

Trends in maternal mortality in a tertiary hospital

Disha Gupta*, Asha Verma, Lata Rajoria

Zenana Hospital, SMS MC, Jaipur, India.

Corresponding author: *Disha Gupta, 70, Nandpuri Colony, 22 Godam, HawaSarak, Jaipur (302019), India.

Abstract

Introduction: Maternal mortality is a reflection of the standards of obstetric service and quality of healthcare¹. Most of these deaths are preventable. The aims and objectives of the study are to analyze the trends in maternal mortality over two years in a tertiary hospital, to calculate the maternal mortality ratio and to suggest ways to reduce the MMR.

Methods: A retrospective study was conducted in Zenana hospital, SMS Medical College over a period of two years (Jan2014-Dec 2015) and data was analyzed manually using case sheets.

Results and discussion: In the study period, there were 36,240 deliveries and 65 maternal deaths leading to mean MMR of 179.36. MMR in 2014 was 227.78 which declined to 133.84 in 2015. The direct causes accounted for 61.42% of maternal deaths with hemorrhage and hypertension as the leading causes of maternal mortality. Indirect causes accounted for 38.58% with anemia and coagulopathy as main indirect causes. Most of the deaths occurred in the age group of 20-30(75.38%) and in multipara (63.08%). Unbooked cases (73.85%) and postnatal patients (75.38%) had maximum no. of deaths. Most of the patients were in moribund state (52.31%) when reported to hospital and 64.62% of deaths occurred within 12 hours of admission to hospital.

Conclusion: Antenatal care screening and management of high risk pregnancies are most important to prevent complications and maternal deaths by timely detection and intervention.

Keywords: Maternal mortality, MMR, tertiary hospital, direct obstetric death, haemorrhage

Introduction

Globally, about 800 women die every day of preventable causes related to pregnancy and childbirth; 20 per cent of these women are from India. Annually, it is estimated that 55,000 women die due to preventable pregnancy-related causes in India. A woman dies from complications of child birth every minute. Improving maternal health was one of the 8 MDGs adopted by international community in 2000. Under MDG-5 countries were committed to reduce

maternal mortality by 75% between 1990 and 2015¹. From an estimated MMR (maternal mortality ratio) level of 437 per 1,00,000 live births in 1990, India has reduced MMR to 174 in 2015.

Maternal mortality is death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the duration and site of pregnancy from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental cause (ICD-10)². Maternal

mortality ratio is number of maternal deaths during given time period per one lac births during same time period³. The major factors contributing to maternal mortality in India are uncontrolled fertility, inaccessibility or inadequate utilization of health care facilities, illiteracy, ignorance and gender discrimination. Direct maternal death is the result of a complication of pregnancy, delivery or management of the two. Indirect maternal death is a pregnancy related death in a patient with a pre-existing or newly developed health problem unrelated to pregnancy or non-obstetrical deaths.

In developing countries MMR is 240/lac and 16/lac in the developed countries⁴. There are disparities within the country also, between high and low income groups and between rural and urban areas. Adolescents are at more risk. In hospitals maternal mortality cases are of three main types. First who arrive in a moribund state too late to be benefitted by emergency care. Second, who could have been saved if they had timely and effective interventions. Third, women admitted for normal delivery that subsequently develop serious complications and die with or without receiving emergency care (McCarthy and Maine, 1992).

In India, several important initiatives have been rolled out under the Reproductive and Child Health (RCH) programme, National Rural Health Mission (NRHM) and JananiSishuSurakshaKaryakram(JSSK).

These have led to a decrease in the MMR in the recent times.

Aims and objectives

- 1) To analyse the trends in maternal mortality over two years in a tertiary care hospital
- 2) To calculate the maternal mortality ratio
- 3) Using analysed data to suggest ways to reduce the MMR.

Materials and methods

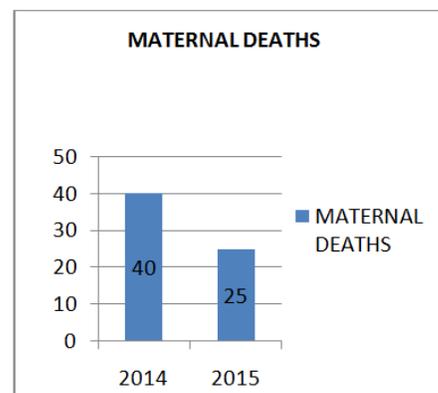
This study was done in SMS Medical College, Jaipur from January 2014 to December 2015 which caters to both booked and unbooked pregnant patients. Admissions are not restricted for any reasons. It gets referrals from nursing homes, maternity homes and level-2 hospitals for high risk care, ICU facility, blood bank facility. The medical records of all maternal deaths from maternal mortality register were analysed. Various factors like maternal age, parity, antenatal registration, condition on admission, admission death interval and cause of death were reviewed.

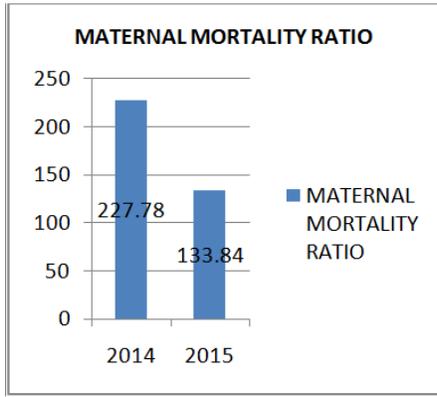
Results and observations

Total 65 maternal deaths occurred between January 2014-December 2015 and live births were 36,240 during the same time period resulting in a mean MMR of 179.36 /10000(Table 1). The MMR was 227.78 in year 2014 which declined significantly to 133.84 in the year 2015

Table 1: Annual distribution of MMR per 100,000 live births.

	2014	2015	Total/ Mean
Maternal deaths	40	25	65
Live births	17561	18679	36240
MMR	227.78	133.84	179.36

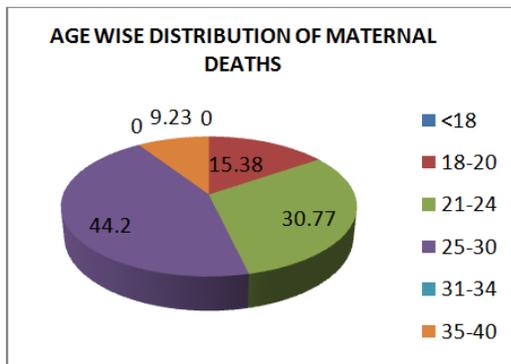




Highest mortality of 75.38% was noted in age group 20 to 30 years (Table2)

Table 2: Annual distribution of maternal deaths according to age.

Age (in years)	2014	%	2015	%
<18	0	0	0	0
18-20	7	17.5	3	12
21-24	12	30	8	32
25-30	21	52.5	8	32
31-34	0	0	0	0
35-40	0	0	6	24%



Multipara women (para 1 to para 3) had maximum MMR of 63.08%, while primi had MMR of 36.92 (Table3).

Table 3: Annual distribution of maternal deaths according to parity.

Parity	2014	%	2015	%
G1	16	40	8	32
G2P1/P1	5	12.5	4	16
G3P2/P2	10	25	8	32
G4-5/P3-4	8	20	5	20
G>5/P>=5	1	2.5	0	0

Postnatal cases accounted for 75.38% of maternal deaths (Table4) with 36.92% deaths from Jaipur rural area, 18.46% from Jaipur city and 44.66% from other districts and states(Table5)

Table 4: Annual distribution of maternal deaths according to antenatal/postnatal.

	2014	%	2015	%
Postnatal	30	75%	19	76%
Antenatal	10	25	6	24

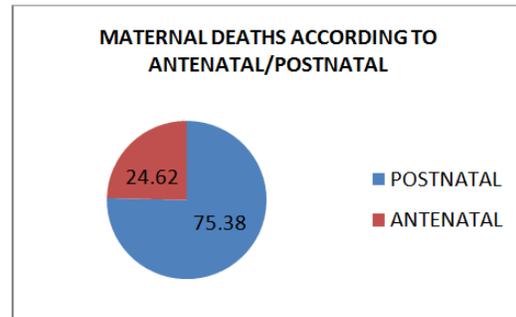
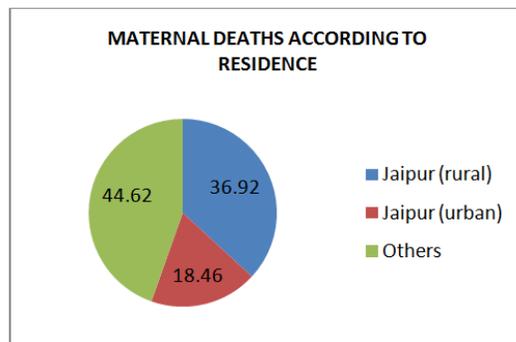


Table 5: Annual distribution of maternal deaths according to residence.

	2014	%	2015	%
Jaipur(rural)	14	35	10	40
Jaipur(urban)	9	22.5	3	12
Others	17	42.5	12	48



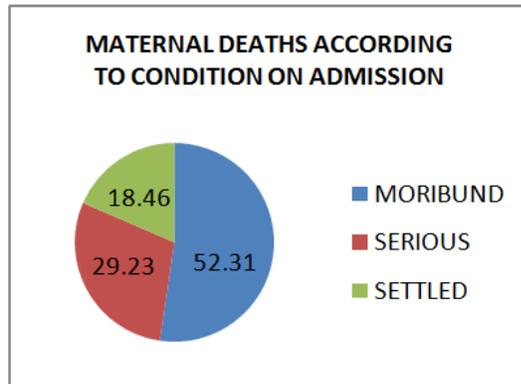
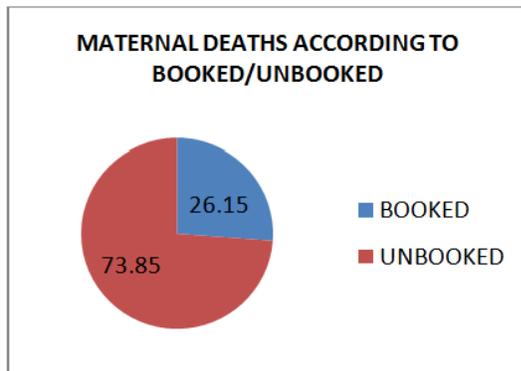
Most of these cases were unbooked (73.85%)(Table6) and most of admissions were brought in a moribund condition(52.31%) (Table7)

Table 6: Annual distribution of maternal deaths according to booked/unbooked.

	2014	%	2015	%
Booked	12	30	5	20
Unbooked	28	70	20	80

Table 7: Annual distribution of maternal deaths according to condition on admission.

	2014	%	2015	%
Moribund	20	50	14	56
Serious	14	35	5	20
Settled	6	15	6	24



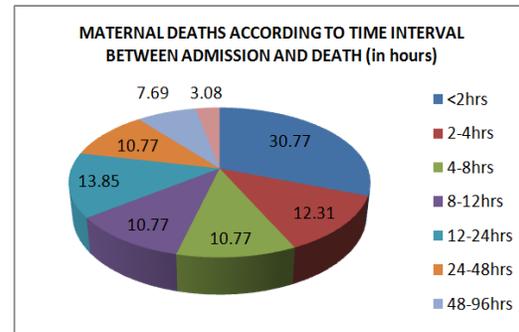
Within 12hours of admission 52.31% of women died (Table 8).

The direct causes of maternal deaths accounted for 61.42% of deaths with haemorrhage and hypertension as the two leading causes. Other direct causes include pulmonary embolism, pulmonary edema,

congestive heart failure, acute myocardial infarction, septicemia, amniotic fluid embolism, aspiration pneumonitis and abruption placenta in the order of contribution to maternal deaths. Rare causes include rupture uterus and abortion.

Table 8: Annual distribution of maternal deaths according to time interval between admission and death.

Time (in hours)	2014	%	2015	%
<2	12	30	8	32
2-4	2	5	6	24
4-8	5	12.5	2	8
8-12	6	15	1	4
12-24	5	12.5	4	16
24-48	5	12.5	2	8
48-96	4	10	1	4
>96	1	2.5	1	4



Indirect causes accounted for 38.58% of maternal deaths with anaemia and coagulopathy as the main contributing factors

Others include heart diseases, infective liver diseases and renal diseases contributing as indirect causes in maternal deaths. The total number of deaths due to these causes exceed far more than the actual numbers as more than one factor may be contributory to a death.

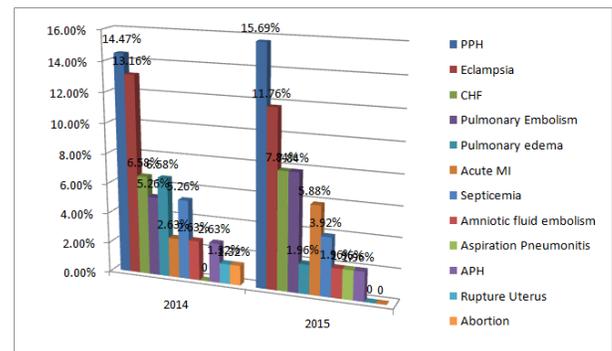
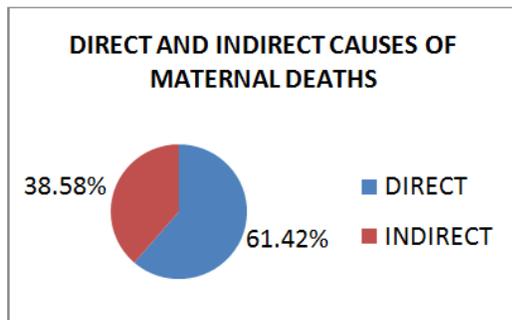
Table 9: Annual distribution of maternal deaths according to direct causes of maternal death.

	2014	%	2015	%
Postpartum hemorrhage	11	14.47	8	15.69
Eclampsia	10	13.16	6	11.76
CHF	5	6.58	4	7.84
Pulmonary Embolism	4	5.26	4	7.84
Pulmonary edema	5	6.58	1	1.96
Acute MI	2	2.63	3	5.88
Septicemia	4	5.26	2	3.92
Amniotic fluid embolism	2	2.63	1	1.96
Aspiration Pneumonitis	0	0	1	1.96
Antepartum Hemorrhage	2	2.63	1	
Placenta previa	0			
Abruptio Placenta	2			
Rupture Uterus	1	1.32	0	0
Abortion	1	1.32	0	0
TOTAL	47	61.84	31	60.78

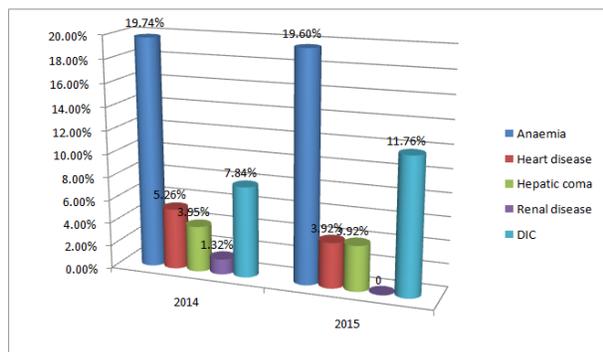
Table 10: Annual distribution of maternal deaths according to indirect causes of maternal death.

	2014	%	2015	%
Anaemia	15	19.74	10	19.6
Heart disease	4	5.26	2	3.92
Hepatic coma	3	3.95	2	3.92
Renal disease	1	1.32	0	0
DIC	6	7.89	6	11.76
TOTAL	29	38.16	20	39.22

GRAND TOTAL	76		51	
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Direct causes of maternal deaths.



Indirect causes of maternal deaths.

Discussion

Maternal mortality is ascribed usually to complications that generally occur during or around labor and cannot be accurately predicted. The major causes of maternal mortality are mostly preventable through regular antenatal check up, proper diagnosis, and management of labor complications. This study is an attempt to collect the distribution and magnitude of the burden of MMR in our population; to identify the etiological factors, and to analyse the data thus collected to suggest ways to reduce MMR. This study also reflects the effect of various health programmes on the declining trends in maternal mortality. This research will also add to the existing data that are essential to the planning, implementation and evaluation of services for the prevention, control and treatment of the disease burden amongst the mothers.

It is heartening to note that MMR is showing a good reduction during the last 2 years at our hospital (Table 1). From this study it is evident that proper health care in our hospital helps in reduction of maternal mortality, but further reduction requires better health facilities in remote and rural areas. MMR has decreased significantly in our hospital because of continuous training of medical and paramedical staff, early intervention, improvement in blood-bank facilities and availability of blood components. Other government interventions such as the Janani Shishu Suraksha

Karyakaram (JSSK) scheme which encompasses free maternity services for women and children, substantial investment in midwifery training by the central as well as the state government, free case supportive health and family planning services like free sterilization camp, judicious utilization of Family Planning methods and Manual Vacuum Aspiration training for safe abortion, etc also have played a role.

However the MMR in our study still remains quite high, more than our national average because our health facility is a referral tertiary hospital for various maternity centers, nursing homes and other level II hospitals which do not have ICU and blood-bank facilities and multi-specialty care. Being a government hospital there is no restriction on admissions inspite of non-availability of beds, antenatal booking etc. Janani Suraksha Yojana promotes institutional deliveries but not antenatal care so many un-booked patients with complications and many a times in moribund state reach hospital which could have been saved by timely access to skilled care and interventions

Highest mortality of 75.38% was noted in age group 20 to 30 years (Table 2). These findings correlate with that reported by other studies, Vidyadhar et. al reported 55.2% deaths in age group 19-24, 15.79 % deaths in < 19 years⁶. Saini and Gupta⁷, reported 81.69% deaths in age group 21-30 years. Nishupriya et. Al⁸, reported 74.22% deaths in 21 -30 years. Yadav k et. Al⁹, reported 72.68% deaths among 20-29 years. Purialkaetal¹⁰, showed 71.53% of deaths occurred in 21-30 years age group. Adolescent and illiterate mothers and those living in hard to reach areas still have a much greater chance of dying in childbirth. Adolescent girls outside Indian cities are especially vulnerable as teenage marriage and pregnancies are very high in rural and remote areas of the country.

Multipara women (para 1 to para 3) had maximum MMR of 63.08% , while primi had MMR of 36.92 (Table3) as was observed in other studies, Vidhyadharetal⁶, reported 57.89% deaths among multigravida and 42.10% among primi; Saini and Gupta⁷, reported 83.49% of deaths among multigravidas; Nishupriya et. Al⁸, showed 49.48% were multigravidae; Yadav k et. Al⁹, reported 56. 7% deaths among multigravida and Purialkaet. Al¹⁰, reported 51.53% of deaths among multigravida. In our study maximum deaths occurred in multipara, reflecting the need to strengthen family planning services so that every pregnancy is wanted and planned. Our hospital is promoting postpartum CuT insertion after vaginal and LSCS delivery besides offering other postpartum contraceptives so that inter-conception spacing is increased leading to recovery of maternal health before next pregnancy. Postnatal cases accounted for 75.38% of maternal deaths (Table 4) with 36.92% deaths from Jaipur rural area, 18.46% from Jaipur city and 44.66% from other districts and states (Table 5). Similar results have been obtained in other studies; Purandare et al⁵, showed 73.33% deaths occurred in postpartum period and 26.66% in antenatal period; Saini and Gupta⁷, reported 66.1% of post natal deaths; Nishupriya et. Al⁸, showed 62.8% postpartum deaths. Yadav k et. Al⁹, reported 72.16% post natal deaths; Purialka et. Al¹⁰, showed 63.08% of deaths in postnatal period. Most of the mothers live in rural areas. Besides poor resources of health facilities in rural areas women may lack awareness of the seriousness of the problems. Delayed referral, poor transport facilities, underutilization of health facilities, and poor socioeconomic status are responsible for the high rate of maternal deaths. MMR tend to be lower in urban areas which reflect easier access of the city dwellers to medical services.

Most of these cases were unbooked (73.85%) (Table 6) and most of admissions were brought in a moribund condition(52.31%) (Table 7). The high percentage of deaths in unbooked cases indicates the importance of adequate antenatal care. The quality of the care is also very important as the facilities may lack even the most basic resources like the drugs, the means to measure the blood pressure and hemoglobin, and even water and electricity. Within 12 hours of admission 52.31% of women died (Table 8). Results of other studies were similar, Purandareet. Al⁵, showed 3 women died within 30 minutes, 14 between 30 minutes and 6 hours, 7 between 6 and 24 hours and 6 after 24 hours; Vidhyadar et. Al⁶, reported 1 death within 1 hour of admission, 15.79% between 2-12 hours of admission, 21. 055 between 13-24 hours of admission and 25.06% after 7 days of admission; Saini and Gupta⁷, reported 42.85% deaths within 24 hours of admission an 57.74% after 24 hours; Nishupriya et. Al⁸, showed that 54.63% of deaths were within 24 hours of admission, 19.58% within 25-48 hours 10. 30% within 49-72 hours and 15.46% after 72 hours of admission; Purialkaet. Al¹⁰, reported 45% of deaths within 24 hours of admission. The direct causes of maternal deaths accounted for 61.42% of deaths with haemorrhage and hypertension as the two leading causes (Table 9). Other direct causes include pulmonary embolism, pulmonary edema, congestive heart failure, acute myocardial infarction, septicemia, amniotic fluid embolism, aspiration pneumonitis and abruption placenta in the order of contribution to maternal deaths . Rare causes include rupture uterus and abortion. Indirect causes accounted for 38.58% of maternal deaths with anaemia and coagulopathy as the main contributing factors (Table 10). Others include heart diseases, infective liver diseases and renal diseases contributing as indirect causes in maternal deaths. The total

number of deaths due to these causes exceed far more than the actual numbers as more than one factor may be contributory to a death. Similar results were seen in other studies, Purandareet. Al⁵, observed 70.83% deaths due to haemorrhage, 13.3% due to hypertension and 3.3% deaths due to sepsis. Vidyadharet. Al⁶, reported 21.05% deaths due to haemorrhage, 10.52% deaths due to eclampsia and pulmonary embolism and 7.89% due to sepsis, 13.15% deaths due to heart disease and anaemia as cause in only 2.63% of deaths. In Saini and Gupta study⁷, 60.5% were direct deaths among which 23.9% were due to haemorrhage 21.1% due to sepsis and 7% due to eclampsia and 39.43% were indirect causes of death; Nishupriyaet. Al⁸, showed postpartum haemorrhage 35.05% as the leading cause followed by hypertensive disorders 27.83% and anaemia 25.7%; Yadav k et. Al⁹, reported 73.19% as direct obstetric deaths of which haemorrhage 43.16%, hypertension 33.09%, sepsis 12.67%, 26.8% were indirect cause with anaemia as leading cause; while Purialka¹⁰, and group reported sepsis 43.05% as leading cause followed by haemorrhage and eclampsia 22.22% and 31.94% respectively. Thus direct causes-haemorrhage and hypertensive disorders are still the leading causes of death.

Various preventable causes are hemorrhage, sepsis, hypertensive disorders, anemia, and anesthesia complications. Antenatal booking can prevent maternal deaths due to eclampsia, pre-eclampsia, severe anemia and various associated medical disorders. Antenatal care starting early in pregnancy, detection and managing pregnancy complications, detection and treatment of associated medical disorders, institutional deliveries, proper referral facility and emergency transport, timely intervention, access to contraceptives and safe abortion services can prevent most of the deaths. Health care facilities can be improved in rural areas by ensuring round the clock

availability of certain basic drugs like injection magnesium sulfate, tablet misoprostol as most maternal deaths in rural areas are still due to eclampsia and post partum hemorrhage. EmOC facilities should be well distributed to serve 500,000 people in our area and there should be one comprehensive and four basic EmOC facilities which can reduce MMR in an area. EmOC key functions are - i) antibiotics (injectable) ii) oxytocic drugs, iii) anticonvulsants, iv) manual removal of placenta, v) removal of retained products, vi) assisted vaginal deliveries, vii) surgery (cesarean section), and viii) blood transfusion facilities. The first six services are basic and all eight services are comprehensive. Education, hygiene, good nutrition, adopting a two child norm will go a long way to improve maternal health and mortality.

These facilities not only reduce burden on tertiary hospitals but also save money and time of poor mothers having complications.

Conclusion

Postpartum haemorrhage is an important cause of maternal mortality followed by hypertension. The analysis of maternal deaths in our study reflects ignorance and poor health education regarding importance of antenatal checkups. Majority of maternal deaths can be averted by proper intervention of 3E's viz., emergency obstetric care (EmOC), early risk screening, and efficient obstetric services. Identification of high risk pregnancies and awareness regarding danger signs should be imparted. To prevent mishaps in deliveries, early referrals and prompt transportation services are required. Proper training of health personnel is necessary. Campaigns for community based maternal education programme and importance of early resuscitative measures should be emphasized.

Conflicts of interest: None

Financial or other competing interests:

None

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