maternal mortality observed was 9 with a case fatality rate of 34.6%. There were 3 cases of uterine rupture which had occurred outside the study hospitals and laparotomy was conducted for all of them. This near miss event had zero mortality.

IV. Maternal and fetal outcome of MNM cases:

Table 44: Distribution of the study participant according to duration of hospital stay

Hospital stay (in days)	Number	Percentage
< 7	64	32.0
7 - 14	98	49.0
15 - 21	34	17.0
> 21	4	2.0
Total	**200**	**100**

Among the total study subject, hospital stay was between 7 to 14 days in 98 (49.0%)women. This was followed by 64 (32.0%) women who stayed in the hospital for less than 7 days. Remaining women stayed for more than two weeks, such as 34 (17.0%) women for 15 - 21 days and 4 (2.0%) women for more than 21 days. The mean ± SD duration of hospital stay was 9.4 ± 6.25 days with a range of 1 to 46 days and median being 9 days.

Table 45: Distribution of the study participant according to mode of termination of pregnancy

Mode of termination of pregnancy	Number	Percentage
Emergency Caesarean	68	40.7
Normal vaginal	41	24.5
Assisted vaginal	28	16.8
Elective Caesarean	6	3.6
Laparotomy for ruptured uterus	3	1.8
Laparotomy for ruptured ectopic pregnancy	16	9.6
Dilatation and evacuation	5	3.0
Total	**167***	**100**

*** 33 remained undelivered**

Out of 167 MNM cases whose pregnancy was terminated, 74 (44.3%) women had caesarean section, in that 68 (40.7%) women underwent emergency section. About 69 (41.3%) had vaginal delivery, in that 28 (16.8%) underwent assisted vaginal delivery. Nearly 19 (11.4%) women underwent laparotomy, in that 16 (9.6%) for ruptured ectopic pregnancy and 3 (1.8%) for ruptured uterus.

Table 46: Distribution of the study participant according to who conducted the delivery/ termination of pregnancy

Delivery/ termination of pregnancy conducted by	Number	Percentage
Specialist	127	76.0
Resident doctor	28	16.8
Staff nurse	10	6.0
Family member	2	1.2
Total	**167***	**100**

*** 33 remained undelivered**

Out of 167 MNM cases who delivered / termination of pregnancy was done, in 127 (76.0%), it was conducted by specialist, 28 (16.8%) by resident doctor and 10 (6.0%) by staff nurse. Two women (1.2%) who were referred to the study hospital delivered in the ambulance only and the delivery was conducted by the accompanying family member.

Table 47: Distribution of the study participant according to maternal outcome

Maternal outcome	Number	Percentage
Recovered	120	71.9
Died	47	28.1
Total	**167***	**100**

***29 went home against medical advice and 4 were discharged on request**

Out of 200 study participant, nearly 2/3rd 120 (71.9%) MNM cases had complete recovery at the time of discharge and 47 (28.1%) women expired during the course of management. Among maternal deaths, about 2/5th 19 (40.4%) subject expired within 24 hours of admission.

Table 48: Distribution of the study participant according to fetal outcome

Fetal outcome	Number	Percentage
Live birth	78	53.4
Still birth	68	46.6
Total	**146***	**100**

*** 33 remained undelivered, 16 were ectopic pregnancy and 5 ended in abortion**

Out of 146 women who delivered, nearly half 78 (53.4%) had good fetal outcome whereas 68 (46.6%) had bad fetal outcome. Out of 78 live births, 21 (26.9%) had neonate intensive care unit admission, the reasons being preterm, low birth weight and birth asphyxia.

Table 49: Distribution of the study participant according to type of discharge

Type of discharge	Number	Percentage
Hospital	120	60.0
Expired	47	23.5
Left against medical advice	29	14.5
On Request	4	2.0
Total	**200**	**100**

Among the study participant, 120 (60.0%) were discharged from the hospital after complete recovery and 47 (23.5%) expired during the hospital stay. About 33 (16.5%) of MNM cases with residual illness went home against medical advice or were discharged on request.

V. Comparison of maternal mortality and morbidity

Table 50: Socio-demographic comparison of maternal morbidity and mortality

Socio-demographic variable	Maternal near miss (n=153)	Maternal death (n=47)
Age (in years)	25.2 ± 4.54	24.4 ± 4.16
Illiterate	12 (7.8%)	7 (14.8%)
Lower middle & lower classes	78 (51.0%)	27 (57.4%)
Unbooked antenatal status	97 (63.4%)	42 (89.4%)
Primigravida	66 (43.1%)	27 (57.4%)
Antenatal care not received	19 (12.4%)	4 (8.5%)
Birth interval < 3 years	38 (24.8%)	12 (25.5%)
Period of gestation (in weeks)	29.4 ± 10.7	32.4 ± 7.7
Trimester of pregnancy		
1st	21 (13.7%)	2 (4.3%)
2nd	18 (11.8%)	7 (14.9%)
3rd	79 (51.6%)	26 (55.3%)
Postnatal	35 (22.9%)	12 (25.5%)

Women experiencing maternal mortality were slightly younger (24.4 ± 4.16) in age when compared to women experiencing near miss event (25.2 ± 4.54). Illiterate women (14.8%) have two times higher risk of maternal mortality. Socioeconomic status, gravidity, antenatal care and birth interval did not show much difference

between the women experiencing near miss or mortality. Women who were not registered for antenatal checkup at the study hospitals had higher (89.4%) maternal mortality. The mean period of gestation of MNM cases and maternal death were 29.4 ± 10.7 and 32.4 ± 7.7 weeks respectively. More than half (55.3%) of the maternal death was noted in the third trimester of pregnancy and women experiencing severe maternal outcome in postnatal period showed slightly higher (25.5%) maternal mortality.

Table 51: The mortality index of near miss event

Near miss event	Severe maternal outcome	Mortality	Mortality index (%)
Anesthesia related complication	1	1	100.0
Obstetric sepsis	12	8	66.7
Obstructed labour	4	2	50.0
Embolism	4	2	50.0
Poisoning	4	2	50.0
Cardiac disorder	12	4	33.3
Severe anemia	17	5	29.4
Hypertensive disorder of pregnancy including HELLP Syndrome	64	16	25.0
Obstetric hemorrhage	38	6	15.8
Severe systemic infection	14	1	7.1

The leading mortality index for maternal near miss event was obstetric sepsis (66.7%) followed by embolism and obstructed labour with 50% mortality. One third (33.3%) of the mortality index was noted in cardiac disorder near miss event. Severe anemia near miss event contributed for 29.4% of mortality index and hypertensive disorder of pregnancy including HELLP Syndrome recorded $1/4^{th}$ (25.0%) mortality index. Obstetric hemorrhage near miss event was responsible for 15.8% mortality index and about 7.1% mortality rate was noted with severe systemic infection. The poisoning and anesthesia related complication had mortality rate of 50% and 100% respectively.

Table 52: The mortality index of organ dysfunction

Organ dysfunction	Severe maternal outcome	Mortality	Mortality index (%)
Renal	5	4	80.0
Multiple organ	17	12	70.6
Cardiopulmonary	11	7	63.6
Cardiovascular	13	5	38.5
Neurologic	25	8	32.0
Respiratory	16	4	25.0
Coagulation	9	2	22.2
Immunologic	15	1	6.7
Reproductive and uterine	63	4	6.3

The three leading mortality index among MNM cases in relation to organ dysfunction was noted in renal system (80.0%) followed by multiple organ dysfunction (70.6%) and cardiopulmonary system (63.6%). About 1/3rd mortality index was noted in cardiovascular and neurological system. Nearly 1/4th mortality index was noted in respiratory and coagulation system. The least mortality index among MNM cases was noted in immunological and reproductive system.

VI. Three delays in maternal mortality and morbidity

Table 53: Distribution of study participant according to presence of Type I Delay

Type I Delay	Number	Percentage
Yes	134	67.0
No	66	33.0
Total	**200**	**100**
If yes,		
Both	110	82.1
Lack of resources	13	9.7
Lack of awareness	11	8.2
Total	**134**	**100**

Among the 200 study subject, 134 (67.0%) MNM cases were having Type I delay which comprises of personal/ family issue like deciding to seek appropriate medical help for an obstetric emergency. Type I delay can be due to lack of resources 13 (9.7%), lack of awareness 11 (8.2%) or both 110 (88.1%). None of the MNM cases gave history of previous poor experience of health care, neither refusal of admission or treatment in the health facility.

Table 54: Distribution of the study participant according to presence of Type II Delay

Type II Delay	Number	Percentage
Yes	130	65.0
No	70	35.0
Total	**200**	**100**
If yes,		
Home to health care facility	116	36.5
Between health care facility	113	35.5
Lack of communication network	89	28.0
Total	**318***	**100**

***multiple responses obtained**

Out of 200 study participant, Type II delay which means reaching an appropriate obstetric facility was observed in 130 (65.0%) women. Out of 200 MNM cases, nearly 2/3rd 151 (75.5%) of women were not from Belagavitaluka. Delay between home to health care facility 116 (36.5%), delay between the health care facility 113 (35.5%) was observed because the distance range covered by the MNM cases was anywhere between 30 to 380 km and cost of transport. Nearly 89 (28.0%) women had lack of communication network due to poor roads and infrastructure.

Table 55: Distribution of the study participant according to type III Delay

(n = 160)

Type III Delay	Number	Percentage
Lack of blood product	108	35.2
Lack of instrument and medicine	101	32.9
Infrastructure issue	98	31.9
Total	**307***	**100**

***multiple response obtained**

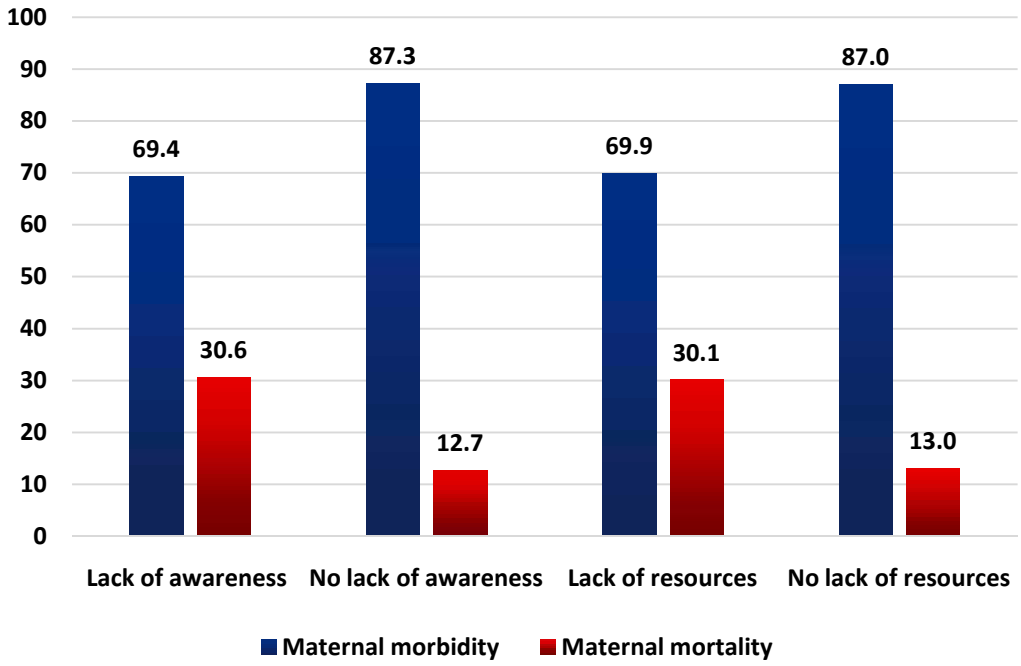
Out of 160 MNM cases who were referred, type III delay which means receiving adequate care when a facility is reached was observed in all of them. Nearly 108 (35.2%) MNM cases were referred due to lack of blood product, followed by 101 (32.9%) women due to lack of instrument and medicine at the previous health facility and 98 (31.9%) participant were referred due to infrastructure issue.

Table 56: Association between Type of delay and maternal outcome

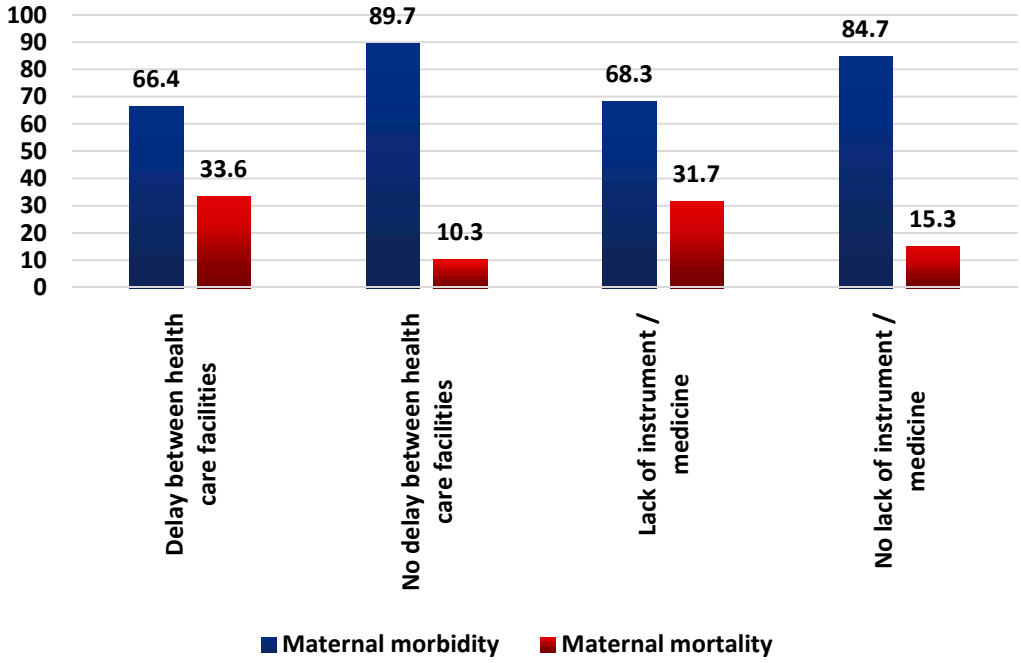
Type of delay	Maternal morbidity		Maternal mortality		χ2 and p value
	No.	%	No.	%	
Type I delay - Lack of awareness					
Yes	84	69.4	37	30.6	**χ2= 8.538,**
No	69	87.3	10	12.7	**df = 1, p= 0.003**
Lack of resources					
Yes	86	69.9	37	30.1	**χ2 = 7.694,**
No	67	87.0	10	13.0	**df = 1, p= 0.006**
Type II delay - Delay between health care facilities					
Yes	75	66.4	38	33.6	**χ2 = 14.823,**
No	78	89.7	9	10.3	**df = 1, p < 0.001**
Type III delay - Lack of instrument / medicine					
Yes	69	68.3	32	31.7	**χ2 = 7.60,**
No	50	84.7	9	15.3	**df = 1, p= 0.006**
Delay due to infrastructure issue					
Yes	67	68.4	31	31.6	**χ2 = 7.07,**
No	52	83.9	10	16.1	**df = 1, p= 0.008**
Lack of blood product					
Yes	88	81.5	20	18.5	**χ2 = 3.241,**
No	31	59.6	21	40.4	**df = 1, p= 0.0072**

The percentage of women experiencing Type I delay i.e. lack of awareness and resources, 30.6% and 30.1% had bad maternal outcome respectively. This difference in the distribution was statistically significant (p = 0.003 and p = 0.006). In relation to Type II delay, significant association was noted in delay between the health care facilities (p < 0.001). Whereas other two delays of Type II (delay between home to first health care facility and lack of communication network) did not show significant difference in the maternal outcome (p = 0.803 and p = 0.716). The third type of delay showed significant association with bad maternal outcome for all the components: lack of instrument / medicine, delay due to infrastructure issue and lack of blood product. (p = 0.006, p = 0.008 and p = 0.0072).

Graph 21 (Table 56): Association between Type of delay and maternal outcome



Graph 22 (Table 56): Association between Type of delay and maternal outcome



Graph 23 (Table 56): Association between Type of delay and maternal outcome

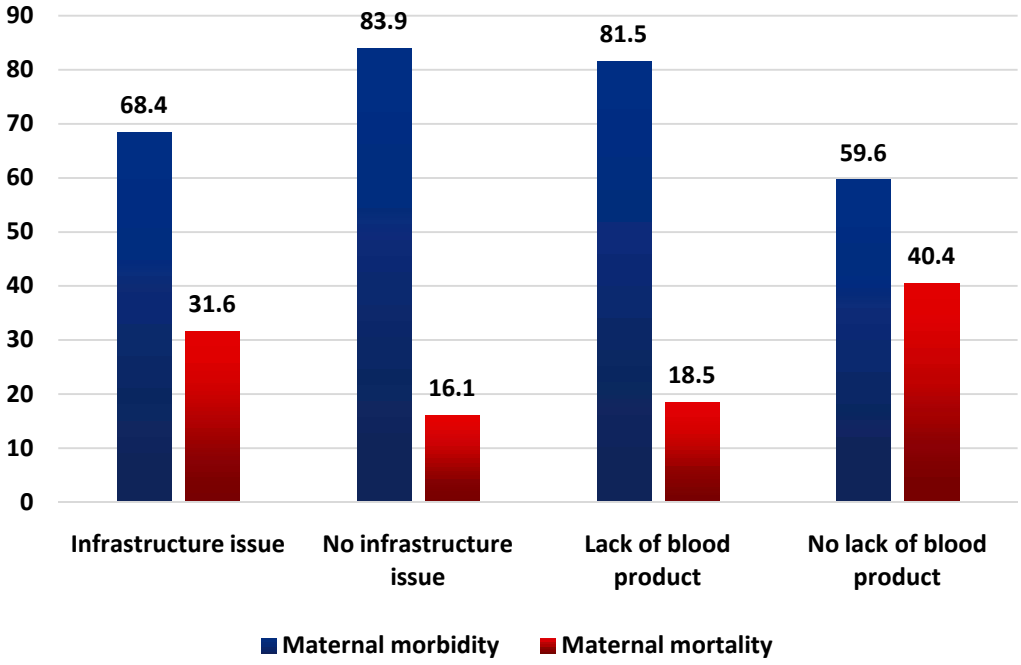


Table 57: Univariate Logistic Regression Analysis

Type of delay	UNIVARIATE ANALYSIS		
	Unadjusted Odd's Ratio	**95% Confidence Interval**	**P value**
Lack of awareness	3.039	1.410 - 6.549	**0.005**
Lack of resources	2.883	1.337 - 6.214	**0.007**
Delay between health care facilities	4.391	1.987 - 9.720	**< 0.001**
Lack of instrument / medicine	2.597	1.301 - 5.183	**0.007**
Infrastructure issue	2.487	1.257 - 4.922	**0.009**
Lack of blood product	0.547	0.282 - 1.060	0.074

On further univariate logistic regression analysis, the important delays leading to bad maternal outcome noted in our study were: lack of awareness [unadjusted Odd's Ratio (OR) = 3.039, 95% Confidence Interval (CI): 1.410 - 6.549, p = 0.005] and lack of resources [OR = 2.883, 95% CI 1.337 - 6.214, p = 0.007]. This is suggestive of the fact that women with Type I delay were approximately 3 times more likely to face poor maternal consequences. Delay between health care facilities reflected significant association [OR = 4.391, 95% CI 1.987 - 9.702, p < 0.001] with bad maternal outcome. This explains that women with this delay in reaching from one health facility to another faced 4 times more chance of attaining mortality. Lack of instrument / medicine [OR = 2.597, 95% CI 1.301 - 5.183, p = 0.007] and infrastructure issue [OR = 2.487, 95% CI 1.257 - 4.922, p = 0.009] had significant association with maternal outcome. Therefore the women with Type III delay had 2.5 times of being at higher risk of bad maternal consequences.

Table 58: Multivariate Logistic Regression Analysis

Type of delay	MULTIVARIATE ANALYSIS		
	Adjusted Odd's Ratio	**95% Confidence Interval**	**P value**
Lack of awareness	2.545	0.793 - 8.168	0.0116
Lack of resources	1.185	0.347 - 4.040	0.786
Delay between health care facilities	7.648	2.581 - 22.666	**< 0.001**
Lack of instrument / medicine	2.617	0.152 - 44.949	0.507
Infrastructure issue	0.982	0.063 - 15.29	0.989

On application of multivariate logistic regression analysis, the present study highlighted that women experiencing delay between health care facilities were seven times more likely to have poor maternal outcome compared to the women who did not face the delay [AOR 7.648, 95% CI 2.581 - 22.666, $p < 0.001$].

DISCUSSION

The present study is an attempt to create deep understanding of maternal morbidity and mortality and the important events that result in such potentially life threatening condition in a woman. This study was undertaken in KLE Charitable Hospital and Belagavi Institute of Medical Sciences Hospital in Belagavi, Karnataka among 200 women identified according to the World Health Organization maternal near miss criteria 2009. A total of 14895 deliveries were conducted in both the study hospitals and the total live births delivered in the study hospitals were 12695 during the study period.

I. Socio-demographic profile of the study participant

Table 1 to 7 : Distribution of the study participant according to socio-demographic profile of the study participant

The mean age of the study subject in our study was 25.0 ± 4.45 years. This was similar to a study conducted in a medical college hospital of Manipal that showed the mean age of 27.0 ± 4.5 years.[19] The present study reflected that 19.0% of the study subject constituted the "high risk" pregnancy, belonging to an age group of 18 - 20 years. This is in agreement to a study conducted in Allahabad that showed 24.5% of participant below 20 years of age.[28] This gives an idea that majority of our study subject were aware of health risks due to early pregnancy and childbirth. According to our study, nearly half (41.5%) belonged to the age group of 21 - 25 years whereas a study done in Indore highlighted about 2/3rd (63.0%) of the study participant were in 21 - 25 years age group.[5] This explains good knowledge of attaining pregnancy at the right age in our study compared with the Central India study that noted pregnancy at

an early age. Among the husbands' of the participant, it was noted that almost all (98.5%) of them were above 20 years of age. Only 1.5% of the husbands' of the study subject were < 20 years in the present study.

More than 2/3rd (69.5%) of the participant were Hindu by religion in our study. Muslim constituted 20% and 6% of the study subject followed Christianity. A study conducted in West Bengal noted 84.3% study participant practised Hinduism.[43] According to the National Family Health Survey (NFHS 4), the vast majority of households in Karnataka consists of 84% Hindu, 12% Muslim and remaining 3% comprising of Christian population.[44]

Literacy rate noted among our study subject and their husband's was 90.5% and 96.5% respectively. The present study noted 13.0% graduate subject whereas a study done in Raipur had only 3.3% graduate subject.[25] Attainment of higher education level such as graduation is considered to be an important milestone in our community, especially among the female population. Our study reflected only 9.5% illiteracy among the subject, whereas a study conducted in Kolkata highlighted almost half (41.41%) illiterate study participant.[17] Illiteracy rate was even higher in the northern part of country. According to a study done in Allahabad, about 3/4th (71.0%) of study subject were illiterate.[28] Higher literacy status in our study reflects better female literacy rate in the southern part of the country. However the NFHS 4 data revealed that 24% of women and 12% of men in the age group 15 to 49 years never went to school in Karnataka.[44]

Our study mentioned that majority (92.5%) of the study participant were homemakers despite having attained good education. It was also noted that their husbands' were commonly employed in (32.5%) private firm or were involved in

(22.5%) farming. Government job was undertaken by 16.5% of the men. It is to be highlighted here that according to the NFHS 4 survey, only 35% of women and 84% of men in the age group of 15 to 49 years were employed. Among the men who were employed, 38% were involved in agriculture in Karnataka.[44]

The present study revealed that half (52.5%) of the study participant belonged to socioeconomic class IV and V according to Modified B.G. Prasad's Classification. This is better than the findings in the Kolkata study where more than 4/5th (82.82%) of the study population belonged to lower middle and lower classes.[17] The reason could be better employment opportunities and social structure in Karnataka state compared to the other parts of India.

II. Obstetric profile of the study participant

Table 8, 9 and 10 : Distribution of study participant according to gravidity, number of living children and birth interval

The present study highlighted that nearly 3/4th (70.0%) of the MNM cases had presented as unbooked cases at the time of hospital admission. This might be due to financial constraints or lack of knowledge regarding the importance of early booking in an appropriate health care facility among the pregnant woman and her family members. This is in accordance to the studies conducted in Allahabad, Telangana and Nagpur that revealed even higher unbooked status of 68.5%, 81.8% and 80.6% respectively.[28,13&26]

Our study observed that about half (46.5%) of the MNM cases were primigravida. This is similar to the study conducted in a hospital of Kolkata where 48.48% of the study participant were primigravida.[17] Another study from Uttar

Pradesh showed 38.5% of primigravida cases.[11] Our study noted ≥ 3 gravidity among 1/4th (27.0%) subject, whereas the Kolkata study observed 37.37% women with gravidity ≥ 3.[17] Thus it may be said that the women in current study knew better about having small family size.

The current study noted only 9.5% of the participant had ≥ 3 number of living children. However a study conducted in Ethiopia showed 20.8% MNM women with ≥ 3 living children.[33] This reflects better understanding of small family norm and ''hum do humare do'' among the local population in our study area. About half (53.3%) women had birth interval of ≥ 3 years. According to NFHS 4 survey, > 3/5th (62.0%) of births in Karnataka occur within 3 years of previous birth.[44]

Research shows that waiting at least 3 years between the children reduce the risk of infant mortality. According to NFHS 4 data, children born < 2 years after a previous birth are two times as likely to die in infancy than children whose mothers waited 2 years to 3 years between births.[44]

Our study too reflects similar findings to the NFHS 4 survey. This explains good family welfare practices among the women who possess good understanding of spacing methods.

Table 11 : Distribution of study participant according to significant past history

The present study noted significant past history in about half (47.0%) of the study participant with majority (90.4%) presenting with a single significant history. In obstetric history, nearly half (51.5%) had a history of previous Lower Segment Caesarean Section (LSCS). The overall prevalence of LSCS in India was 17.2% according to a paper analyzed, based on the NFHS 4 survey data by International

Institute for Population Sciences and Indian Council of Medical Research, Mumbai.[45] However Karnataka reported comparatively higher prevalence (23.6%) of C - section during the survey.[44] Interestingly, the findings are consistent with other studies that most of the southern states of India have recorded high C-section delivery in the country. The main reason for this transition being increase in institutional delivery for the inclination of caesarean delivery in most of the southern states. A study from Malaysia reported 36.2% MNM cases with history of previous LSCS.[46]

Our study observed positive medical history in 40.8% subject with about $1/10^{th}$ (9.7%) women having cardiac illness and infections like retroviral and hepatitis B. Nearly 8.7% women had thyroid disorder which is in accordance to some Indian studies that reported 4.8% to 11% prevalence of hypothyroidism in pregnancy.[47] About 4.8% of the study participant gave history of primary hypertension, 3.9% were known case of epilepsy, 2.9% had Type II Diabetes and 1.1% had mental illness.

However a Rwandan study reported comparable finding to current study with 9.3% MNM cases having retroviral infection but 14.0% MNM cases gave history of previous LSCS unlike the current study.[35] Another study conducted in Boston had dissimilar findings compared to the present study with only 0.3% MNM cases suffering from retroviral infection.[48] About $1/10^{th}$ of the MNM cases gave history of (10.5%) Type II Diabetes and (10.2%) primary hypertension respectively and previous LSCS was conducted among 15.7% of the MNM cases as per the Boston study.[48]

Table 12 : Distribution of study participant according to the antenatal care received

Our study showed that antenatal care was received by majority (88.5%) of participant. This is in contrast to the studies conducted in Moradabad and Nagpur that observed only 1.6% and 11.5% of women receiving antenatal care respectively.[11&26] Better antenatal care in our study is suggestive of enhanced knowledge and understanding of having regular antenatal visits among the expecting mothers and effective and vigilant role of health care workers in the community towards the welfare of health of the pregnant women in this part of the country. This is in agreement to the NFHS 4 survey data that noted antenatal care being received in 88% of the women in Karnataka.[44]

The number of antenatal visits in the current study were adequate (≥ 4) as per the Reproductive and Child Health guidelines in less than half (43.5%) MNM cases. Doctors comprising of medical officer as well as specialist formed the bulk of care provider at the facility followed by nursing staff constituting of 81.4% and 18.6% respectively. About 3/4th (73.4%) of antenatal women were informed about the complications in present pregnancy. The finding is in accordance to a study conducted in West Bengal, where > 90% subject were registered for antenatal care. But it is to be noted that 3/5th (60.0%) of them had made ≥ 4 antenatal visits.[43] However as per the NFHS 4 data, ≥ 4 antenatal visits were made by 70% of pregnant women and doctors were the prime caregivers among 83% of them in Karnataka.[44]

Table 13 to 15 : Distribution of study participant according to the blood group, hemoglobin level and peripheral smear

The present study observed 7.5% participant with high risk pregnancy as they were Rh negative. The blood groups were distributed as: 36.5% with blood group O, 32.0% with group A, 24.0% with group B and 7.5% with blood group AB. This is comparable to a study conducted in Vishakhapatnam that reported 4.6% Rh negative pregnancy with similar trend of distribution of various blood groups, such as 43.0% having blood group O, 23.6% with group A, 27.6% with B and 5.5% subject with blood group AB.[49] However our study was slightly different to a North Indian study that noted only 3.9% Rh negative pregnant women. There were 40.9% participant with blood group O, 28.1% with blood group A, 24.1% with B and 6.9% with blood group AB in that study.[50] Despite the variation, our study was found to be in agreement with the overall prevalence of Rh negative pregnancy in India that ranges between 2 to 10%.[51]

Our study noted severe anemia with hemoglobin level of < 7 g/dL in 39.0% MNM cases. Mild to moderate anemia comprised of almost half (47%) of the study subject. However according to the NFHS 4 survey, the prevalence has declined with 50.4% of pregnant women suffering from anemia.[44]

According to the morphological type of anemia based on peripheral smear, it was observed in the current study that 36.0% had microcytic hypochromic type of anemia, 35.0% were of normocytic normochromic type which is also referred to as physiological anemia of pregnancy and 10.0% were of dimorphic type. This is similar to the study conducted in Ambala that showed microcytic hypochromic and dimorphic type as 47.5% and 7.5% respectively. However the Ambala study had only

6.25% participant with normocytic normochromic type of anemia.[52] Another study done in Cameroon noted a 57.0% prevalence of anemia with mild to moderate type consisting of 55.5% participant and 1.4% with severe form of anemia. The morphological types in the Cameroon study were: 53.3% normocytic normochromic, 23.0% microcytic hypochromic and only 0.8% with dimorphic anemia.[53]

III. Maternal Near Miss (MNM) profile of the study participant

Table 16 to 18 : Distribution of study participant according to the type, service received and time taken to reach the health facility

The present study noted majority (80.0%) of the study participant being referred to the study hospitals but 5.6% of the subject had visited more than one referring facility in our study. However according to studies conducted in Moradabad and Orissa, 55.7% and 61.2% women were referred respectively.[11&6]

Our study showed that nearly two third (60.6%) of the referrals were made from public facility such as primary health centre and taluka hospital. This is contrary to the Nagpur college study where almost all (97.11%) of the referral was made from public setup.[26] Another study conducted in Lucknow reflected that just more than 1/4th (29.7%) of referrals were made from public facility such as district hospital, primary health centre and community health centre.[7]

Doctor was the primary (96.3%) attending health personnel at the referring facility in the present study with referral slip and transport facility being made available to 87.5% and 81.9% of the study participant respectively. More than 2/3rd (68.5%) of the study participant reached the first health facility within 12 hours from

the time of illness in the current study. To reach the current health facility, 74.4% of MNM cases took another 12 hours.

Table 19 and 20 : Distribution of study participant according to the period of gestation and health condition at the time of admission

According to the present study, nearly 2/3rd (72.0%) of the subject were in antenatal period of gestation whereas the Nagpur study showed 89.8% of women presenting in antenatal period.[26] Our study observed 23.5% postnatal MNM cases. However the study conducted in Lucknow and Nagpur noted 13.1% and 8.16% postpartum subject respectively.[7&26] The current study noted 2.5% post abortal cases. This is similar to the study conducted in Nagpur that showed 2.04% post abortion MNM cases.[26] However according to NFHS 4 survey, nearly 1/4th (23%) of women reported having complications in the post abortion period in Karnataka.[44]

The current study reflected that majority (83.5%) of study participant had presented as MNM cases on admission to the study hospitals. This is due to the fact that majority of the study participant approached the study hospitals at moribund stage and hence were labeled as MNM on arrival. However the study done in Moradabad observed that almost all (98.4%) the subject were MNM at the time of admission.[11] In contrast to the above studies, a study conducted in Jharkhand reported only half (52.08%) of its participant having presented as MNM cases at the time of arrival to the study hospital.[54]

A. Clinical criteria for identification of MNM cases

Table 21 to 31 : Distribution of the study participant according to underlying health condition, presenting symptom and clinical finding at the time of admission

The present study noted the clinical profile of study participant in which the underlying health condition at the time of admission was assessed in depth. More than half (53.0%) were suffering from single underlying health condition at the time of admission. It was found that obstetric hemorrhage was seen in 23.1% participant, hypertensive disorder of pregnancy in 19.9%, rupture uterus in 4.2% and septic abortion was noted in 7.0% study subject. However according to the study conducted in Nagpur, hypertensive disorder of pregnancy was the most common underlying condition consisting of 33.1% subject, followed by obstetric hemorrhage seen in 27.4% study participant.[26] But the findings of other two common underlying health condition such as rupture uterus (6.6%) and septic abortion (4.2%) were similar to the present study.[26] Domestic violence constituted of 12.5% of the study women in our study. As compared to the NFHS 4 survey that reported 23.0% violence among women during pregnancy.[44] However, our study had much lower prevalence. It is to be highlighted that domestic violence is a serious issue in the male dominated society in our country. Unfortunately, higher burden of family violence during pregnancy may be associated with several form of harm to the pregnant mother and her unborn child leading to maternal morbidity and mortality.

Our study participant had more than one clinical symptom at the time of presentation. Two symptoms were observed in 42.0% subject and ≥ 3 symptoms were noted in 39.0% MNM cases. The most common symptom seen was abdominal pain

(18.9%) followed by vaginal bleeding (15.7%) and breathlessness (12.0%). Uncontrolled convulsion and loss of consciousness were noted in our study in 7.4% and 5.9% MNM cases respectively. However the study done in Lucknow revealed uncontrolled convulsion and unconsciousness in only 0.5% and 11.4% respectively.[7] According to the study conducted in Punjab, uncontrolled fits and loss of consciousness were noted in 2.1% MNM cases each.[10] Another study from Odisha highlighted loss of consciousness in 6.9% subject.[6]

Clinical finding such as feeble pulse was noted in 7.0% MNM cases. Tachypnea (respiratory rate as per WHO's MNM 2009 criteria = 20 cycles/minute) was observed in half (51.5%) of the MNM cases. However the studies conducted in Lucknow and Odisha observed tachypnea (cut off used 40 cycles / minute) in 17.7% and only 1.0% subject respectively.[7&6] Blood pressure examination revealed hypotensive, hypertensive and blood pressure being not recordable in 17.5%, 16.9% and 7.0% MNM cases respectively in the current study.

B. Laboratory criteria for identification of MNM cases

Table 32 : Distribution of the study participant according to laboratory finding

According to the present study, severe anemia with hemoglobin level < 5 gm% was noted in 1/4th (25.0%) MNM cases. Other blood investigation such as platelet count of < 20,000 /cu mm blood as per the MNM WHO 2009 criteria was observed in only 4.0% women in our study whereas other studies used platelet cut off value < 50,000 /cu mm blood to diagnose MNM cases. According to those studies, like the study conducted in Nagpur showed 46.6% women with low platelet count.[26] Other studies conducted in Punjab and Telangana highlighted 17.7% and 9.1% MNM

cases with acute severe thrombocytopenia each.[10&13] Oxygen saturation of < 90% was observed among 3.0% MNM cases in the present study whereas a study done in Punjab that showed 11.5% low oxygen saturation.[10] However it was noticed in the Nagpur study that 1/3rd (31.6%) of the participant had poor oxygen saturation.[26] Severe acute hyperbilirubinemia with serum bilirubin of > 6 mg/dL in our study was observed in 7.0% women. This corresponds to a study done in Punjab that showed higher serum bilirubin level in 5.2% MNM cases.[10] Our study noted that serum creatinine > 3.5 mg/dL was found in 4.0% participant. This is in contrast to the study done in Nagpur and Gujarat that showed higher serum creatinine level in 8.3% and 2.5% of the participant respectively.[26&23]

C. Interventional criteria for identification of MNM cases

Table 33 and 34 : Distribution of the study participant according to history of blood / blood product transfusion and the type and quantity of blood component transfusion.

Our study observed blood / blood product transfusion in 68.5% of MNM case with 3/4th subject (77.4%) receiving blood / blood product transfusion in any one of the period of gestation (antenatal / intranatal / postnatal). This is in accordance to the study conducted in Punjab that noted transfusion in 62.5% study participant.[10] Another study done in Telangana revealed massive blood transfusion in 45% of the MNM cases.[13] However, a study in Allahabad observed only 18.2% of massive blood/ blood component transfusion.[28] According to the present study, > 5 units of blood / blood product was transfused in about half (47.4%) of the study participant. Our findings were similar to the Raipur study that noted > 5 units blood / blood product transfusion in 1/3rd (35%) women.[25] However according to studies done in Lucknow

and Odisha, ≥ 5 units blood product transfusion were received by 78.4% and 7.6% MNM cases respectively.[7&6] The current study noted packed red blood cell transfusion among 31.4% study participant. This is similar to the Central Gujarat study that showed 27.5% packed red blood cell transfusion.[23] The findings in our study are in contrast to the Lucknow study where nearly 3/4th (73.4%) of the MNM cases were transfused packed red blood cell.[7] Our study observed fresh frozen plasma and platelet transfusion in 29.0% and 16.4% participant each. However according to the Central Gujarat study, fresh frozen plasma and platelet transfusion were noticed in only 7.7% and 1.3% participant each.[23]

Table 35 to 37 : Distribution of the study participant according to history of intensive care unit admission and type of intervention

The present study revealed intensive care unit (ICU) admission in half (50.5%) of the MNM cases. This is similar to a study conducted in Nagpur that showed more than half (64.2%) ICU admission.[26] However the Punjab study concluded 38.5% of ICU admission among the study subject whereas about 3/4th (75.4%) ICU admission was noted in a study conducted in Moradabad.[10&11] It was noted in the current study that majority (83.2%) of the study participant were admitted in ICU for up to 4 days. However according to the study done in a Nagpur hospital, only 1/3rd (33.3%) of the MNM cases stayed in ICU for up to 4 days.[26] The mean duration of ICU stay in our study was 2.92 ± 2.37 days with a range between 1 to 13 days which is in contrary to the study conducted in Egypt that observed critical ICU admission in more than 4/5th (83.3%) study participant with mean duration of stay as 7.36 ± 4.34 days and range of stay lasting between 1 to 38 days.[29]

Various forms of interventions were done among the MNM cases in our study to reduce the maternal morbid status and avoid maternal mortality. Among the medical intervention, 28.0% of the study subject were treated by vasoactive drug, 19.6% women were intubated and put on mechanical ventilator and dialysis for acute renal failure was performed in 6.5% MNM cases. According to the study conducted in Punjab, treatment with vasoactive drug was done in 16.6% MNM cases, intubation and ventilation was performed in 11.6% and dialysis for acute renal failure was performed in 4.2% study participant.[10] Nagpur study too reflected comparable finding with dialysis being used in 5.1% study subject.[26] The present study finding is dissimilar to the study conducted in Odisha where use of vasoactive drug was observed in 50.3% women and dialysis for acute renal failure was performed in 12.2% MNM cases.[6]

Among the various surgical interventions that were undertaken in our study, laparotomy was conducted in 46.6% of the study participant. This is in agreement to the study done in Moradabad which noted laparotomy in 31.1% MNM cases. Hysterectomy was performed in 13.7% MNM cases in our study. This is similar to the finding of Punjab study that noted hysterectomy in 13.5% study participant.[10] However, another study from Moradabad observed hysterectomy in only 5.7% MNM cases.[11] Our study noted repositioning of inverted uterus among 9.6% study subject whereas in a Punjab study repositioning of inverted uterus was done in only 1.6% MNM cases.[10]

Table 38 : Distribution of the study participant according to five important criteria for identification of MNM cases

The present study tried to compile some of the most important severity markers such as clinical, laboratory and interventional criteria in order to efficiently identify and understand Maternal Near Miss (MNM) cases as per the WHO's MNM criteria 2009. A few of the clinical criteria in the current study highlighted were: convulsion in 17.0% participant, unconsciousness in 13.5% MNM cases, cardio - respiratory failure in 5.5%, pulmonary edema in 3.0% and jaundice in the presence of pre - eclampsia in 2.0% of MNM cases. However the findings were dissimilar to a study conducted in Central Gujarat that noted loss of consciousness in only 5% of the subject. But, jaundice in the presence of pre - eclampsia was found similar to our study corresponding to 2.5% of the MNM cases.[23]

The laboratory criteria reported in the present study were: bilirubin > 6 mg/dL in 7.0% subject, platelet < 20,000/ cu mm blood in 4.0% women and oxygen saturation < 90% for 60 min in 3.0% of MNM cases. However the laboratory finding in Central Gujarat study were much higher: serum bilirubin > 6 mg/dL in 20.0%, acute thrombocytopenia in 20.0% and oxygen saturation of < 90% in 10.0% of MNM cases.[23]

According to the interventional criteria in our study, it was highlighted that intensive care unit admission was required by half (50.5%) of MNM cases. This is comparable to a Manipal study that highlighted 62.6% of ICU admission.[19] Cardiotonic / vasopressor and mechanical ventilation were being used by 38.5% and 27.0% MNM cases respectively in the present study. However a study done in Nagpur noted the use of vasopressor among 25.5% participant and mechanical ventilation in

13.2% MNM cases.[26] Blood / blood product transfusion with ≥ 5 unit was noticed in 1/3rd (32.5%) MNM cases. The finding of the present study is comparable to a study conducted in Telangana that reported massive blood transfusion in 45% women.[13] Laparotomy was conducted in less than 1/5th (17.0%) of the total MNM cases in current study. However a study from Kerala reported much higher (75.0%) laparotomy procedure being conducted among MNM cases.[22]

Table 39 to 41 : Distribution of the study participant according to time of development of near miss event, type of event and the organ dysfunction

According to the time of development of near miss event among the MNM cases in the present study, it was reported that half (50.5%) of the subject developed complication during their third trimester. This could be due to the fact that third trimester is usually considered as the most critical phase during pregnancy and a woman is physically and emotionally vulnerable during this phase of her pregnancy. This is comparable to the study conducted in Moradabad that reported third trimester as the worst time for the pregnant woman to land up in life threatening situations.[11] Development of near miss event during 1st and 2nd trimester was noted in 9.0% and 12.5% women respectively. It was observed that 1/10th of the subject developed an event within 24 hours of delivery / abortion and nearly 16.0% of the participant had developed a near miss event within 42 days of termination of pregnancy.

The present study highlighted the major obstetric and non-obstetric events that led to the development of maternal near miss and subsequent mortality at severely morbid stage. It was found that hypertensive disorder of pregnancy was the most common direct obstetric event in nearly 32.0% participant followed by severe obstetric hemorrhage in 1/4th (20.5%) MNM cases. Severe anemia was the main

contributing non obstetric event in 8.5% of the subject which was similar to a study from Raipur that highlighted severe anemia as the most common indirect cause of MNM event.[25] Our study was similar to the study conducted in Nagpur that noted hypertensive disorder of pregnancy as the most common direct obstetric event in half (51.0%) participant followed by severe obstetric hemorrhage in 43.8% MNM cases.[26] Another study done in Ahmedabad observed eclampsia (29.45%) followed by pre - eclampsia (25.46%) and severe postpartum hemorrhage (22.39%) as the leading causes of potentially life threatening conditions.[27] However according to a study done in a Delhi hospital, the results were dissimilar to our finding with hemorrhage accounting for the most common near miss event (39.0%), followed by infection (28.5), severe anemia (19.2%) and hypertensive disorder of pregnancy (13.3%).[24] Our findings were also found to be in contrast to another study conducted in Moradabad that observed severe hemorrhage as the most common cause of maternal near miss event among 44.3% subject followed by hypertensive disorder of pregnancy in 34.4% and severe anemia in 4.1% MNM cases.[11]

On assessing the various organ systems that were affected in the present study, it was found that reproductive and uterine was the most commonly affected system comprising of 31.5% of study participant. This was followed by neurologic system in 12.5% cases, respiratory being affected in 8.0%, cardiovascular involvement in 6.5% cases, hematologic in 5.5%, hepatic involvement in 5.0%, coagulation derangement in 4.5% and renal system involvement in 2.5% of study participant. In contrast to our study, the Moradabad study noted uterine dysfunction in 5.7% subject, respiratory system affected in only 4.1% MNM cases and cardiac involvement in 3.3% participant.[11] Other findings of the study were similar to our study such as neurologic system involvement in 10.7% subject and hepatic in 4.1% cases. But the other

systems being more affected compared to the present study were hematologic in 9.8%, coagulation in 8.2% cases and renal involvement in 6.6% of MNM cases. Another study conducted in Nagpur also highlighted dissimilar findings compared to our study.[26] According to them, hematologic and coagulation systems were most commonly affected consisting of 28.5% MNM cases each whereas the current study noted only 5.5% and 4.5% of MNM cases respectively. The Nagpur study reflected 6.1% of participant with cerebral involvement which is much lower compared to our study that showed 12.5% neurologic system dysfunction. Other system like cardiac, respiratory and renal systems were affected in 21.4%, 19.3% and 5.1% of the total cases whereas the present study had much lower involvement of the above mentioned organ system.[26]

Table 42 : Mortality morbidity and mortality indices

Maternal morbidity and mortality indices calculated in the current study were grouped under various indicators. Among the severe maternal outcome indicators, it was noted that there were 153 maternal near miss cases and 47 maternal deaths. Hence the women experiencing life threatening condition was 200. The prevalence of maternal near miss / 100 deliveries was 1.34 whereas the study done in Nagpur showed 2.19% as MNM prevalence.[26] Near miss cases / 1000 deliveries on arrival was 11.21 and during hospitalization was 2.21 in the current study whereas according to a study done in Nigeria, near miss cases / 1000 deliveries on arrival and during hospitalization stood much higher with 119.3 and 22.0 respectively.[30] However that study was conducted for a period of 3 years. The maternal near miss incidence ratio / 1000 live births was 12.05 which is quite similar to the studies done in Telangana, Raipur and Indore that noted maternal near miss incidence ratio of 9.2, 15.18 and

16.32 respectively.[13,25&5] Timely management and provision of efficient care to the critical patients during the course of hospital stay played a crucial role in our study. However some studies showed extremely higher maternal near miss incidence ratio like Assam and Moradabad studies that highlighted 42.1 and 45.2 respectively.[21&11] Surprisingly the study conducted in Odisha had very low maternal near miss incidence ratio of 1.18 / 1000 live births.[6] According to the present study, severe maternal outcome ratio / 1000 live births was 15.75 which is similar to the study conducted in Ahmedabad and Odisha that revealed 15.17 / 1000 live births and 18.62 / 1000 live births respectively.[27&6] However our finding was in contrast to the study done in Assam that observed a very high severe maternal outcome ratio of 42.1 / 1000 live births.[21] Maternal near miss : maternal death ratio in the current study was 3.3:1 suggesting that, for every 3 to 4 life threatening conditions, there was one maternal death and higher ratio indicative of better care. This was in accordance to the Indore and Assam study that noted 3.52:1 and 3.9:1 respectively.[5&21] Hence higher ratios in the current study indicate better level of care. Maternal mortality ratio (MMR) calculated in the current study was 338.7 / 1,00,000 live births, whereas a study done in Odisha recorded much higher (681 / 1,00,000 live births) MMR.[6] However according to a Delhi study, MMR noted was 188 / 1,00,000 live births.[24] The mortality index calculated in our study was 23.5% which was in agreement to the studies conducted in Indore and Ahmedabad that observed mortality index of 22.1% and 24.2% respectively.[5&27] High mortality index in the current study is due to the fact that highly complicated cases are usually referred to the tertiary care facilities in a moribund state that leads to poor prognosis. However according to some other Indian studies, the mortality index calculated was very high like the Manipal and Odisha study that showed 39.2% and 36.59% mortality index respectively.[19&6]

Among the hospital access indicators used in our study, it was found that 167 women had arrived at the hospital with life threatening condition. Out of these, proportion Women with Life Threatening Condition (WLTC) at arrival among all women with life threatening condition, proportion WLTC at arrival coming from other hospital and WLTC at arrival mortality index noted were 83.5%, 83.2% and 6.0% respectively. The finding of the current study were dissimilar to the study conducted in Tanzania that revealed proportion WLTC at arrival among all women with life threatening condition and proportion WLTC at arrival coming from other hospital as 69.4% and 20.9% respectively. However the WLTC at arrival mortality index noted in Tanzania study was similar (7.6%) to our study.[32]

The intra hospital care indicators were also assessed in the present study. The total intra hospital WLTC cases were 33. Out of that intra hospital WLTC rate / 1000 live births was 2.6 and the intra hospital mortality index noted in our study was 54.5% which is quite different from the Tanzania study that observed 8.32 intra hospital WLTC rate / 1000 live births and only 5.3% intra hospital mortality index.[32]

According to the intensive care unit (ICU) admission indicator, the ICU admission rate calculated in our study was 0.68% which is in contrary to the Iraq study that noted only 0.28% of ICU admission rate.[31] However, a study conducted in a rural Rwandan hospital observed ICU admission rate of 1.4% among all women.[35]

Table 43 : Process and outcome indicator among women with severe maternal morbidity and mortality

Assessment of various process and outcome indicator of the study participant with severe maternal morbidity and mortality was made in the present study.

According to that, among women with severe postpartum hemorrhage, oxytocin, ergometrine, misoprostol and blood product transfusion was used in all the MNM cases. Use of tranexamic acid, hysterectomy and internal iliac artery ligation was conducted among 60.7%, 28.6% and 10.7% participant respectively. This is in contrast to the study conducted in Ahmedabad that revealed the use of oxytocin, ergometrine, misoprostol and tranexamic acid in 82.1%, 41.1%, 54.7% and 56.1% subject each.[27] Procedure such as hysterectomy and internal iliac artery ligation was conducted in 24.6% and 5.4% respectively in Ahmedabad study.[27] Case fatality rate due to severe postpartum hemorrhage in our study was 17.9%.which was similar to the study by Ahmedabad that calculated the case fatality rate of 16.4% whereas the study done in Iraq observed only 7.14% mortality.[27&31]

Magnesium sulfate for the treatment of eclampsia was used in all the participant in the current study. This is similar to the study done in Ahmedabad that showed use of magnesium sulfate in all subject.[27] However according to a study done in Iraq, only 2/3rd (67.4%) of the women with eclampsia received magnesium sulfate.[31] Case fatality rate due to eclampsia in our study was 33.3% which is in contrast to the Ahmedabad and Iraq studies that noted 18.75% and 9.3% respectively.[27&31]

Prophylactic antibiotics during caesarean section and parenteral therapeutic antibiotics in the treatment of obstetric sepsis were used in all women who were in need in our study. This is similar to the Ahmedabad study that also showed 100% use of antibiotics during caesarean section as well as in the treatment of obstetric sepsis.[27] However, the study done in Iraq has shown that 3/5th (60.75%) of the women received prophylactic antibiotics during caesarean section.[31] The case fatality rate in our study

due to obstetric sepsis was 34.6% which is much lower compared to the Ahmedabad study that has shown the case fatality rate of 68.6%.[27] But the Iraq study has shown only 20.0% mortality due to obstetric sepsis.[31]

Uterine rupture was used as the indicator in our study with laparotomy being conducted in all (100%) the cases with rupture uterus with nil case fatality rate. However this is dissimilar to the study conducted in Ahmedabad that observed laparotomy in 93.3% MNM cases with a case fatality rate of 40.0%.[27] Similarly, the Iraq study noticed laparotomy in 96.5% cases with a case fatality rate of 10.3%. Zero case fatality rate with respect to uterine rupture in our study highlights timely management of the MNM cases by conducting immediate laparotomy procedure and saving the lives of mothers.[31]

IV. Maternal and fetal outcome of MNM cases

Table 44 : Distribution of the study participant according to duration of hospital stay

Hospital stay lasting between 7 to 14 days was noted in almost half (49.0%) of the MNM cases in the present study. The mean duration of hospital stay in our study was 9.4 ± 6.25 days. According to the Nagpur study, hospital stay of 9 - 14 days was observed in 74.4% study participant with mean duration of 13.44 ± 2.19 days.[26] Another study from Telangana noted 10 - 15 days of hospital stay in 63.6% MNM cases.[13]

Table 45 to 46 : Distribution of the study participant according to mode and the health personnel who conducted delivery / termination of pregnancy

During the course of stay in the study hospitals, various modes of termination of pregnancy were performed. In our study, it was seen that lower segment caesarean section and vaginal delivery were conducted in 44.3% and 41.3% subject respectively. The study done in Telangana however observed lower segment caesarean section and vaginal delivery in 63.6% and 36.3% MNM cases respectively.[13] The present study highlighted laparotomy for ruptured ectopic pregnancy and ruptured uterus in 9.6% and 1.8% MNM cases each. But according to the study conducted in Moradabad laparotomy procedure for ruptured ectopic pregnancy and ruptured uterus was noted in 15.6% and 13.1% MNM cases respectively.[11] Another study conducted in Assam also observed laparotomy procedure for ruptured ectopic pregnancy and ruptured uterus 9.1% and 10.6% MNM cases each.[21] Our study revealed dilatation and evacuation procedure being conducted in 3.0% cases which is similar to the Assam study that showed the procedure being conducted in 3.0% MNM cases as well.[21] However the Moradabad study observed 5.7% MNM cases having undergone dilatation and evacuation procedure.[11] We found 16.5% study participant that remained undelivered. This is in contrast to the Assam study where 42.9% participant remained undelivered.[21]

According to the current study, delivery / termination of pregnancy was conducted by specialist in about 3/4th (76.0%) of the MNM cases. Remaining 16.8% by resident doctor and 6.0% by staff nurse. About 2.0% of delivery was conducted by the accompanying family member. NFHS 4 survey data revealed that 94% of children in Karnataka who were born in the past 5 years were born in a health facility with

assistance of skilled provider and just 1% of deliveries were conducted by traditional birth attendants.[44]

Table 47 and 48 : Distribution of the study participant according to maternal and fetal outcome

With regard to maternal outcome, it was observed in the present study that out of the total study participant, nearly 3/4th (71.9%) of the MNM cases had recovered and slightly higher than 1/4th (28.1%) had attained mortality. However according to a study conducted in Delhi, 17.8% of the study subject had attained mortality.[24] Another study from Assam also noted very low 8.4% maternal mortality compared to the present study.[21] The present study revealed that nearly half (40.4%) of the study participant had expired within 24 hours of admission. However, according to the Odisha study, more than half (56.8%) of the MNM cases had expired within 24 hours of admission.[6] Another study conducted in Assam highlighted nearly 2/3rd (64.7%) maternal deaths occurred within 24 hours of hospital admission owing to late diagnosis and referral from periphery.[21]

The present study hospitals are the major tertiary care facilities in Belagavi district and higher incidence of maternal mortality in our study is attributed to the fact that mothers had presented to the study hospitals at a very critical state and saving life within a very short span of time would be a big challenge for the health professionals. Another important factor is since both the study hospitals are the only major tertiary care facilities in Belagavi district catering to thousands of patients on a daily basis, hence overcrowding and proportionately lesser staff contributes towards the delays at the level of accessing care at the hospital premises.

Regarding the fetal outcome in the present study, half (53.4%) of MNM cases delivered live babies, remaining 46.6% had still birth delivery whereas a study done in Moradabad showed similar 48.4% live birth delivery but much lower (28.7%) still birth delivery.[11] Another study done in Nepal too reported only 20.0% still birth delivery.[55] In contrast to the present study, the Lucknow study also observed good fetal outcome in 71.9% participant who delivered live births.[7] However it is to be observed that the Central Gujarat study reported live birth and still birth in 60.98% and 39.02% participant respectively, which can be comparable to the present study.[23]

Table 49 : Distribution of the study participant according to type of discharge

According to the current study, $3/5^{th}$ (60.0%) of the study participant were discharged from the hospital after complete recovery and about $1/4^{th}$ (23.5%) of the MNM cases had expired during the course of hospital stay. Nearly $1/5^{th}$ of the subject had left the hospital premises against medical advice and 2% participant had requested to get discharged citing their desire to get treated elsewhere.

V. Comparison of maternal mortality and morbidity

Table 50 : Socio-demographic comparison of maternal morbidity and mortality

Socio-demographic comparison of women experiencing severe maternal outcome was done to assess the contributing factors that led to poor maternal outcome. The mean age of MNM cases and maternal mortality cases in the present study was 25.2 ± 4.54 and 24.4 ±4.16 respectively. This is in agreement to the study conducted in Ahmedabad that observed mean age of MNM and maternal mortality cases as 25.7 ± 3.70 and 26.3 ± 4.41 respectively.[27] Another study done in Manipal showed the mean age of 27.0 ± 4.7 and 27.0 ± 4.5 respectively.[19]

Our study noted low illiteracy rate among both the MNM and maternal mortality groups: 7.8% and 14.8% each. However our study highlighted double the illiteracy rate among the maternal death cases compared to the MNM cases. This is slightly in accordance to the study done in Odisha that observed almost similar 28.4% and 26.4% illiteracy rate across both the groups.[6] But the findings were in contrast to the Delhi study that noted illiteracy rate of 72% and 81% in both MNM and maternal mortality groups respectively.[24]

According to the socio - economic class, half of the participant among both MNM and maternal mortality groups belonged to lower middle / lower class which was 51.0% and 57.4% respectively. It was also noted that about half of the participant in our study were primigravida in both the groups, that is 43.1% MNM cases and more than half 57.4% maternal mortality cases. Maternal mortality cases showed higher 89.4% unbooked status compared to the MNM cases 63.4% in the present study. The findings were similar to the Odisha study that noted slightly higher occurrence 71.6% and 77.6% of lower class among both MNM and maternal mortality groups.[6]

The study also revealed that about half of the participant were primigravida in both the groups that is 58.7% MNM cases and 56.2% cases of maternal mortality. The Odisha study observed 68.1% MNM cases and 74.1% maternal mortality cases that were unbooked at the time of presentation.[6] Another study conducted in Delhi had similar findings to our study. According to that, 88.2% maternal mortality cases were unbooked at the time of admission to the study hospital and remaining 82.4% unbooked were MNM cases.[24]

Our study assessed the period of gestation among MNM and maternal mortality cases. It was noted that 13.7% of the MNM participant and 4.3% of maternal mortality cases were in 1st trimester, whereas the Manipal study highlighted 12.9% and 17.4% participant in 1st trimester respectively.[19]

According to the current study, 11.8% and 14.9% of MNM and maternal mortality cases were in their 2nd trimester respectively whereas the Manipal study showed only 4.5% and 8.7% participant respectively.[19]

The present study reflected half the study subject that is 51.6% and 55.3% MNM and maternal mortality in their 3rd trimester each whereas the Manipal study had almost similar 57.2% and almost half 26.1% findings respectively when compared to our study.[19]

The mean period of gestation observed in our study was 29.4 ± 10.7 MNM cases and 32.4 ± 7.7 maternal mortality cases.

We noted in our study that 22.9% and 25.5% of MNM and maternal mortality cases were postnatal during the study period respectively but the study conducted in Manipal suggested 25.1% and 47.8% postnatal cases respectively.[19]

Table 51 ad 52 : The mortality index of near miss event and organ dysfunction

There were major obstetric and non-obstetric event in the present study that led to severe maternal outcome resulting in increased mortality index. The most common obstetric causes were: obstetric sepsis with 66.7% mortality index and hypertensive disorder of pregnancy that include pre - eclapmsia, eclampsia and pregnancy induced hypertension along with HELLP Syndrome resulting in mortality

index of 25.0%. This was followed by embolism with 50.0% mortality index and cardiac disorder with mortality index of 33.3%. Severe anemia and obstetric hemorrhage comprising of antepartum and postpartum hemorrhage with 29.4% and 15.8% mortality index each. This is similar to the study conducted in Chattisgarh that revealed sepsis as the leading direct obstetric event with a mortality index of 60.0%, followed by hypertensive disorder of pregnancy and severe anemia that comprised of 54.5% and 33.3% mortality index each. However obstetric hemorrhage showed only 5.56% mortality.[56] The study conducted in Indore also had dissimilar findings compared to our study with severe anemia and pre - eclapmsia / eclampsia contributing maximum to mortality index which is 25.0% and 21.73% respectively. It was noted that obstetric sepsis had 16.6% of mortality index and hemorrhage comprised of just 3.2% mortality index in contrast to present study.[5] Another study done in a Manipal hospital observed cardiac disorder as the most common event leading to a high mortality index of 40.0%. Next in order was obstetric sepsis that led to 36.3% mortality index. Other indirect obstetric events resulted in 11.8% mortality index. Severe hemorrhage and hypertensive disorder of pregnancy comprised of mortality index of 6.5% and 3.1% each.[19]

The present study highlighted mortality indices of major organ dysfunction. It was noted that renal dysfunction had mortality index of 80% followed by multiple organ that comprised of 70.6% mortality index. Next in order was cardiopulmonary and cardiovascular system that contributed to 63.6% and 38.5% mortality index each. Neurologic dysfunction had mortality index of 32.0%, respiratory 25.0%, coagulation 22.2%, immunologic 6.7% and reproductive and uterine dysfunction comprised of 6.3% mortality index. However according to the study conducted in a rural Rwandan hospital, hepatic, hematologic and uterine involvement formed the bulk of mortality

among MNM cases with indices being: 33.3%, 30.4% and 27.3% respectively. The study also noted that multiple organ dysfunction comprised of 20.5% mortality, respiratory 19.4%, renal 16.7% and neurologic system involvement contributed to 16.1% mortality index. Cardiovascular system was affected the least with 11.1% mortality index in the Rwanda study.[35]

VI. Three delays in maternal mortality and morbidity

Table 53 to 55 : Distribution of the study participant according to the presence of delay

We could identify Type I delay in almost 2/3rd (67.0%) of MNM cases, Type II delay was noted in 65.0% cases and Type III delay in all the participant. Our findings were dissimilar to the study conducted in Raipur that observed Type I, Type II and Type III delay in 44.0%, 36.0% and 19.9% study participant respectively.[25] Another study done in Allahabad also reflected very less occurrence of the delays among the study participant with Type I, Type II and Type III delay being 33.9%, 10.0% and 4.4% respectively.[28] As per research, even in resource limited settings of developing countries like India, 1 out of every 10 women with life threatening conditions can survive with help in time. Therefore it's important to promote and strengthen skilled health care workers at the grass root level.

Table 56 to 58: Association between the type of delay and maternal outcome

The present study assessed the "3 delay model" to contextualize with the maternal outcome. The delays influencing the maternal outcome were: lack of awareness, lack of resources, delay between health care facilities, lack of instrument / medicine, lack of blood product and infrastructure issue ($p < 0.05$ in each type of

delay). According to univariate logistic regression analysis, the MNM cases experiencing Type I, II and III delays were three times, four times and two times more likely to face poor maternal outcome compared to the ones who did not. [OR = 3.039, OR = 2.883, OR = 4.391, OR = 2.597 and OR = 2.487]. On multivariate logistic regression analysis, Type II delay in our study highlighted that women experiencing delay between health care facilities were seven times more likely to have poor maternal outcome compared to the women who did not face the delay [AOR 7.648]. This was similar to a study conducted in West Bengal that showed statistically significant association between Type I and Type II delay and the obstetric near miss event with $p < 0.001$ in each type of delay.[43] Another study conducted in West Bengal also noted higher Type II delay [AOR with 95 % CI; 1.7 (1.11-1.96)] as compared to its counterparts.[57] This is similar to the present study that observed Type II delay components such as delay between health facilities as directly associated with the poor maternal outcome with a statistically significant p value [AOR with 95% CI; 7.648 (2.581 - 22.666)]. Another study done in Egypt reflected women who experience delay between health facilities were 6 times more likely to have MNM condition compared with women who did not [OR=6.19, 95% CI = 2.88 - 10.35], followed by those with first delay [OR = 3.43, 95% CI = 1.54 - 7.52] and those with second delay [OR = 2.51, 95% CI = 1.11 - 5.68].[58] However, our study did not reflect any significant association between the third type of delay and bad maternal outcome on multivariate analysis. This was found similar to the West Bengal study that also reported no significant association ($p = 0.312$) between the third type of delay with near miss event.[43]

CONCLUSION

A developing nation like India with limited resource setting has been witnessing the highest burden of maternal morbidity and mortality in recent past. The aim of Sustainable Development Goal 3 needs to be met efficiently by improving the existing health status of Indian women in order to reduce morbidity and mortality. Health of a woman, especially during her pregnancy must be of prime importance and any kind of mishappening during this precious phase of her life may result in dire consequences.

The present study aimed to assess the factors in depth that chronologically lead to maternal near miss event and poor maternal outcome. The current study revealed that hypertensive disorder of pregnancy and obstetric hemorrhage have been the most important direct obstetric event that pushes a woman into moribund state. Maternal mortality accounted for 28.1% of the total cases with a maternal near miss ratio of 12.05 / 1000 live births and maternal near miss : maternal mortality ratio observed in our study was 3.3 : 1, this suggested that for 3 to 4 women with life threatening condition, there was a maternal death. A higher ratio is indicative of better care. Mortality index was 23.5% in the present study and renal and multiple organ system dysfunction formed the leading cause of increased mortality index. Higher near miss cases is attributed to the fact that majority of the women presented in critically ill stage with very poor prognosis. This was contributed by the three delays that increase the disease burden noted in the current study, wherein more than 2/3rd faced the first two types of delays at personal or logistic level, with a significant association of delay noticed between the health care facilities. Though literacy status

is found to be good in our study, but the need of this hour is crucial understanding and knowledge of sequence of events that would equate to positive health outcome.

All the maternal near miss cases prove to be living lessons to us and the society by forming an essential indicator of the current health scenario. They show us the face of deficiencies that needs to be tackled and taken care of on an urgent basis. Hence there is a need of a comprehensive approach to improve the overall health of an expectant mother to attain a healthy motherhood and save her from the misery of becoming a near miss woman.

RECOMMENDATION

The present study deals with assessment of near miss obstetric events that result in poor maternal and fetal outcome. The gaps have been highlighted and some recommendations are being suggested in order to reach a step closer to the goal of nationwide reduction in maternal morbidity and mortality rates.

1. Proper training of health care workers at the grass root level so that they can identify and refer the potentially life threatening conditions effectively that affects a pregnant woman's health.

2. Creation of awareness among the general population regarding the importance of routine antenatal check-up and educating and sensitizing the young mothers and their health seeking behavior must be quintessential.

3. Proper implementation of the tailor made ''near miss guideline'' based on WHO's near miss criteria, formed by the Ministry of Health and Family Welfare and approved by Government of India. This would act as a useful tool in reducing the preventable morbidity and mortality among women who would have otherwise succumbed to the obstetric complications.

4. Strengthening of the referring health facilities mainly focusing on the peripheral levels with better communication network link between the facilities especially in rural setting. This would lead to early identification of high risk cases for timely intervention and prompt treatment and in turn lead to notable reduction in morbidity and maternal death.

5. Improvement and scaling up of the existing obstetric care and development of evidence based management protocol with multidisciplinary approach for tackling severe maternal illnesses.

6. Effective audit system to manage the obstacles at an early stage and initiation of corrective measures to effectively reduce the maternal morbidity and mortality.

STRENGTH OF THE STUDY

1. The questionnaire used in the present study was a standardized proforma based on the World Health Organization's Maternal Near Miss Criteria 2009 covering all the aspects related to maternal morbidity and mortality.

2. Both the major tertiary care facilities catering to Belagavi district were included in the study. Hence the sample formed an important representation of the entire district.

LIMITATION OF THE STUDY

1. This is a hospital based study. Hence postpartum women after delivery could not be assessed for further outcome.

2. Few detail such as the investigation finding have been collected from the case files of the admitted patients. Difficulties were faced in obtaining the complete data from poorly managed medical records.

SUMMARY

The present observational study was undertaken in two major tertiary care hospitals of Belagavi to study the incidence of obstetric near miss event and the factors that led to the near miss event. The study was conducted between January to December 2019 among 200 women who were identified based on the World Health Organization (WHO) Maternal Near Miss (MNM) 2009 criteria. Written informed consent was obtained from study participant and a standard proforma approved by Ministry of Health and Family Welfare, Government of India which was based on the WHO MNM 2009 criteria was used for data collection.

Out of the 200 women fitting into the MNM criteria studied, 72.5% subject belonged to the age group of 21 to 30 years, 19.0% were 18 to 20 years old and 8.5% of the women were aged ≥ 31 years. The mean ± SD age of the study participant was 25.0 ± 4.45 years. More than 2/3rd (69.5%) were Hindu and half (52.5%) of them belonged to socio-economic classes IV and V according to Modified B G Prasad's Classification. Most of them (90.5%) were literates and majority (92.5%) were homemakers.

With respect to the obstetric profile of study subject, it was noted that 2/3rd (69.5%) participant had presented to the study hospitals as unbooked case and about half (46.5%) were primigravida whereas gravidity of ≥ 3 was seen in 27.0% women. About 9.5% had ≥ 3 living children and 46.7% subject had birth interval of < 3 years at the time of presentation. Almost half (47.0%) had a significant past history with 51.5% and 40.8% having positive obstetric and medical history respectively. Majority (88.5%) of the study participant had received antenatal care during their pregnancy

with almost half (43.5%) having made ≥ 4 antenatal visits, out of which more than half (61.6%) being attended by a registered medical officer and 19.8% by a specialist as the primary care provider. About 3/4th (73.4%) were informed about the complication in present pregnancy during the antenatal checkups. The overall prevalence of anemia at the time of admission was 86.0% in the current study. Majority (80.0%) of the MNM cases were referred, in which 60.6% were referred from a public health facility. Almost all (96.3%) the referred MNM cases were attended by a Doctor at the referring facility with more than 4/5th (81.9%) being provided with ambulance for transportation and 87.5% came to the study hospital with a proper referral slip. The mean ± SD duration taken by the women to reach the first and the current health facility was almost similar with 12.1 ± 10.24 hours and 12.01 ± 12.56 hours respectively. There were 83.5% women who were admitted with severe illness and diagnosed as a MNM case immediately at the time of presentation to the study hospital. Nearly 2/3rd (72.0%) MNM cases were in antenatal period of gestation at the time of admission with majority in third trimester of pregnancy, 2.0% presented in intranatal period, 23.5% in postnatal period and 2.5% in post-abortal period. More than half (53.0%) of the study subject were suffering from single underlying health condition at the time of admission. It was observed that 81.0% participant had ≥ 2 presenting symptoms with abdominal pain (18.9%) and vaginal bleeding (15.7%) being the most common symptoms. The study participant had a hospital stay ranging between 1 to 46 days with the mean ± SD duration of stay being 9.4 ± 6.25 days.

Based on the five important criteria for the identification of MNM cases, in depth assessment of clinical, laboratory and interventional criteria were attempted to

determine the near miss event. Among the clinical criteria observed, 17.0% had episodes of convulsion, 13.5% were in long standing unconscious state, 5.5% had cardio - respiratory failure, 3.0% had pulmonary edema and 2.0% suffered from jaundice in the presence of pre - eclampsia. Laboratory finding revealed that 1/4th (25.0%) of the MNM cases had hemoglobin level < 5 gm%. About 11.0% subject had abnormal computed tomography scan like presence of intracerebral hemorrhage, cerebral edema, posterior reversible encephalopathy syndrome, cerebral thrombosis and infarcts. Serum bilirubin > 6 mg/dL was recorded in 7.0% women, severe thrombocytopenia (< 20,000 / cu mm blood) in 4.0% study subject and poor oxygen saturation (<90%) was seen in 3.0% MNM cases. The interventional criteria highlighted intensive care unit (ICU) admission in 50.5% study participant with mean ± SD duration of stay being 2.92 ± 2.37 days. Use of cardiotonic / vasopressor was noted in 38.5% cases. Blood / blood product transfusion was observed in more than 2/3rd (68.5%) study subject with 47.4% being transfused with > 5 unit. Mechanical ventilation was required by 27.0% followed by 17.0% MNM cases who underwent laparotomy.

Among the antenatal MNM cases, near miss event was noted in half (50.5%) of the study participant in third trimester of pregnancy. In the postnatal and post-abortal women, it was observed that 10.0% developed complication within 24 hours of delivery / abortion, 6.5% developed between 1 to 7 days and 9.5% women developed near miss event between 8 to 42 days of delivery / abortion.

According to the type of near miss event, more than 2/3rd (76.5%) study participant had obstetric type of near miss events that included: 32.0% MNM cases with hypertensive disorder of pregnancy, 20.5% suffering from obstetric hemorrhage,

8.0% with ectopic pregnancy, 6.0% having obstetric sepsis etc. The non-obstetric events noted were: severe anemia in 8.5% subject, 7.0% with severe systemic infection, 6.0% with underlying cardiac disorder and 2.0% MNM cases had history of poisoning that further led to near miss event.

Based on the type of organ dysfunction, reproductive / uterine system was most commonly (31.5%) affected followed by neurologic (12.5%) , multiple organ (8.5%) , respiratory (8.0%) , immunologic (7.5%) and cardiovascular system (6.5%).

Among the various maternal morbidity and mortality indices computed, Women with Life Threatening Condition (WLTC) were 200 that comprised of 153 MNM and 47 maternal mortality cases. Prevalence rate of MNM / 100 deliveries in our study was 1.34. The maternal near miss incidence ratio in the present study was recorded as 12.05 / 1000 live births and severe maternal outcome ratio was found to be 15.75 / 1000 live births with a Maternal Mortality Ratio (MMR) of 339 / 1,00,000 live births. Maternal near miss : maternal death ratio calculated was 3.3 : 1 and the mortality index was 23.5%. Hospital access indicator was suggestive of 83.5% proportion of WLTC at arrival among all WLTC, 83.2% proportion of WLTC at arrival coming from other hospital and 6.0% WLTC at arrival mortality index. The intra hospital indicator showed 33 intra hospital WLTC case, out of which 2.60 / 1000 live births being the intra hospital WLTC rate and 54.5% calculated as the intra hospital mortality index. Intensive care unit admission index noticed ICU admission rate as 0.68% and ICU admission rate among women with severe maternal outcome as 1.34%. Several process and outcome indicator among women with severe maternal morbidity and mortality were determined in the present study. It was noted that case fatality rate among target women treated for severe postpartum hemorrhage was

17.9%. In women who were treated with anticonvulsant for eclampsia observed 33.3% of case fatality rate and prevention of severe systemic infection / obstetric sepsis recorded a case fatality rate of 34.6%. Interestingly rupture uterus cases had nil case fatality rate in our study.

The MNM and maternal mortality cases were compared according to domains such as the socio-demographic variable and mortality index for near miss event and organ dysfunction. The mean age in MNM and mortality cases were noted as 25.2 ± 4.54 and 24.4 ± 4.16 respectively. Illiteracy rate was two times higher (14.8%) in mortality group compared to (7.8%) MNM cases. Maternal mortality had higher (89.4%) unbooked antenatal status compared to (63.4%) morbidity case. The mortality index of various near miss event across both the group highlighted 2/3rd (66.7%) subject with obstetric sepsis, followed by obstructed labour and embolism with a mortality index of 50% each. This was followed by one third (33.3%) cases noted with cardiac disorder and severe anemia observed a mortality index of 29.4%. Hypertensive disorder of pregnancy including HELLP Syndrome was responsible for mortality index of 25.0% and obstetric hemorrhage comprising of antepartum and postpartum hemorrhage contributed to 15.8% of mortality index. The top four leading mortality index of organ dysfunction revealed 80.0% renal involvement, followed by 70.6% noted in multiple organ, 63.6% in cardiopulmonary and 38.5% with cardiovascular dysfunction.

Ultimately it was observed that out of the 200 study participant in our study, slightly higher than 1/4th (28.1%) attained mortality during the course of management in the study hospital. Remaining nearly 2/3rd (71.9%) women showed complete

recovery during the course of treatment. The fetal outcome was however not good in the present study. It reflected that closely half (46.6%) had bad fetal outcome.

The delays noted among the study participant in this study highlighted 2/3rd (67.0%) with Type I delay that consisted of lack of awareness and resources. This was followed by 65.0% being detected with Type II delay comprising of logistics delay between home to health care facility and in between the health facilities along with lack of communication network. Finally the third type of delay was observed at the referring health facility in all the referred study participant and it consisted of 35.2% presenting due to lack of blood product, 32.9% due to lack of instrument and medicine and 31.9% having infrastructure issue. Based on the association finding of the factors that led to poor maternal outcome, it was assessed that Type I delay comprising of lack of awareness and resources recorded an association with maternal mortality and the difference was statistically significant, [$\chi 2$ = 8.538, p = 0.003] and [$\chi 2$ = 7.694, p = 0.006] respectively. Delay between health care facilities observed significant association [$\chi 2$ = 14.823, p < 0.001] with poor maternal outcome. The third type of delay showed significant association with bad maternal outcome for all the factors: lack of instrument / medicine (p 0.006), delay due to infrastructure issue (p 0.008) and lack of blood product (p = 0.0072). On application of univariate logistic regression model it was noticed that first type of delay comprising of lack of awareness [OR = 3.039, 95% CI 1.410 - 6.549] and lack of resources [OR = 2.883, 95% CI 1.337 - 6.214] had significant association with poor maternal outcome. Delay between health care facilities reflected significant association [OR = 4.391, 95% CI 1.987 - 9.702, p < 0.001] with bad maternal outcome. Lack of instrument / medicine [OR = 2.597, 95% CI 1.301 - 5.183] and infrastructure issue [OR = 2.487, 95% CI : 1.257 - 4.922] also showed statistically significant association with poor maternal

outcome. On further analyzing with multivariate regression, it was highlighted that women experiencing delay between health care facilities were seven times more likely to have poor maternal outcome compared to the women who did not face the delay [AOR 7.648, 95% CI: 2.581 - 22.666] and the difference was statistically significant ($p < 0.001$). Hence the overall assessment of association between poor maternal outcome and the "3 delay model" by use of logistic regression analysis models suggested that women who faced any kind of delay during their pregnancy were 2.5 to 7 times more likely to end up with poor maternal consequences.

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ANNEXURE I - ETHICAL CLEARANCE CERTIFICATE

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed – to- be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
Website: http//www.jnmc.edu
E-Mail : domc@jnmc.edu
Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/23 **Date: 24/11/2018**

To.

(**Reg No: BD0118001**).

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"FACILITY BASED STUDY OF NEAR MISS OBSTETRIC EVENTS IN TWO TERTIARY CARE HOSPITALS OF BELAGAVI",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Arathi Darshan)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

Institutional Ethics Committee
BELAGAVI INSTITUTE OF MEDICAL SCIENCES, BELAGAVI
Dr. B R Ambedkar Road, Belagavi – 590 001
(An Autonomous Medical Institution)

No. BIMS-IEC/49 /2018-19 Date:- 14/11/2018

To,

(**Reg No: BD0118001**).

Sub: Institutional Ethics Committee approval of study protocol.

*****

This is to inform you that the research protocol titled **"Facility Based Study of Near Miss Obstetric Events in two Tertiary Care Hospitals of Belagavi"** was reviewed and discussed by the Institutional Ethics Committee in the meeting held on 31/10/2018. As there were no ethical issues involved in the study, the committee approved the study proposal subject to the following conditions ----------

1. Any adverse reactions / events during the study and amendments in the study protocol should be informed to the undersigned at the earliest.
2. The study will be conducted only after the INFORMED CONSENT from patient/participant/guardian wherever necessary.
3. The permission for conducting the study to be obtained from the head of the institution or concerned authority.

Member Secretary
Institutional Ethics Committee,
BIMS, BELAGAVI
MEMBER SECRETARY
Institutional Ethics Committee
BIMS, Belagavi.

ANNEXURE II

INFORMED CONSENT FORM

"FACILITY BASED STUDY OF NEAR MISS OBSTETRIC EVENTS IN TWO TERTIARY CARE HOSPITALS OF BELAGAVI"

INVESTIGATOR: _____

GUIDE: _____

Objective/Purpose of the study:

Every year millions of women around the world suffer from pregnancy, childbirth and postpartum complications. Women who survive the most serious clinical conditions are regarded to have experienced a severe acute maternal complication known as Maternal Near Miss (MNM). This study aims to assess the occurrence of MNM cases as per the WHO's criteria.

Procedure:

I will be personally interviewing the mothers admitted in the Obstetrics & Gynecology Department of KLE's Dr Prabhakar Kore Charitable Hospital and Belagavi Institite of Medical Science, Belagavi using the Modified Facility Based Maternal Near Miss Review Form. The interview will take not more than 45 minutes per participant.

Risks and benefits:

Methods applied to do the study are safe. No risk is involved in this study. You will not be eligible for any kind of monetary benefits or free services by virtue of your participation in the study.

Alternatives:

Not applicable

Privacy and Confidentiality:

The results of the study may be published in journals for scientific purposes. However your identity will not be revealed. All information collected will be coded so that no one other than the investigator will know your identity.

Institutional / Sponsors Policy:

Not applicable

Financial incentives for participation:

The cost of the study will be entirely borne by the researcher. There will be no cost to you for your participation in this study.

Legal rights:

By signing this consent form, you are not waiving off any of your legal rights.

Withdrawal from the study:

You can withdraw from the study at any point of time, if you wish to do so.

Authorization to publish the results:

The researcher may use the information gathered from this study for presentation in scientific meetings. However your identity will not be revealed.

Questions:

If you have any queries regarding violation of rights or ethical issues, you can contact **Dr. Roopa Bellad,** Chairperson, Institutional Ethics Committee for Human Subjects' Research, J. N. Medical College, Belagavi – 590010, Contact number: 9448113403.

Consent Statement

I have been explained all the contents of this consent form in my local language and having understood and clarified all my queries about the study to the best of my knowledge, I hereby give my voluntary consent for participation in the study. I do sign the informed consent form in front of an eyewitness whom I recognize.

Name and Signature / left hand thumb impression of the participant:

Name and Signature of the Interviewer:

Name and Signature / left hand thumb impression of the eyewitness:

Date :

ANNEXURE III - FACILITY BASED MNM REVIEW FORM

CRITERIA LIST

- **For diagnosis of Near Miss, the patient should meet Minimum 3 criteria: one each from 1) clinical findings (either symptoms or signs), 2) investigations & 3) interventions done Or Any single criteria which signifies cardio respiratory collapse as indicated with heart (♥) symbol**

1.1 PREGNANCY SPECIFIC OBSTETRIC AND MEDICAL DISORDERS

Adverse Event	Disorders/Conditions or Complications	Clinical findings: Symptoms	Clinical findings: Signs	Results of Investigations	Interventions
HAEMORRHAGE	• Abortion (Spontaneous / Termination of Pregnancy (Safe/Unsafe)) • Ectopic Pregnancy • Gestational Trophoblastic Disease • Antepartum haemorrhage -Placenta previa -Placental abruption • Scar dehiscence • Rupture uterus • Surgical injury during labour, Caesarean Section/ Forceps or Vacuum delivery • Third Stage complications, e.g. Inversion of uterus, retained placenta, Cervical tear, others • Post partum haemorrhage -Atonic -Traumatic • Amniotic Fluid Embolism	Any Bleeding from or into the genital tract leading to: • Air Hunger • Syncopal attacks	• Altered conscious state • Tachycardia >120/min Low volume pulse • Bradycardia <40/min • Tachypnea >40/min • Bradypnea <6/min • Blood pressure - Systolic <90 mmHg - Diastolic <60 mmHg • Absent peripheral reflexes • Oliguria with output <30ml/hour	• Acute fall Hb <5gm% or 10% fall in haematocrit (fall in hemoglobin so as to affect oxygen saturation) • ♥ Fall in oxygen saturation below 90% • ♥ $PaO_2:FiO_2<200$ • ♥ $PaCO_2>50$mm Hg • ♥ Platelet <20,000 (Acute Decline in platelet count more significant) • ♥ Clot observation time >7 min or any other test done which proves deranged coagulation profile • Serum creatinine >3.5mg/dL • ECG – Ischemic changes, ST inversion elevation	• ♥ ICU admission requiring resuscitative (CAB) or cardio respiratory support • ♥ Blood & blood products transfusion (more than 90 ml/kg body weight/ >5 units of blood) • ♥ Use of cardiotonics/ vasopressors (Mephentine/Dobutamine/ Dopamine etc) • ♥ Circulatory collapse requiring Emergency Surgery for controlling blood loss such as urgent Evacuation, Laparotomy with or without Hysterectomy, Internal Iliac Ligation or any Suturing of tears with a background of hemorrhage • Dialysis- peritoneal/ hemodialysis (renal replacement therapy)

PaO_2 : Partial pressure of oxygen in the blood FiO_2 : Fraction of inspired oxygen, $PaCO_2$: Partial pressure of carbon dioxide in the blood.

SESIS	Termination of pregnancy • Septic / Spontaneous Abortions • Prelabour rupture of membranes Term/Preterm • Puerperal sepsis • Post surgical procedures (E.g. Cesarean section, laparotomy, evacuation, manual removal of placenta, others)	• High grade fever • Abdominal pain • Distention of abdomen • Vaginal foul smelling discharge • Decreased urinary output • Altered consciousness • Difficulty in breathing	• Delirium/altered conscious state • Persistent rise in Temp >39.2ºC, not responding to routine treatment • Hypothermia temp < 37 ºC • Pulse rate > 120/min • Thready low volume pulse • Tachypnoea> 20/min • Rebound tenderness of abdomen, guarding, rigidity • Clinical evidence of septic focus in body. Pus discharge from wound, cervix or vagina	• Leucocytosis (> 15,000/cu mm) • Microbial culture positive for organisms • Ultrasound shows intra uterine/ pelvic/ abdominal collection • Imaging modality showing bladder/bowel /uterine injuries e.g. air under diaphragm	• ♥ ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • Shifting to intravenous fourth general Antibiotics like(Sulbactum+ Celoperazone combinations, Imepenum etc) • ♥ Blood component transfusion (upto 30 ml /kg body weight/ >5 units of blood) • ♥ Use of cardiotonics/ vaso pressors (Mephentine/Dobutamine/ Dopamine etc) • ♥ Surgical procedure done (Evacuation, Laparotomy for Drainage of pus,Repair of Bladder, Bowel and /or Hysterectomy) • Dialysis – peritoneal/hemodialysis (renal replacement therapy)
HYPERTENSION	• Hypertensive disorders of pregnancy (Pregnancy induced hypertension, Preeclampsia, Eclampsia HELLP Syndrome)	• Convulsions • Diminution/Blurring of vision • Severe epigastric pain • Severe headache non responsive to pain killers • Difficulty in breathing • Palpitations	• Altered conscious state • BP >160/110mm Hg • Deep Jaundice • Oliguria / anuria / haematuria • ♥ coma • Coagulation failure • ♥ Pulmonary edema • ♥ Evidence of circulatory collapse	• Proteinuria > 1 gm/dl • S.Creatinine >3.5 mg /dL • Elevated S.Bilirubin (>6 mg/dL) • ALT, AST (>100IU/L) • Thrombocytopenia <20,000 • Haemolysis on peripheral smear • ♥ Clot observation time > 7 min. or any other test done which shows deranged coagulation profile • Hypertensive retinopathy > GRADE II • Abnormal ECG (ST inversion, elevation/ arrythmias) • ♥ Cerebral hemorrhage on CT scan	• ♥ ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • ♥ Non responder to Magnesium sulphate • ♥ Mechanical Ventilation • ♥ Blood & blood products transfusion (more than 30 ml /kg body weight/ >5 units of Blood) • ♥ Use of cardiotonics/ vaso pressors (Mephentine/Dobutamine/ Dopamine etc) • ♥ Status eclampticus

POSTPARTUM COLLAPSE	• Amniotic Fluid Embolism • Uterine Inversion	• Acute collapse of patient after delivery	• Pulse not recordable • BP not recordable • Cardiorespiratory arrest	• Acute fall Hb < 5 gm% (fall in hemoglobin so as to affect oxygen saturation) • ♥ Fall in oxygen saturation below 90% • ♥ PaO_2 : FiO_2 < 200 • ♥ $PaCO_2$ > 50 mm Hg • ♥ Platelet < 20,000 (Acute Decline in platelet count more significant) • ♥ Clot observation time > 7 min or any other test done which proves deranged coagulation profile • ECG – Ischemic changes, ST inversion • elevation	• ♥ ICU admission requiring resuscitative (CAB) or cardio respiratory support • ♥ Blood & blood products transfusion (more than 90 ml/kg body weight/ >5 units of blood) • ♥ Use of cardiotonics/ vaso pressors (Mephentine/Dobutamine/ Dopamine etc) • ♥ Circulatory collapse requiring Emergency Surgery for controlling blood loss such as urgent Evacuation, Laparotomy with or without Hysterectomy, Internal Iliac Ligation or any Suturing of tears with a background of hemorrhage • Dialysis-peritoneal / hemodialysis
LIVER DYSFUNCTION / FAILURE	• Acute fatty liver of pregnancy • Acute Fulminant hepatic failure	• Convulsions • Altered behavior • Bleeding from various sites (nose, gums, IV access ports, varices)	• Unconsciousness • Deep jaundice • Hepatic flaps, tremors • Abnormal bleeding sites - haematuria, hoemetemesis, haemoptesis, bleeding gums etc.	• Elevated Serum Billirubin (> 6mg/dL) • Abnormal liver enzymes ALT, AST (> 100 IU/L) • Abnormal ECG • Coagulation profile deranged • USG showing showing changes of Acute fatty liver ♥ Fibroscan showing changes of acute fatty liver	• ♥ ICU admission for resuscitation and cardiorespiratory support • ♥ Resuscitation • ♥ Mechanical ventilation • ♥ Blood and component transfusion (more than 90 ml/kg body weight/ >5 units of blood)

CARDIAC DYSFUNCTION / FAILURE	• Cardiomyopathy Cardiosarcoma, pericardium	• Breathlessness especially at night • Palpitations • Chest pain • Orthopnoea	• Tachycardia pulse > 120 bpm • Dyspnoea • Organic Murmurs • Cardiomegaly • Signs of CCF/LVF	• Abnormal ECG • Abnormal echocardiography • X-ray chest (with shielding of abdomen) showing Gross Cardiomegaly • ❤ Acid Base Values PH <7.35 or >7.45 PCO_2 >50 or <30 mmHg PO_2 arterial < 80 mmHg	• ❤ ICU admission for resuscitative procedure like ICAB) or cardiorespiratory support • ❤ Ventilatory support • Digitalisation • Use of cardiotonics
			1.2 PREEXISTING DISORDERS AGGRAVATED DURING PREGNANCY		
Anaemia	• Iron /Folic Acid Deficiency • Sickle cell Disease • Thalasemia • Aplastic Anaemia	• Dyspnea • Palpitations • Syncopal Attack • ❤ Altered consciousness state • Features of Sickle cell crisis such as bone pains, joint pains, acute abdominal pain etc • Swelling over body	• Severe Pallor • Jaundice • Tachycardia- pulse rate >120/ min • Tachypnea >20/min • Tender, inflamed joints • Sternal tenderness • Splenomegaly • Anasarca • Ascites • ❤ Signs of congestive cardiac failure • Bleeding tendencies	• Haemoglobin below 5 gm/dl • Haemoglobin status not able to maintain O_2 saturation of 90% • Platelet < 20,000 • ❤ Clot observation time > 7 min. or any other test done which proves deranged coagulation profile • Elevated S. bilirubin (> 6 mg/dl)	• ❤ ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • ❤ Blood /component transfusion (Upto 90 ml/kg/ >5 units of blood) • ❤ Use of cardiotonics/ veso pressors (Mephentine/Dobutamine/ Dopamine etc)
Respiratory Dysfunctions	• Asthma • Tuberculosis • Pneumonia	• Breathlessness / Air hunger • High/Low grade fever • Chronic weight loss	• Tachycardia- pulse rate >120/ min • Tachypnea >20/min • Orthopnea • Abnormal Chest signs (Bronchi, Crepts, Absent breath sounds) • Signs of Cardiorespiratory failure • Cyanosis, Clubbing	• Various lesions on chest X-ray (with shielding of abdomen) specific to disease • ❤ Abnormal Acid Base values PH <7.35 or >7.45 PCO_2 >50 or <30 mmHg PO_2 arterial < 80 mmHg PO_2 venous <40 mmHg	• ❤ ICU admission for resuscitation and Cardiorespiratory Support and or Endotracheal intubation

Cardiac Dysfunctions	• Rheumatic Heart Disease • Congenital Heart Disease • Cardiomyopathies • Aortic Aneurysm • Collagen Disorders	• Breathlessness/Air hunger • Orthopnea • Palpitations • Paroxysmal nocturnal dyspnea • Chest pain	• Tachycardia - pulse rate > 120/min • Bradycardia > 40/min • Irregular pulse • Tachypnea > 40/min • Bradypnea < 6/min • Organic murmurs • Cardiomegaly • Tender hepatomegaly • Signs of CCF/ VF Pitting edema, raised JVP, basal crepts etc.	• Abnormal ECG • Abnormal Echocardiography • Abnormal Acid Base values PH <7.35 or >7.45 mmHg PCO_2 >50 or <30 mmHg PO_2 arterial <80 mmHg PO_2 venous <40 mmHg	• ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • Ventilatory support, • Digitalisation • Use of cardiotonics
Hepatic Dysfunction	• Cirrhosis of liver • Portal hypertension • Acute liver failure	• Yellowness of urine / eyes/other body parts • Convulsions • Altered behavior • Bleeding from various sites (nose,gums, IV access ports, varices)	• Deep Jaundice • Hepatic flaps/ tremors • Abnormal bleeding sites haematuria, haematemesis, haemoptysis, bleeding gums etc • Abnormal bleeding from nose, gums, IV sites, varices • Hepatomegaly Ascites	• Elevated Serum Bilirubin >6 mg /dL • Abnormal liver enzymes ALT,AST (> 100 U /L) • Abnormal ECG • Clot observation time > 7 min or any other test done which proves deranged coagulation profile • Imaging modalities showing hepatomegaly, splenomegaly and any other abnormalities	• ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • Mechanical Ventilation • Blood and component transfusion
ENDOCRINAL DISORDERS **Diabetic Ketoacidosis**	• Gestational diabetes mellitus • Diabetes mellitus	• Altered conscious state • Breathlessness / Air Hunger • Palpitations • Convulsions • Bladder/Bowel dysfunction	• Features of circulatory collapse • Neurological deficit like muscular weakness, paresis, plegia • Altered consciousness • Coma	• Ketoacidosis pH < 7.35 RBS > 200 g/dL • Abnormal ECG • Electrolyte Imbalance (S/Na < 129 K <3.2 >5.5	• ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • Mechanical Ventilation • Resuscitative Procedures • Management of Ketosidosis (Insulin or glucagon)
Thyroid Crisis	• Thyrotoxicosis • Thyroid storm • Pheochromocytoma	• Palpitations • Convulsions • Bladder/Bowel dysfunction	• Altered consciousness • Coma • Tachycardia pulse > 120 bpm	• T_3 elevated (>200 IU) • Low TSH (< 0.2 IU) • Ischaemic changes on ECG • Elevated Vinyl mandilic acid	• ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • Mechanical Ventilation • Resuscitative Procedures

Neurological Dysfunction	• Epilepsy • Cortical vein thrombosis	• Syncopal attacks • Convulsions • Unconscious state	• Altered conscious state and coma • Abnormal reflexes (hyper or absent) • Paresis/plegia • ❤ Cardiorespiratory failure	• Abnormal EEG • Abnormal acid - base status • ❤ CT/MRI head showing abnormalities	• ❤ ICU admission for resuscitative procedure like (CABI or cardiorespiratory support • Shifting to intravenous Antibiotics fourth generation • ❤ Mechanical ventilation • Heparinisation
Renal Dysfunction / Failure	• Medico renal disease e.g. chronic/acute renal failure • Renal artery stenosis • Transplant complications • Collagen Disorders	• Reduced / absent urine • Edema all over body • Breathlessness (due to volume overload) • Unconscious state	• Oliguria - < 400 ml urine output in 24 hours not responding to fluid therapy and diuretics • Anuria • ❤ Coma	• USG showing renal abnormalities • Doppler USG showing stenotic renal artery • Deranged KFT	• ❤ ICU admission for resuscitative procedure like (CABI or cardiorespiratory support • Need for dialysis peritoneal / hemodialysis

1.3 INCIDENTAL AND ACCIDENTAL CAUSES IN PREGNANCY

Accident/assault/ surgical problems	• Trip or fall • Vehicular accident • Violence • Blunt trauma abdomen • Assault • Burns • Poisoning • Cancers • Acute surgical condition • Suicide attempt • Snake bite • other	• History of trauma or accident, suicide attempt • Syncope • Pain abdominal or pertaining to specific site • Blurred vision • Bleeding • ❤ Convulsions • ❤ Altered behavior	• Altered consciousness state • Tachycardia > 120/min, low volume pulse • Bradycardia <60/min • Tachypnea >20/min • Blood pressure Systolic < 90 mm Hg Diastolic < 50 mm Hg • Tenderness, rigidity and guarding of anterior abdominal wall with/ without distension • ❤ Cardiorespiratory failure • Evidence of trauma /burns	• Acute fall Hb < 5 gm% fall in hemoglobin so as to affect oxygen saturation) • Fall in oxygen saturation below 90 % • ❤ PaO_2 : FiO_2 <200 • ❤ $PaCO_2$ >50mm Hg • Platelet < 20,000 acute decline in platelet count more significant • ❤ Clot observation time > 7 min or any other test done which shows deranged coagulation profile • USG showing trauma to vital organs • Imaging modality showing injury to bladder bowel, liver, spleen • CT/MRI showing injury	• ❤ ICU admission for resuscitative procedure like (CABI or cardiorespiratory support • ❤ Blood &/blood products transfusion (more 90 ml/kg body weight/ >5 units of blood d • ❤ Use of cardiotonics/ vasopressors (Mephentine/Dobutamine/ Dopamine etc • ❤ Surgical procedures come (laparotomy for intraperitoneal hemorrhage, repair of bladder, bowel spleen, liver kidney, burr hole for head injury/

Anaphylaxis	• Anaesthetic drugs • Antibiotics • Antimalarials • Iron preparations • Anticonvulsants • Blood transfusions • Other reactions	• History of taking the drug • Breathlessness • Air Hunger • Syncope • Not passing urine	• ♥ Altered conscious state • Tachycardia > 120/min thready, low volume pulse • Bradycardia <60/min • Tachypnea >30/min • Blood pressure - Systolic < 90 mmHg - Diastolic < 60 mmHg • Oliguria/Anuria	• Fall in oxygen saturation below 90 % on room air • ♥ PaO_2 : FiO2<200 ♥ $PaCO_2$>50mm Hg • Proteinuria > 1 gm/dl • S. Creatinine >3.5 mg /dL • Elevated S Bilirubin (6 mg/dL) AlT, AST(> 100 IU/L) • Thrombocytopenia <20,000 • Haemolysis on peripheral smear • Clot observation time > 7 min or any other test done which proves deranged coagulation profile • ECG	• ♥ ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • ♥ Blood & blood products transfusion (more 90 ml/kg body weight/ >5 units of blood) • ♥ Use of cardiotonics/ vaso pressors (Mephentine/ Dobutamine/ Dopamine etc • ♥ Use of Adrenaline Renal dialysis peritoneal/ hemodialysis (Renal Replacement Therapy)
Infections	• Malaria • Dengue • H1N1 viral Disease • Lower respiratory tract infections • ARDS • Meningitis • Encephalitis • Infective hepatitis (A,B,C,E) • HIV/AIDS • Scrub typhus • Nephritis • Other	• High grade fever (with/ without chills and rigor) • Yellowness of urine • Altered behavior • Breathlessness • Abdominal pain • Abdominal Distension • Unconscious state • Convulsions	• Altered conscious state • Persistent fever Temp >39.2 °C, not responding to routine treatment • Hypothermia temp. 37 °C • Pulse rate > 120/min • Tachypnea> 20/min • Chest signs (Crepts, crackles, ronchi, decreased or absent air entry) • Neck rigidity • Coma • Bleeding from various sites	• Leucocytosis (>15,000/cumm) • Toxic granules on peripheral smear • Low platelets(<50,000) • Microbial culture positive for organisms • Dengue, paracheck, malarial parasite positive on ELISA/ peripheral smear • H1N1 ELISA positive • Spinal fluid positive for infection • Elevated serum bilirubin (>6 mg) • Abnormal liver enzymes (> 100 IU) • Abnormal ECG • Abnormal EEG • Clot observation time > 7 min or any other test done which proves deranged coagulation profile • Positive Hepatitis markers • HIV ELISA positive	• ICU admission for resuscitative procedure like (CAB) or cardiorespiratory support • Shifting to intravenous Antibiotics of fourth generation (Sulbactum-Cefoperazone combinations, Imepenum) • ♥ Blood component transfusion (upto 90 ml / kg body weight/ >5 units of blood) • ♥ Use of cardiotonics/ vaso pressors (Mephentine/Dobutamine/ Dopamine etc) • Injectable antimalarials • Use of drugs to relieve cerebral oedema (Mannitol) • Antiretroviral therapy

Embolism and Infarction	• Pulmonary embolism • Cerebral embolism (stroke) • Cardiac embolism (myocardial infarction)	• Breathlessness • Air hunger • Collapse • Acute chest pain • Syncope	• Tachypnea - >30/min • BP : 1) Systolic <90 mmg. 2) Diastolic <60 mmg. • Weak pulse • Abnormal chest signs (Bronchi, Crepts, effusion) • ❤ Cardiorespiratory failure • Sweating, cold and clammy skin	• Various lesions on chest X ray pertaining to disease • Abnormal ECG • ❤ CT/MRI showing Lesion	• ❤ ICU admission for resuscitative procedure like (CAR) or cardiorespiratory support • ❤ Blood component transfusion (upto 90 ml/kg body weight (>5 units of blood) • ❤ Use of cardiotonics / vasopressors (Mephentine/Dobutamine/ Dopamine etc • Anticoagulant therapy • Drugs to reduce cerebral oedema (Mannitol)

ANNEXURE IV

PROFORMA

1. **GENERAL INFORMATION**

Full Name: Age:

Inpatient No: Contact No:

Complete Address:

Education: Illiterate / Primary / High school / Graduate

Occupation:

Husband's name:

Husband's age:

Education: Illiterate / Primary / High school / Graduate

Occupation:

Monthly income:

No. of family members:

Date of admission: Day Month Year Time:Hours Min

Date of discharge: Day Month Year Time:Hours Min

Date when became near miss: Day Month Year Time:Hours Min

Type of discharge: Hospital / On Request / Left against Medical advice / Referred to other centre / Absconded

Provisional diagnosis at admission:

Final diagnosis at discharge:

Duration of Hospital stay: Days Hours

Duration of ICU stay: Days Hours

2. CONDITION AT THE TIME OF ADMISSION

I. Patient admitted in Hospital with severe illness:

II. Admitted with no disorder became near miss:

III. Admitted with disorder, became near miss:

3. TYPE OF ADMISSION

Self / Referred

4. REFERRAL

I. If referred from outside, number of places visited prior :

II. Specify type- Public, How many

Private, How many

III. Attended by: Doctor / Nurse / Other staff / None

IV. From last visited place before referral, referral slip completed: Yes/No

V. Transport provided by the referring facility: Yes/ No

5. ILLNESS DURATION :

I. Duration from illness to 1st health facility : Days Hours

II. Duration from 1st facility to this facility : Days Hours

III. Duration from admission to Near Miss Morbidity : Days Hours

6. **STATUS AT ADMISSION :**

GRAVIDA	PARITY	ABORTION	LIVING CHILDREN
			Male: Female:

Antenatal status (POG in weeks) :

Antenatal <22 weeks	> 22 & < 34 weeks	> 34 & < 37 weeks	> 37 & < 42 weeks	> 42 weeks

Intranatal	Postnatal	Abortion	Post abortion	Others

Days since delivery/ abortion :

Within 24 hrs	>24 hrs- 1 week	>1 week - 6 wks	Not applicable

7. UNDERLYING DISORDER AT ADMISSION

Hemorrhage	**Abortion**	**Ectopic pregnancy**	**Gestational Trophoblastic disease**	
	Antepartum bleeding			
	Placental causes		**Late pregnancy Bleeding other than placental causes**	
	Placenta previa	Abruptio placenta	Scar dehiscence	Rupture uterus
	Intrapartum bleeding			
	Postpartum bleeding	Atonic	Traumatic	Mixed
Infection	Hep/HIV/Malaria/Dengue/Scrub Typhus others			
	Antepartum	Intrapartum	Postpartum	Post abortal
Hypertensive disorder of pregnancy	**Gestational HTN**	Mild		Severe
	Pre eclampsia	Mild		Severe
	Eclampsia		**Others**	
Labour related disorder	Prolonged/ obstructed / rupture uterus	Inversion of uterus	Retained placenta	others
Medical disorder	Anemia	Cardiac disorder	LRTI infection	Diabetes
	Others			
Incidental/ Accidental Disorders Eg: Surgical including Iatrogenic, Trauma, Violence, Anaesthetic complications etc.				

8. **ANTENATAL PERIOD:**

Did she receive ANC? Yes, Number of visits No Not Applicable

If YES,

I. Type of Care Provider: Nurse / Medical Officer / Specialist / Others including private sector

II. Was she informed about problems in present pregnancy? Yes/ No

III. Was referral made to appropriate facility? Yes/ No

IV. Referral slip with details: Yes/ No

9. SIGNIFICANT PAST HISTORY

	YES	NO	DETAIL
PERSONAL			
MEDICAL			
SURGICAL			
FAMILY			
OBSTETRICAL			
GYNECOLOGICAL			

10. **PRESENTING COMPLAINTS WITH DURATION :**

	YES/NO	HOURS	DAYS
Vaginal bleeding			
Vaginal discharge			
High grade fever			
Abdominal pain			
Severe headache			
Convulsions			
Syncope			
Swelling of feet			
Blurred vision			
Scanty urine			
Breathlessness			
Chest pain			
Palpitations			
Right upper quadrant pain			
Orthopnea			
Unconscious state			
Yellowness of Urine/ Skin			
Others			

11. EXAMINATION FINDINGS

SYSTEM	EXAMINATION	AT ADMISSION	AT THE TIME OF NEAR MISS	SYSTEM	EXAMINATION	AT ADMISSION	AT THE TIME OF NEAR MISS
General							
	Date & time of examination				Distension		
	temperature				Scars		
	Pulse rate			Abdominal findings	Soft/ guarding		
	Resp rate				Tenderness		
	BP						
	pallor						
CNS	Consciousness						
	Orientation						
CVS	Any abnormlity						
RS	Any abnormality						
Abdominal findings							

12. INVESTIGATIONS

TYPE	SAMPLES	AT ADMISSION	AT THE TIME OF NEAR MISS
BLOOD	Hb		
	TLC/DLC		
	Platelets		
	Peripheral smear		
	BT/CT		
	Clot observation time		
	Blood group/ Rh		
URINE	Urine albumin		
	Urine sugar		
	Urine ketone		
	Urine M/E		
BLOOD SUGAR	FBS		
	PPBS		
	RBS		
LFT	Alk phosphatase		
	SGPT		
	SGOT		
	Total Bilirubin		
	Direct Bilirubin		
	Total Proteins		
	Albumin		
	Globulin		
RFT	Creatinine		
	Urea		
	s. Na^+		
	s. K^+		
Infectious disease screening	HIV I & II		
	HbsAg		
	VDRL		
	Rapid Dengue		
	Rapid Malaria		
	Widal		
	Blood C/S		
	Urine C/S		
	Cervical swab		
	Vaginal swab		
	Locial swab		
Fundus examination	Ophthalmoscopy		
Imaging	USG		
	Doppler		
	CXR/Abdomen CT/MRI		

13. DELIVERY DETAILS (in PNC cases)

I. Known / Unknown / Not Applicable

II. Place of delivery: Public Hospital / Private Hospital / Home / Others

III. Did she have Labour pains? Yes / Spontaneous / Induced / No

IV. If Yes was a partograph used? Yes / No / Don't know

V. Indication for induction:

VI. Duration of labour: hours mins

VII. Mode of delivery:

Undelivered	Vaginal						Caesarean section		Laparotomy		Indication (C/S, Instrumental)
	Normal	Assisted			Breech	Multiple pregnancy	Elective	Emergency	Rupture uterus	*Ectopic pregnancy	
		Episiotomy	Forceps	vacum							

*In Ectopic pregnancy, woman does not deliver, but fetus may be removed during Laparotomy.

VIII. Anesthesia (any adverse reaction) :

General anesthesia	Reg- Epidural/ Spinal	Local

In which phase of labor did she develop complications?

First stage	Second stage	Third stage	Post birth		
			Within ≤ 6 hrs of birth	>6 hrs to ≤24 hrs of birth	>24 hrs of birth

IX. Specify the complications

Atonic PPH	Traumatic vaginal/ cervical tear	Broad ligament hematoma	Rupture uterus	Intrapartum eclampsia	Retained placenta/ inversion	Others
	Cervical /vaginal/ perineal tear					

X. **Who conducted the delivery?**

Traditional Birth Attendant/ Family member/ Nurse /Resident Doctor /Specialist / Others

14. **PUERPERIUM/ POST ABORTAL/ POST LAPAROTOMY**

I. Eventful/ uneventful

II. If eventful : PPH

Sepsis

Postpartum eclampsia

Others

15. **H/O BLOOD TRANSFUSION**

I. Received : YES / NO

II. Received transfusion in which period : ANTENATAL / INTRANATAL / POSTNATAL /POSTABORTAL / OTHERS

Details of Blood/ Component transfusion :

SL. NO.	COMPONENT	QUANTITY	TOTAL
1	Whole blood		
2	Packed cells		
3	FFP		
4	Platelets		

16. DETAIL OF BABY

OUTCOME				
STILLBORN	Livebirth	NEONATAL DEATH	NICU admission	
	Discharged		Discharged	Died

17. **SYSTEM INVOLVED:**

Single / multiple

CARDIOVASCULAR SYSTEM		RESPIRATORY SYSTEM	
HEPATOBILIARY SYSTEM		URINARY SYSTEM	
GENITAL SYSTEM		HEMATOLOGICAL SYSTEM	
CENTRAL NERVOUS SYSTEM		GASTROINTESTINAL SYSTEM	
IMMUNE SYSTEM		MUSCULOSKELETAL SYSTEM	

18. CONDITION AT DISCHARGE:

RECOVERED	NOT RECOVERED	REASON FOR RESIDUAL MORBIDITY (IF NOT RECOVERED)

19. DETAILS OF INTERVENTION

INTERVENTION	PREVIOUS FACILITY			PRESENT FACILITY		
	YES	NO	SPECIFY	YES	NO	SPECIFY
ICU requiring CAB						
Mechanical ventilation						
Intubation						
Cardiotonics / vasopressors						
Digitalization						
Evacuation						
Laparotomy						
Hysterectomy						
Internal iliac ligation						
Manual removal of placenta						
Dialysis						
Repositioning of inverted uterus						
Bladder/ bowel repair						
Management of keto acidosis						
Mannitol use						
Anticoagulant use						
Repair of genital injuries						
Others						

20. OTHER FACTORS :

SYSTEM	EXAMPLE	YES	NO	SPECIFY		
				ANC	INC	PNC
Personal/ family	Delay in seeking help. If yes, why? Lack of awareness Lack of resources Past adverse experience					
	Refusal of treatment or admission					
	Refusal of admission in facility					
Logistics	Lack of transport: 1. Home to health care facility 2. Between health care facilities 3. Lack of communication network					
Referring facility	Infrastucture issues Lack of medication, istruments, equipments etc Non utilization of available medications, instruments, equipments or consumablesLack of blood products Others					

ANNEXURE V

KEY TO MASTER CHART

GENERAL INFORMATION

A – PATIENT ID

B – RELIGION

1. Hindu 2. Muslim 3. Christian 4. Jain

C – AGE

Actual value in years

D – AGE INTERVAL

1. ≤ 20 years 2. 21 – 25 years 3. 26 – 30 years 4. 31 – 35 years 5. > 35 years

E – ADDRESS

1. Gokak 2. Ramdurg 3. Saundatti 4. Bailhongal 5. Khanapur 6. Belagavi 7. Hukkeri 8. Chikodi 9. Raibag 10. Athani 11. Dharwad 12. Kolhapur 13. Gadag 14. Kalaburgi 15. Bagalkot

F – EDUCATION

1. Illiterate 2. Primary 3. High school 4. Graduate

G – OCCUPATION

1. Housewife 2. Employed

H - HUSBAND'S AGE

Actual value in years

I - HUSBAND'S AGE INTERVAL

1. ≤ 20 years 2. 21 – 25 years 3. 26 – 30 years 4. 31 – 35 years 5. > 35 years

J – HUSBAND'S EDUCATION

1. Illiterate 2. Primary 3. High school 4. Graduate

K – HUSBAND'S OCCUPATION

1. Farmer 2. Government employee 3.Self-employed 4. Business 5. Private employee

L – SOCIOECONOMIC STATUS

1. Class I 2. Class II 3. Class III 4. Class IV 5. Class V

M – TYPE OF CASE

1. Booked 2. Unbooked

N – TYPE OF DISCHARGE

1. Hospital 2. On request 3. Left against medical advice 4. Expired

O – DURATION OF HOSPITAL STAY

Actual number in days

P – DURATION OF ICU STAY

Actual number in days

99 – No ICU stay

Q – CONDITION AT THE TIME OF ADMISSION

1. Patient admitted in hospital with severe illness
2. Admitted with no disorder became illness

R – TYPE OF ADMISSION

1. Self 2. Referred

IF REFERRED (S – V):

S – NUMBER OF PLACES VISITED PRIOR

1. Visited one health facility 2. Visited two health facilities 3. Visited three health facilities 99. Not applicable

T – ATTENDED BY

1. Doctor 2. Staff nurse / female health worker 99. Not applicable

U – REFERRAL SLIP AVAILABILITY

1. Yes 2. No 3. Not applicable

V – TRANSPORT PROVIDED

1. Yes 2. No 3. Not applicable

W – ILLNESS DURATION FROM HOME TO FIRST HEALTH FACILITY

Actual value in hours

X - ILLNESS DURATION FROM FIRST TO CURRENT HEALTH FACILITY

Actual value in hours

STATUS AT ADMISSION (Y – AE):

Y – GRAVIDITY STATUS

1. Primigravida 2. 2^{nd} gravida 3. 3^{rd} gravida 4. 4^{th} gravida 5. 5^{th} gravida

6. 6^{th} gravida 7. 7^{th} gravida

Z – BIRTH INTERVAL IN YEARS

Actual number in years

99. Not applicable

AA – TOTAL LIVING CHILDREN

Total number (male + female)

1. One 2. Two 3. ≥ 3 99. Nil

AB – ANC POG

Actual number in weeks

AC – PERIOD OF GESTATION IN WEEKS

1. Antenatal < 22 weeks 2. > 22 & < 34 weeks 3. > 34 weeks & < 37 weeks 4. > 37 weeks & < 42 weeks 5. > 42 weeks 6. Intranatal 7. Postnatal 8. Post-abortion

AD – TRIMESTER DETAIL

2. First 2. Second 3. Third 6. Intranatal 7. Postnatal 8. Post-abortion

AE – DAYS SINCE DELIVERY / ABORTION

1. Within 24 hours 2. > 24 hours – 1 week 3. > 1 week – 6 weeks 4. Not applicable

UNDERLYING DISORDER AT ADMISSION (AF – AK):

AF – HEMORRHAGE

1. Abortion 2. Ectopic pregnancy 3. Placenta previa 4. Abruptio placentae 5. Gestational trophoblastic disease 6. Rupture uterus 7. Intrapartum bleeding 8. Postpartum bleeding 99. Not applicable

AG – INFECTION

1. Hepatitis 2. HIV 3. Dengue 4. Sepsis 5. Meningitis 6. Filariasis 7. Tuberculosis 99. Not applicable

AH – HYPERTENSIVE DISORDER OF PREGNANCY

1. Gestational hypertension 2. Pre-eclampsia 3. Eclampsia 99. Not applicable

AI – LABOUR RELATED DISORDER

1. Obstructed labour 2. Inversion of uterus 3. Retained placenta 99. Not applicable

AJ – MEDICAL DISORDER

1. Anemia 2. Cardiac disorder 3. LRTI infection 4. Diabetes mellitus 5. Anemia + LRTI 6. Anemia + cardiac disorder 7. Rh negative pregnancy 8. HELLP Syndrome 9. Acute Kidney Injury 99. Not applicable

AK - INCIDENTAL / ACCIDENTAL DISORDER

1. Poisoning 2. Fall / Trauma 3. Violence 4. Anesthetic 5. Blood transfusion reaction 99. Not applicable

IF ANTENATAL CARE RECEIVED (AL – AO):

AL – ANC CARE RECEIVED

1. Yes 2. No

AM – NUMBER OF VISITS

Actual number

99. Not applicable

AN – TYPE OF CARE PROVIDER

1. Nurse 2. Medical officer 3. Specialist 99. Not applicable

AO – INFORMED ABOUT COMPLICATIONS

1. Yes 2. No 99. Not applicable

SIGNIFICANT PAST HISTORY (AP – AT):

AP – MEDICAL

1. Yes 2. No

AQ – SURGICAL

1. Yes 2. No

AR – FAMILY

1. Yes 2. No

AS – OBSTETRICAL

1. Yes 2. No

AT – GYNECOLOGICAL

1. Yes 2. No

PRESENTING COMPLAINTS (AU – BI):

AU – VAGINAL BLEEDING

1. Yes 2. No

AV – VAGINAL DISCHARGE

1. Yes 2. No

AW – HIGH GRADE FEVER

1. Yes 2. No

AX – ABDOMINAL PAIN

1. Yes 2. No

AY – SEVERE HEADACHE

1. Yes 2. No

AZ – CONVULSION

1. Yes 2. No

BA – SYNCOPE

1. Yes 2. No

BB – SWELLING OF FEET

1. Yes 2. No

BC – BLURRED VISION

1. Yes 2. No

BD – SCANTY URINE

1. Yes 2. No

BE – BREATHLESSNESS

1. Yes 2. No

BF – CHEST PAIN

1. Yes 2. No

BG – PALPITATION

1. Yes 2. No

BH – UNCONSCIOUSNESS

1. Yes 2. No

BI – JAUNDICE

1. Yes 2. No

EXAMINATION FINDINGS (BJ – CK):

BJ – PULSE RATE

Actual value in beats per minute

BK – RESPIRATORY RATE

Actual value in cycles per minute

BL – SYSTOLIC BLOOD PRESSURE

Actual value in mm Hg

BM – DIASTOLIC

Actual value in mm Hg

BN – ADOMINAL DISTENSION

1. Present 2. Absent

BO – ABDOMINAL SCAR

2. Present 2. Absent

BP – GUARDING

1. Present 2. Absent

BQ – TENDERNESS

1. Present 2. Absent

BR – Hb%

Actual value in g/dL

BS – TLC

Actual value in cu/ mm of blood

BT – PLATELET

1. Normal 2. Thrombocytopenia

BU – PERIPHERAL SMEAR

1. Microcytic hypochromic 2. Normocytic normochromic 3. Dimorphic 4. Normal

BV – BLOOD GROUP

1. A+ 2. A- 3. B+ 4. B- 5. AB+ 6. AB- 7. O+ 8. O-

BW – URINE ALBUMIN

1. No 2. 1+ 3. 2+ 4. 3+ 5. 4+

BX – RBS

Actual value in g/dL

BY – Oxygen saturation

1. <90% 2. >90%

BZ – ALP

Actual value in IU/L

CA – SGPT

Actual value in IU/L

CB – SGOT

Actual value in IU/L

CC – TOTAL BILIRUBIN

Actual value in mg/dL

CD – CREATININE

Actual value in mg/dL

CE – SODIUM

Actual value in mEq/L

CF– POTASSIUM

Actual value in mEq/L

CG – HIV

1. Positive 2. Negative

CH – HbsAg

1. Positive 2. Negative

CI – RAPID DENGUE

1. Positive 2. Negative

CJ – ECG and ECHOCARDIOGRAPH

1. Normal 2. Abnormal 3. Not done

CK – CT SCAN

1. Normal 2. Abnormal 3. Not done

MODE OF TERMINATION OF PREGNANCY / DELIVERY DETAIL (CL – CN):

CL – MODE OF TERMINATION OF PREGNANCY / DELIVERY

1. Normal 2. Assisted vaginal 3. Elective caesarean 4. Emergency caesarean 5.laparotomy for rupture uterus 6. Laparotomy for ectopic pregnancy 7. Undelivered 8. Dilatation and evacuation

CM – TIME OF DEVELOPMENT OF NEAR MISS EVENT

1. First trimester 2. Second trimester 3. Third trimester 4. During labour 5. Within 24 hours of delivery / abortion 6. > 24 hours of delivery / abortion 99. Not applicable

CN – TERMINATION OF PREGNANCY / DELIVERY CONDUCTED BY

1. Specialist 2. Family member 3. Nurse 4. Resident doctor 99. Not applicable

BLOOD TRANSFUSION (CO –CR):

CO – RECEIVED

1. Yes 2. No

CP – TRANSFUSION DONE IN WHICH PERIOD

1. Antenatal 2. Intranatal 3. Postnatal 4. Post abortal 5. Antenatal + Intranatal + Postnatal 6. Antenatal + Postnatal 7. Intranatal + Postnatal 8. Antenatal + Intranatal 9. Antenatal + Post-abortal 99. Not applicable

CQ – WHAT SHE RECEIVED

1. Whole blood 2. Packed cells 3. Fresh frozen plasma 4. Platelet 5. Whole blood + packed cell 6. Whole blood + fresh frozen plasma 7. Whole blood + packed cell + fresh frozen plasma + platelet 8. Packed cell + fresh frozen plasma 9. Fresh frozen plasma + platelet 10. Packed cell + fresh frozen plasma + platelet 11. Whole blood+ packed cell + fresh frozen plasma 12. Whole blood + packed cell + platelet 13. Whole blood + fresh frozen plasma + platelet 14. Packed cell + platelet 15. Whole blood + platelet 99. Not applicable

CR – TOTAL UNITS RECEIVED

Actual number of unit

99. Not applicable

CS – FETAL OUTCOME

1. Stillborn 2. Live birth discharged 3. NICU admission

ORGAN SYSTEM DYSFUNCTION (CT – CV):

CT – NUMBER OF SYSTEM INVOLVED

1. Single 2. Multiple

CU – WHICH SYSTEM INVOLVED

1. Cardiovascular 2. Hepatobiliary 3. Genital 4. Nervous 5. Immune 6. Respiratory 7. Endocrine 8. Hematologic 9. Genital + hematologic 10. Cardiovascular + nervous + respiratory 11. Urinary + hematologic 12. Nervous + hematologic 13. Nervous + respiratory + hematology 14. Cardiovascular + nervous + renal 15. Hematologic + respiratory

16. Hematologic + endocrine 17. Respiratory + immune 18. Genital + gastrointestinal 19. Genital + cardiovascular 20. Respiratory + hematologic + genital 21. Nervous + hematologic + genital 22. Hematologic + cardiovascular 23. Cardiovascular + respiratory + hematologic 24. Hematologic + hepatological 25. Nervous + genital 26. Hepatological + hematologic + respiratory 27. Hematologic + genital + urinary 28. Genital + respiratory 29. Respiratory +. Cardiovascular

CV – MATERNAL CONDITION AT DISCHARGE

1. Recovered 2. Not recovered (Mortality) 3. Residual morbidity

DETAIL OF INTERVENTION (CW – DJ):

CW – ICU ADMISSION

1. Yes 2. No

CX – INTUBATION AND MECHANICAL VENTILATION

1. Yes 2. No

CY – CARDIOTONIC / VASOPRESSOR

1. Yes 2. No

CZ – DIGITALIZATION

1. Yes 2. No

DA – LAPAROTOMY

1. Yes 2. No

DB – HYSTERECTOMY

1. Yes 2. No

DC – INTERNAL ILIAC ARTERY LIGATION

1. Yes 2. No

DD – MANUAL REMOVAL OF PLACENTA

1. Yes 2. No

DE – DIALYSIS

1. Yes 2. No

DF – REPOSITION OF INVERTED UTERUS

1. Yes 2. No

DG – MANAGEMENT OF KETOACIDOSIS

1. Yes 2. No

DH – MANNITOL USED

1. Yes 2. No

DI – ANTICOAGULANT USED

1. Yes 2. No

DJ – GENITAL INJURY REPAIR

1. Yes 2. No

DELAY DUE TO FAMILY/PERSONAL REASONS (DK – DL):

DK – LACK OF AWARENESS

1. Yes 2. No

DL – LACK OF RESOURCES

1. Yes 2. No

DELAY DUE TO LACK OF TRANSPORT (DM – DO):

DM – HOME TO HEALTH CARE

1. Yes 2. No

DN – BETWEEN HEALTH CARE

1. Yes 2. No

DO – LACK OF COMMUNICATION NETWORK

1. Yes 2. No

DELAY AT REFERRING FACILITY (DP – DR):

DP – LACK OF MEDICINE / INSTRUMENT

1. Yes 2. No

DQ – INFRASTRUCTURE ISSUE

1. Yes 2. No

DR – LACK OF BLOOD PRODUCT

1. Yes 2. No

ANNEXURE VI

MASTER CHART

																		IF REFERRED				ILLNESS DURATION		STATUS ON ADMISSION							UNDERLYING DISORDERS AT ADMISSION							IF ANTENATAL CARE YES		
PATIENT ID	RELIGION	AGE	AGE INTERVAL	ADDRESS - TALUKA / BLOCK	EDUCATION	OCCUPATION	HUSBAND'S AGE	HUSBAND'S AGE INTERVAL	HUSBAND'S EDUCATION	HUSBAND'S OCCUPATION	SOCIOECONOMIC STATUS	TYPE OF CASE - BOOKED OR UNBOOKED?	TYPE OF DISCHARGE	DURATION OF HOSPITAL STAY IN DAYS	DURATION OF ICU STAY IN DAYS	CONDITION AT THE TIME OF ADMISSION	TYPE OF ADMISSION	NO OF PLACES VISITED PRIOR	ATTENDED BY	REFERRAL SLIP AVAILABILITY	TRANSPORT PROVIDED	HOME TO FIRST HEALTH CARE FACILITY	FIRST TO CURRENT HEALTH CARE FACILITY	GRAVIDA	BIRTH INTERVAL IN YEARS	TOTAL LIVING CHILDREN	ANC POG	PERIOD OF GESTATION IN WEEKS	TRIMESTER DETAIL	DAYS SINCE DELIVERY/ABORTION	HAEMORRHAGE	INFECTION	HYPERTENSIVE DISORDER OF PREGNANCY	LABOUR RELATED DISORDER	MEDICAL DISORDER	INCIDENTAL/ACCIDENTAL	ANC CARE RECEIVED	NO OF VISITS	TYPE OF CARE PROVIDER	INFORMED ABOUT COMPLICATIONS
1	2	30	3	1	2	1	31	4	2	1	5	2	1	15	3	1	2	2	1	1	1	4	48	3	1	2	12	1	1	4	2	99	99	99	1	99	1	1	1	2
2	1	25	2	11	1	1	28	3	2	1	5	2	4	13	13	1	2	1	1	1	1	12	3	3	2	1	26.3	2	2	4	99	99	3	99	99	99	2	99	99	2
3	1	28	3	1	1	2	30	3	2	5	5	1	3	10	99	1	2	1	1	1	1	2	3	5	1	3	38.4	4	3	4	4	99	99	99	1	99	1	3	2	99
4	2	25	2	6	3	1	30	3	4	5	1	1	4	11	5	1	2	2	1	1	2	24	24	1	99	99	38	4	3	4	4	99	2	99	1	4	1	9	2	2
5	1	20	1	7	2	1	28	3	2	5	4	1	4	5	1	1	2	1	1	2	2	15	2	1	99	1	99	7	5	3	99	99	3	99	99	99	1	4	2	1
6	1	24	2	12	3	1	26	3	3	5	1	2	4	1	99	3	1	99	99	99	99	4	99	1	99	99	40	4	3	4	99	99	99	99	2	99	1	2	3	1
7	2	24	2	6	2	1	25	2	2	5	5	2	4	2	2	3	2	1	1	1	2	9.5	5	1	99	99	39	4	3	4	99	99	3	99	99	99	1	4	3	1
8	1	24	2	4	1	1	27	3	2	1	4	2	4	1	1	1	2	1	2	2	2	4.5	1.5	5	2	3	99	7	5	1	4	99	99	99	6	99	1	2	1	2
9	1	20	1	4	2	1	26	3	2	2	3	2	4	6	2	1	1	99	99	99	99	2	99	1	99	99	40.1	4	3	4	99	99	99	1	2	99	1	4	2	1
10	2	24	2	6	2	1	28	3	2	4	3	2	1	8	99	1	2	1	1	1	2	2	48	3	2	2	21	1	2	4	6	2	2	99	2	2	1	1	2	1
11	1	35	4	1	1	2	40	5	2	5	5	2	3	21	99	1	2	1	1	1	2	3	0.5	2	8	1	33	2	3	4	99	99	3	99	1	99	1	4	2	1
12	1	25	2	13	2	1	28	3	2	5	5	2	2	8	99	1	2	1	1	2	1	7	18	3	1	99	38	4	3	4	99	99	99	99	1	99	1	3	2	1
13	3	36	5	7	4	1	42	5	4	5	3	2	1	8	99	1	2	1	1	1	1	9	2	3	3	2	32	2	3	4	4	99	99	99	99	99	1	2	2	1
14	1	28	3	7	2	1	32	4	2	5	5	2	1	12	5	3	2	1	2	2	2	12	4	3	2	2	40.3	3	3	4	7	99	99	1	99	99	1	4	1	1
15	1	25	2	7	3	1	30	3	3	5	2	2	4	2	2	1	2	1	1	1	1	8	12	1	99	99	33	2	3	4	99	99	3	99	3	99	1	5	2	1
16	1	20	1	6	3	1	28	3	3	5	4	2	4	2	2	1	2	1	1	1	1	6	4	1	99	99	99	7	5	3	99	1	99	99	9	99	1	6	2	2
17	3	30	3	6	3	1	31	4	4	5	4	1	3	14	10	1	2	1	1	1	1	8	12	2	2	1	34	3	3	4	99	99	99	99	3	99	1	4	2	2
18	1	24	2	5	2	1	25	2	4	5	3	2	1	8	99	1	2	2	1	1	1	28	6	2	3	1	42	5	3	4	99	99	3	99	99	99	1	6	2	1

	SIGNIFICANT PAST HISTORY					PRESENTING COMPLAINTS															EXAMINATION FINDINGS								INVESTIGATIONS																			
PATIENT ID	MEDICAL	SURGICAL	FAMILY	OBSTETRICAL	GYNAECOLOGICAL	VAGINAL BLEEDING	VAGINAL DISCHARGE	HIGH GRADE FEVER	ABDOMINAL PAIN	SEVERE HEADACHE	CONVULSION	SYNCOPE	SWELLING OF FEET	BLURRED VISION	DECREASED URINE OUTPUT	BREATHLESSNESS	CHEST PAIN	PALPITATION	UNCONSCIOUSNESS	JAUNDICE	PULSE RATE	RESPIRATORY RATE	SYSTOLIC	DIASTOLIC	ABD DISTENSION	ABD SCAR	GUARDING	TENDERNESS	HB	TLC	PLATELETS	PERIPHERAL SMEAR	BLOOD GROUP	URINE ALBUMIN	RBS	OXYGEN SATURATION	ALP	SGPT	SGOT	TOTAL BILIRUBIN	CREATININE	SODIUM	POTASSIUM	HIV	HbsAg	RAPID DENGUE	ECG and ECHOCARDIOGRAPH	CT SCAN
1	2	2	2	1	2	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	115	20	90	60	2	1	2	1	5.5	8200	2	2	7	1	102.8	2	60	18	24.6	0.5	0.8	133.3	4.3	2	2	2	3	3
2	1	1	2	1	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	2	112	18	150	96	2	2	2	2	11.4	203,00	1	2	2	1	89.2	1	121	16	52.5	0.5	1.2	135.4	3.4	2	2	2	2	3
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				BLOOD TRANSFUSION					ORGAN SYSTEM DYSFUNCTION			DETAILS OF INTERVENTION														DELAY DUE TO FAMILY/PERSONAL REASONS		DELAY DUE TO LACK OF TRANSPORT			DELAY AT REFERRING FACILITY		
PATIENT ID	MODE OF TERMINATION OF PREGNANCY	COMPLICATION DURING LABOUR PHASE	TERMINATION OF PREGNANCY / DELIVERY CONDUCTED BY	RECEIVED	TRANSFUSION DONE IN WHICH PERIOD	WHAT SHE RECEIVED	TOTAL UNITS RECEIVED	FETAL OUTCOME	NUMBER OF SYSTEM INVOLVED	WHICH SYSTEM IS INVLOVED?	MATERNAL OUTCOME AT DISCHARGE	ICU ADMISSION	INTUBATION AND MECHANICAL VENTILATION	CARDIOTONIC/VASOPRESSOR	DIGITILIZATION	LAPAROTOMY	HYSTERECTOMY	INTERNAL ILIAC ARTERY LIGATION	MANUAL REMOVAL OF PLACENTA	DIALYSIS	REPOSITION OF INVERTED UTERUS	MANAGEMENT OF KETOACIDOSIS	MANNITOL USED	ANTICOAGULANT USED	GENITAL INJURY REPAIR	LACK OF AWARENESS	LACK OF RESOURCES	HOME TO HEALTH CARE FACILITY	BETWEEN HEALTH CARE FACILITIES	LACK OF COMMUNICATION NETWORK	LACK OF MEDICINE / INSTRUMENT	INFRASTRUCTURE ISSUE	LACK OF BLOOD PRODUCT
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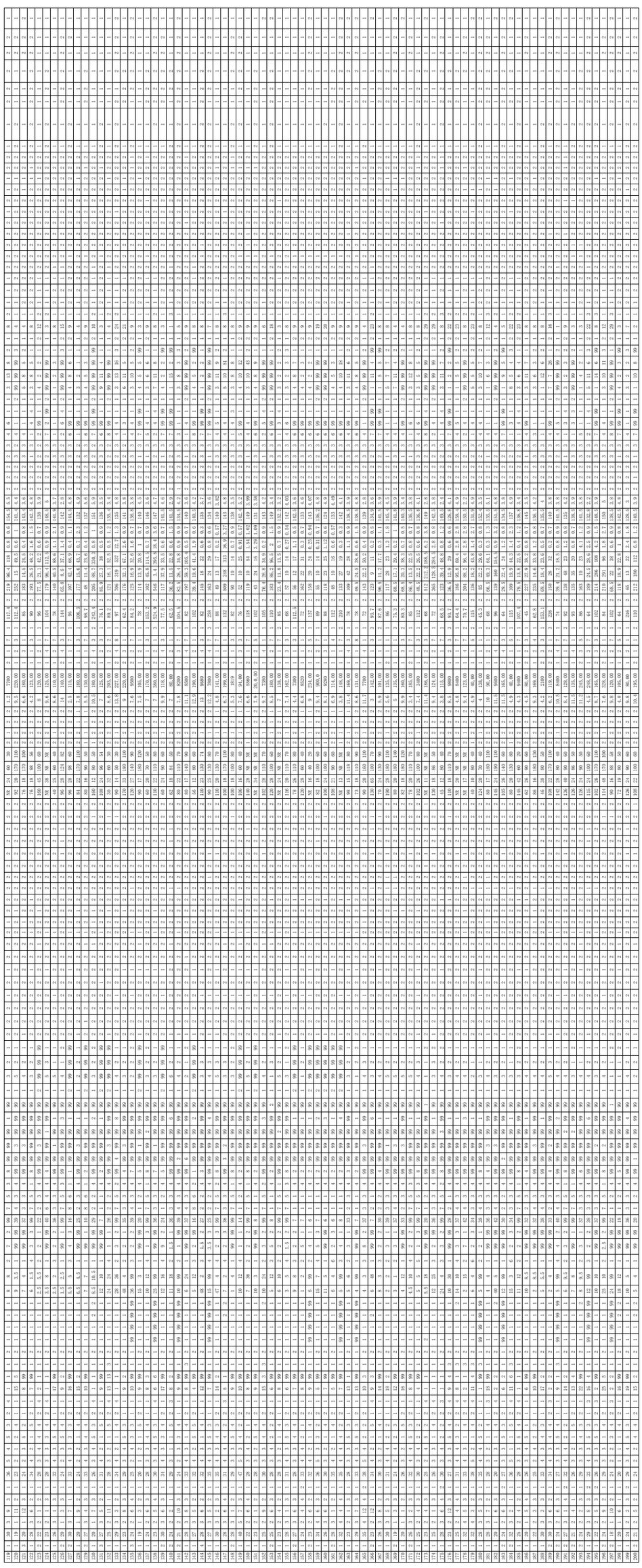


Introduction

Aim and Objectives

Review of Literature

Methodology

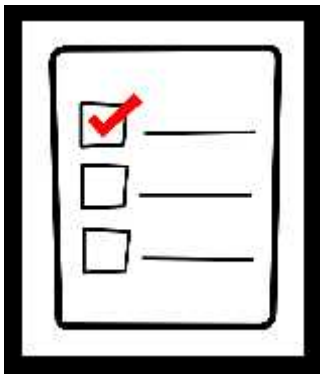
Results

Discussion

Conclusion

Recommendations

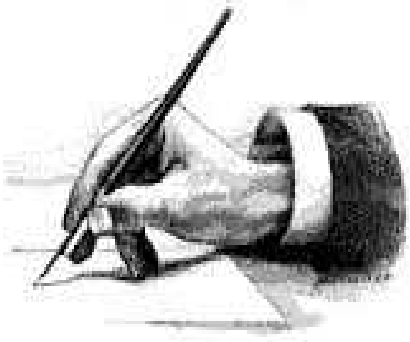
Strengths



Limitations

Summary

Bibliography



Annexures