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Prospective study on near miss obstetric events in a tertiary care hospital in South India

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Abstract
Maternal near miss are the cases that those womens who nearly died but survived as a complications during pregnancy and childbirth or within 42 days of termination of pregnancy. Maternal mortality has been the leading cause of illness and death among women of reproductive age in India. In the recent years, the concept of the WHO maternal near miss (MNM) has been adopted by the tertiary level hospitals as it has an added advantage of offering a large number of cases for intervention and for the evaluation of the maternal healthcare being provided by the health-care system to reduce maternal mortality.
Goal and objectives: The main objectives of the study are to identify the incidence of the maternal near-miss events, observe the trend of near-miss events, and compare the nature of near-miss events with maternal mortality.
Materials and Methods: It was an prospective study conducted in the department of obstetrics and gynecology at Chengalpattu medical college and hospital, Tamilnadu, India. From January 2023 – December 2023, over a period of one year. Potentially life-threatening maternal complications and maternal mortalities were identified and recorded in the case sheets of the patients and near miss registers were maintained in the department, and monthly near miss audit was conducted in the department. Near-miss cases were analysed based on the Health and Family Welfare Government of India guidelines 2014 and WHO criteria. Datas were collected on demographic characteristic including age, parity, nature of complications, intensive care unit admissions, and timing of near miss events in relation with admissions. Similarly statistical analysis was also done.
Results: The total no of near miss admission of the obstetrics and gynecology department during the study period was 62 and the maternal mortality was 11 cases. During the study periods the total no of deliveries were 10856 and total live births were 10,847. The incidence of Near miss was high in the age group of 26-30 years (22%) and the lowest incidence was seen in the extremes of age less than 20 years and more than 35 years each carries the risk of (9%). Among the etiology assessed Hypertensive disorders of pregnancy contributes majority of the near miss cases (33%) of this Hypertensive disorders of pregnancy Antepartum eclampsia contributes most of the cases, followed by Heart disease (20%) and post-partum hemorrhage (11%). With reference to the obstetric code near miss events is most commonly seen in primigravidas which contributes about (45%) of the cases, (98%) of the cases are being referred from secondary care referral centers and (2%) came as self. Comparing with educational qualifications (98%) of the near miss cases were educated. From this study the maternal near miss incidence of the institution is 5.7/100000 live births which indicates optimum quality of the treatment given at this institution and the focus has been aimed against 0 mortality. The maternal mortality ratio was 563:1which indicates for every 563 deliveries there is 1 maternal mortality.
Conclusions: Enlighting the causes of near miss events of pregnancy of our institution, Hypertensive disorders in pregnancy, heart disease complicating pregnancy and postop partum hemorrhage were the three leading major causes of maternal near-miss events and mortality followed by sepsis. As the near-miss analysis indicates the quality of health care and causes are almost similar to maternal mortality, so its registry should be followed along with maternal mortality.

Keywords: Maternal mortality, near miss, haemorrhage in pregnancy, mortality index, quality of health care

Introduction
In the majority of developing nations, complications during the antenatal period, childbirth, and the postpartum phase continue to be the primary causes of severe illness and mortality among mothers. In 2015, developing countries accounted for nearly 99% of global maternal deaths

(MDs). Recently, severe maternal morbidity or maternal near miss (MNM) has been proposed as a quality indicator for assessing the maternity care provided in hospitals, in contrast to maternal mortality [1]. Near-miss cases follow similar pathways as maternal deaths, with the added benefit of providing a larger number of cases for analysis and intervention, thereby facilitating the evaluation of the quality of obstetric care offered by the institution. In many well-developed countries, maternal mortality has decreased to single digits, while near-miss cases are more prevalent and thus more useful for evaluating the current health system [2]. Maternal near-miss (MNM) refers to an obstetric event in which a woman nearly dies from complications related to pregnancy or childbirth within 42 days following the termination of the pregnancy, regardless of the location or duration, but survives either due to the quality of healthcare she receives [3]. Maternal mortality serves as a standard indicator for assessing the quality of services provided by a healthcare system. However, the quality of services offered to pregnant women is not solely indicated by maternal mortality; maternal near miss is also a significant factor. The World Health Organization (WHO) introduced the concept of 'near-miss' obstetrical events or severe acute maternal morbidity (SAMM) and the criteria for evaluating these cases in 2009 [4]. There has been a global decline in the maternal mortality ratio (MMR), which fell by 38% from 342 in the year 2000 to 211 in 2017 per 100,000 live births [5]. In India, maternal mortality is also on the decline; it decreased from 130 during 2014-2016 to 122 during 2015-2017, while in Tamil Nadu, the MMR was recorded at 110 per 100,000 live births in 2015-2017.

Materials and Methods

This original research study was a prospective observational study done in the Department of Obstetrics and Gynaecology at Chengalpattu medical college and hospital, Tamil Nadu, India from January 2023 – December 2023, over a period of one year. This institution is responsible for more than 1000 deliveries per month. It is a tertiary care referral center for 3 districts, 10 bedded high dependency unit (HDU), and 24-hours blood bank facility. The Obstetrics and Gynaecology (O & G) department has a state-of the-art 10 -bedded labor room that is manned round-the-clock for emergency services for 24 hours. Apart from that, there is separate ward for complicated postnatal and post operative mothers. This hospital has a large patient base, and it provides healthcare facilities not only to Chengalpattu but also from other parts of the district. The study population included all the pregnant women admitted to Chengalpattu medical college from January 2021 to December 2021. Based on the clinical audit, the patients who had severe maternal complications, and those who underwent critical interventions or needed ICU admissions were identified. Among them, the patients who fulfill the WHO near-miss criteria based on organ dysfunction or failure and Indian recommendations were considered as eligible cases (Table: 2 and Fig.2). During this period maternal deaths were also registered.

The maternal characteristics including age, parity, and gestational age booking status, educational qualification, socio economic status at the time of admission were recorded. Apart from that, the maternal condition during admission, the mode of delivery, the primary cause of morbidity, the sequence of morbidity and mortality, organ dysfunction, and the major interventions was recorded in the patients record sheet. All these cases were followed up during their hospital stay till their discharge or death and then details were entered in maternal near miss and maternal audit registers. The following indicators were calculated; maternal near-miss (MNM), maternal death (MD), severe maternal outcome ratio (SMOR = MNM+ MD per 1000 live births), MNM ratio (MNMR = MNM per 1000 Live births), maternal near-miss: mortality ratio (MNM: 1MD), and mortality index [MI = MD/ (MNM + MD)].All needed data were extracted from the medical records and entered into a study proforma. Individual participants of the study were not interviewed, since no information was directly obtained from the patients. Confidential information about the patients identity like name, medical registration number and the date of hospital admission was kept undisclosed by the data collected and informed consent letter from the individual patients was not required as there was no direct contact with individual patients. The data from individual patients were audited and analyzed monthly in the department of obstetrics and gynecology.

Results

The total no of near miss admission of the obstetrics and gynecology department during the study period was 62 and the maternal mortality was 11 and deliveries were 10856 and total live births was 10847.The incidence of near miss was high in the age group of 26-30 years 37% and the lowest incidence were seen in the extremes of age less than 20 years and more than 35 years each carries 9% (Table 1 and Fig. 1). Among the etiology assessed hypertensive disorders of pregnancy contributes majority of the near miss cases 33% of this hypertensive disorders of pregnancy antepartum eclampsia contributes most of the cases, followed by heart disease 20% and post partum hemorrhage 11%. With reference to the obstetric code near miss events is most commonly seen in primigravidas which contributes about 45% of the cases, 98% of the cases are being referred from secondary care referral centers and 2% came as self. comparing with educational qualifications 98% of the near miss cases were educated. From the study the maternal near miss incidence of the institution is 5.7/1000 live births which indicates optimum quality of the treatment given at this institution and the focus has been aimed against 0 mortality. The maternal near miss to mortality ratio was 563:1 which indicates for every 563 deliveries there is 1 maternal mortality.

Table 1: Age wise distribution of cases

S. No	Age in years	Numbers	Percentage
1	<20	6	9%
2.	20-25	12	19%
3.	26-30	22	37%
4.	30-35	16	26%
5.	>35	6	9%

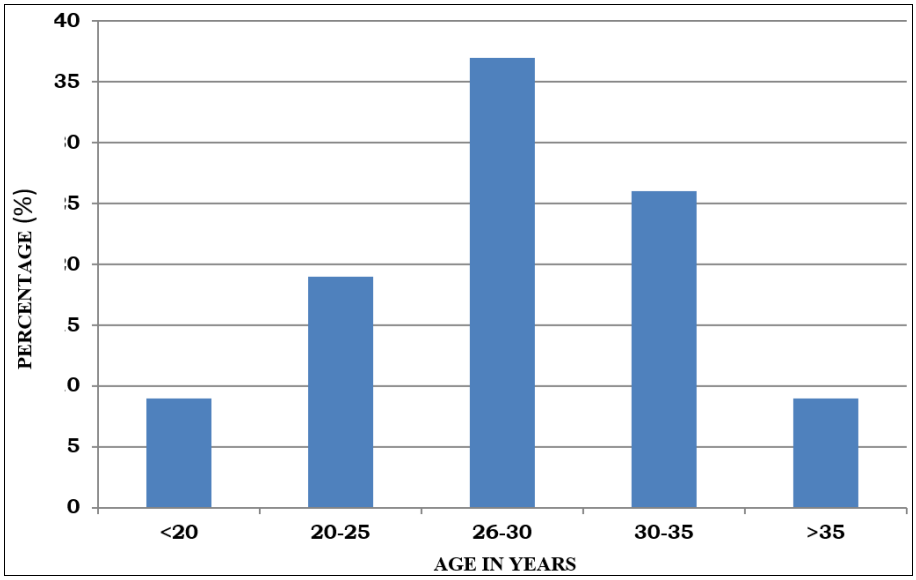

Fig 1: Age wise distribution of cases

Table 2: Causes for maternal mortality

S. No	Type of etiologies	Numbers	Percentage
1	Hypertensive disorders	21	33%
2	Heart disease	13	20%
3	Thrombocytopenia and Coagulation disorders	11	17%
4	Post partum hemorrhage	7	11%
5	Other causes	10	9%

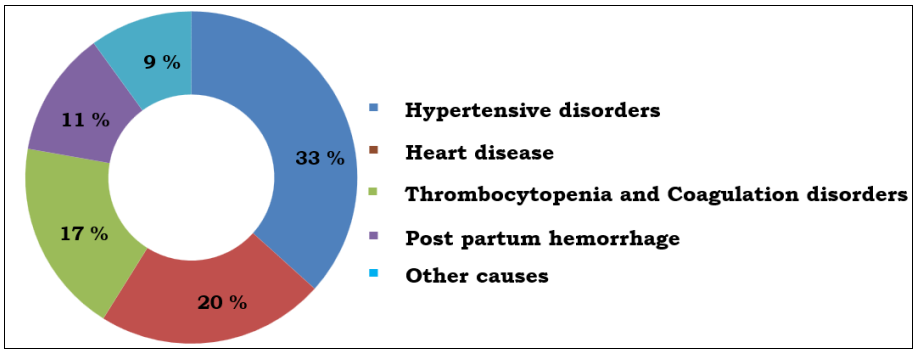

Fig 2: Causes for maternal mortality

Discussion

In recent decades, there have been significant improvements in obstetric care. However, despite these improvements, maternal morbidity and mortality continue to present a significant challenge in developing countries. Maternal mortality is "Just the tip of the iceberg" and has a vast base to the iceberg, maternal morbidity, which remains undescribed. Near miss cases generally occur more frequently than MDs, and therefore, it is a more dependable indicator. The study was done by using combination of using Mantels and Waterstones criteria to identify more no of near miss cases. Quantitative analysis of near miss cases provides a more comprehensive profile of health system functioning the maternal near miss incidence of the institute was 5.7/ 1000 live births which similar with the studies done in various parts of the developing countries which ranges from 5 to 20/1000 live births [6, 7, 8, 11, 12].

Maternal mortality ratio of our institute during the study period was 101/ 100000 live births and our state maternal mortality Ratio was 45.5/100000 live births.with the rate of the developing countries maternal mortality. Brazilian study shown a maternal mortality rate of 260/100000 population (9) which is very much higher than our study. Maternal Near Miss to mortality ratio is 5.6;1 indicates that there is 1 maternal death for each 6 near miss cases. Higher rates indicates good quality care 60:1 in Syrian study (10) and Nepal study the ratio is 7.1:1. The study done at our institution most of the the patient are belonging to the age group of 26 to 30 years (37%) which is similar to the study done by Poovathy *et al* [12] and the least common incidence seen in the age group of less than 20 years and more than 30 years with the rate of 6% each respectively.45% of the patients are primi gravidas and the incidence of near miss is less in multigravida. Our institute being tertiary care center 98% of the cases referred from primary health centers and private hospitals and about 98% of the patients were educated. on the basis of various etiologies the incidence of near miss was 33% is due to hypertensive disorders of pregnancy, 20% due to heart disease, 17% due to thrombocytopenia and coagulation disorder, 11% due to post partum hemorrhage and other causes were 9%. In various studies hemorrhage was the leading cause of maternal deaths in purandare *et al.* [13] review of a pilot program on maternal near miss in 2013. but in this study hypertensive disorders 33% were leading cause for maternal deaths. hemorrhagic deaths are very

less in our study due to adequate replacement of blood products for hemorrhage cases with 24-hours working blood bank facility at our institution. In a systematic review conducted by the WHO, hypertensive disorders were responsible for 25% deaths in Latin America and the Caribbean, while hemorrhage was the leading cause of maternal deaths in Africa (33.9%) and in Asia [14].

Conclusion

The goal of the current study was to determine the prevalence and contributing factors of maternal mortality and near-misses in an eastern Indian tertiary care facility. The WHO database was used to identify the near-miss cases. Criterion for a close call. According to the study, maternal deaths were less compared with other studies. The three main causes of morbidity were hypertensive disorders, heart diseases and hemorrhage. Similar with mortality as in other regions of India. Additionally, it was noted that the majority of the maternal mortalities were occurred due to delayed referrals. Additionally, the majority of them was critically unwell and already had organ dysfunction when they were admitted to the hospital, indicating a delay in seeking appropriate care or in getting to the medical facility. The main aim of the institute to give focus each and every women health to prevent maternal Death.

Access to good quality CEmONC (Comprehensive Emergency Obstetric and Neonatal Care) is an key strategy to improve maternal outcome. Studies have shown the availability and access of CEmONC to be below the target coverage levels especially among the poor and less educated women in poorly performing states. The state of Tamil Nadu has been successful in observing a significant decline in maternal mortality due to series of initiatives such as skilled birth attendance for all births and making more CEmONC centers available in 24 hours with ambulance services and easily accessible. The key lesson learnt from the success is to aim and focus on specific evidence based strategies to reduce maternal mortality. Study limitations include the fact that a prospective follow-up of patients, which might have yielded more information and decreased losses, did not occur. Further, a longer duration and a multicenter study would provide broader perspective of the deficiencies in the present health care and identify measures to overcome them.

Reviewing near-miss cases helps in identifying the pattern of severe maternal morbidity and mortality, strengths and weakness in the referral system and the clinical interventions available and the ways in which improvements can be made. Hemorrhage and hypertensive disorders are the leading causes of near-miss events. Early identification of risk factors for preeclampsia and prompt initiation of treatment with correction of associated factors such as anemia plays a critical role in optimal management of near-miss cases.

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