Original Article

Maternal Death Reviews : an analysis in a teaching hospital in North Bihar

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A maternal death review (MDR) is a medical audit which goes beyond merely enumerating the causes of maternal deaths. It investigates the community and hospital circumstances due to which currently available life-saving interventions could not save the woman's life. This is a retrospective analysis of facility-based MDR forms in a tertiary care teaching hospital in North Bihar. Seventy two deaths over a one-year period were analysed. Obstetric hemorrhage (antepartum and postpartum hemorrhage) and eclampsia were the leading causes of maternal deaths. Anemia was an important contributory cause. Twenty four cases were clearly documented as referred cases and were admitted in critical condition reflecting the community-based conditions contributing to delay 1 and delay 2 responsible for maternal deaths. Sub-standard care in the hospital after admission was also identified in some cases like poor management in postoperative period or in intensive care facilities of the hospital. Non-availability of blood was a serious limitation due to donor scarcity. Maternal deaths can be reduced only by combined socio-economic and medical interventions so that women in pregnancy and puerperium can receive timely evidence-based life-saving interventions.

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Key words **: Maternal deaths, maternal death reviews, medical audit, tertiary care hospital, obstetric hemorrhage, eclampsia, anemia, delay factors in maternal deaths, health care providers (HCPs).**

According to the International Statistical Classification of Diseases and related Health Problems-10 (ICD) a maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the duration or site of pregnancy[1]. Global, national and regional analyses reveal that causes of maternal deaths remain the same although the contribution of each cause to the percentage of overall maternal mortality varies in different health-care settings. According to the Million Death Study collaborators' data of maternal mortality in 2014 in India, the causes in order of importance are haemorrhage 38%, miscellaneous causes 34%, sepsis 11%, abortion 8%, obstructed labor 5% and hypertensive diseases of pregnancy 5%[2]. The variations in the contribution to mortality figures, and the fact that while some women with the same pregnancy/puerperal complication or with co-morbid conditions in pregnancy survive while others succumb forms the basis of the rationale of maternal death reviews (MDR).

A maternal death review (MDR) is a medical audit-a qualitative in-depth analysis into the causes and circumstances surrounding maternal deaths at a health facility or even outside it. The difference between maternal mortality analysis and maternal death review is that while maternal death analyses is purely an academic exercise in delineating the disorder that lead to the death of mother, an MDR goes beyond the medical domain and looks into the reasons why the woman's life could not be salvaged despite effective treatment being available in current times[3]. As such it involves investigations into the conditions prevailing in the community as well as the health care facility where the woman died.

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Aims and Objectives

This study analyses the causes of maternal mortality in our hospital and the circumstances leading to failure to save the woman in our hospital. The objectives were

(1) To calculate the maternal mortality rate(MMR) in our hospital

(2) To estimate the proportion of maternal deaths in which delay 3 contributed solely or significantly to the death.

(3) To delineate the areas of substandard care in our hospital

(4) To formulate an action plan to remove such deficiencies in care within a feasible time-span.

Materials and Methods

This study is a facility-based observational study over a one-year period from August 2015-July 2016. It looks into deaths which occurred after admission of the pregnant, parturient or puerperal women at Sri Krishna Medical College Hospital, Muzaffarpur in North Bihar. A state-level orientation program was attended by one faculty member of the department. Other doctors working in the department were familiarised with the principles and practical aspects of MDR. A schedule for MDR sessions was set up in which each MDR form and case note was discussed at length. Each death was analysed to establish the underlying, immediate and contributory cause of death, the type of death (direct or indirect) and whether the death could have been averted at the facility.

The following data were compiled: maternal age, residential address (urban/rural), obstetrical history (GPAL), quality of antenatal care provided; period of gestation, diagnosis and general condition of the woman at the time of admission; whether she was a referred case, from where she was referred and the reason for referral; date and time of admission, onset of complication, delivery and death; details of delivery and outcome of pregnancy as relevant; interventions (D&E, CS, laparotomy, hysterectomy, instrumental delivery, manual removal of placenta, blood transfusion, type of anesthesia if required; admission to intensive care unit with details of care provided there; cause of death (primary/ contributory); whether death was antepartum, intrapartum or postpartum; whether autopsy was performed. A grid analysis of factors working in the family/personal life of the dead woman and logistical factors (infrastructure and manpower) in the health care system operating in each individual case was looked into (Table 1). The collected data was entered into MS Excel,analysed and the results expressed as percentage.

Table 1 — *Grid analysis chart of non-obstetrical/medical factors contributing to maternal deaths*

System	Example	Yes	No	Remarks
Personal/ family	Delay in woman seeking help			
	Refusal of treatment			
	Refusal of admission in previous facility			
Logistical problems	Lack of transport from home to health care facility			
	Lack of transport between health care facilities			
	Health service –Health service communication breakdown			
Facilities	Lack of facilities, equipment or consumables			
	Lack of blood			
	Lack of OT availability			
Health personnel problems	Lack of human resources			
	Lack of anesthetist			
	Lack of obstetrician			
	Lack of expertise, training or education			

Results

There were 72 maternal deaths between August 2015 and July 2016 at Sri Krishna Medical College Hospital, Muzaffarpur, Bihar. There were 8701 deliveries during that period was giving an appallingly high MMR of 827.

The socio-demographic data of the maternal deaths are shown in Table 2.

Table 2 — *Socio-demographic characteristics of maternal deaths (n=72)*

Characteristic	No of women (n) Percentage (%)
Residence :	
Rural	68 (94.44%)
Urban	4 (5.56%)
Religion :	
Hindu	58 (80.55%)
Muslim	14 (19.44%)
Distribution of maternal deaths according to period of year :	
August-October	13 (18.06%)
November-January	17 (23.61%)
February-April	12 (16.67%)
May-July	30 (41.67%)
Age :	
<20 years	2 (2.78%)
20-30 years	56 (77.78%)
>30 years	14 (19.44%)
Referred case :	
Yes	24 (33.33%)
Not documented/direct admission/unclear documentation	48 (66.68%)

Table 3 summarises the reproductive and obstetric status of the deceased women. The condition of the patient at the time of admission, the gestational period, onset of labor and postpartum/postoperative period at the time of admission and at the time of death and whether she needed and received blood transfusion are shown in Table 4.

More than 50% patients needing blood did not get it chiefly because attendants were not available or were not willing to give blood, and free blood could not be arranged by the hospital.

Fig 1 shows the primary underlying causes of the maternal deaths. The leading causes of death were obstetric haemorrhage (antepartum hemorrhage and postpartum haemorrhage-36.2%), antepartum and postpartum eclampsia (27%), postoperative complications (13.9%) severe anemia (8.33%)and miscellaneous

Table 3 — *Obstetric characteristics of the deceased women in the index pregnancy*

Characteristic	No of women (n) Percentage (%)
Gravidity/parity :	
Primigravida/para1	20 (27.78%)
Gravida 2/para 2-gravida 3-para3	27 (37.5%)
Gravida 4-para 5 or above	25 (34.72%)
Period of admission :	
Antepartum	39 (54.17%)
Intra-partum	20 (27.78%)
Postpartum	10 (13.89%)
Postprocedure (C.S./Pregnancy termination)	2 (2.78%)
Antenatal care :	
Yes	7 (9.72%)
No/undocumented clearly	65 (90.28%)

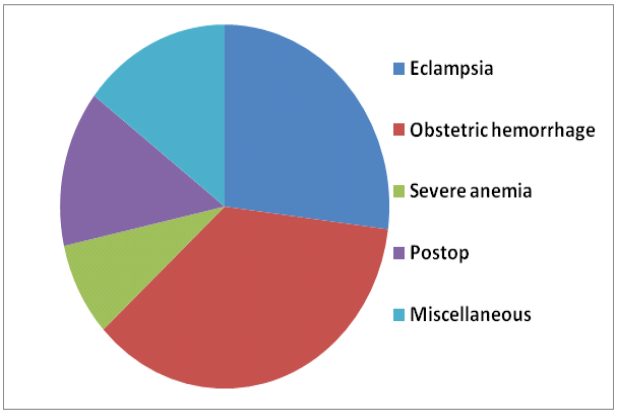

Fig 1 — Primary causes of maternal deaths

causes (about 14.57%). The miscellaneous group included hepatic encephalopathy 4%, heart disease 4%, sepsis 3%, respiratory problems 1%, cerebral malaria 1% and unclear causes 1%.

In 15 cases severe anemia was an important contributory cause for the maternal mortality.

Table 5 is a grid analysis of the 3 delay factors associated with the maternal deaths.

Discussion

In our study obstetric hemorrhage (APH, PPH) was the commonest cause of maternal deaths followed by antepartum and postpartum eclampsia. In other studies in different regions of India within the last decade the causes of maternal mortality are the same although the percentage contribution of each cause varies[3-8].

The maximum numbers of deaths were reported in mothers aged between 20-30 years. This is similar to the findings of Paul *et al*[3] in their study in another teaching hospital of Eastern India. It was, however, encouraging to note that there were no teenage maternal deaths in this series although elderly multigravida were in significant numbers (n=25, 34.72%).

MDRs are an important medical audit so that the resources of a hospital can be prioritised on the basis of the incidence of causes in the health care setup in which it is conducted. This is especially important in low-resource settings where cost-effectiveness of any intervention is very relevant. In our hospital the observation that many women died due to hemorrhage underpins the importance of providing efficient blood bank services and increasing public awareness regarding myths and misconceptions about blood donation.

Another important area to be looked into is the management protocol of the hospital. Labor ward inventory of injection Magnesium Sulphate and injection Labetalol as well as other items of the eclampsia tray need to be topped up on a regular basis by the staff in charge of the delivery suite. Eclampsia and PPH drills need to be repeated frequently so that labor ward staff remain conversant with their role while managing these complications.

Although non-medical factors (demand –side barriers)-delay 1: delay by patient and/ or family in seeking medical aid and delay 2 : delay in transport to and between health facilities-are often stressed upon as being responsible for most maternal deaths, it is equally important to accept the stark reality that many deaths occur after the woman has reached the health care facility where evidence-based life-saving interventions could or should have been available –delay 3 supply side barriers[9]. HCPs cannot intervene too effectively to eliminate delay 1 and 2. Facility-based MDRs provide insights into delay 3 in a particular health care centre so that remedial actions can be instituted eg, lack of essential drugs, trained personnel, blood transfusion facilities. WHO emphasises six essential building blocks for quality health care: services delivery, health workforce,

Table 4 — *Distribution of maternal deaths by delivery-associated characteristics*

Characteristic	No of women (n) Percentage (%)
Obstetric stage at admission period :	
Antepartum	39 (54.17%)
Intrapartum	20 (27.78%)
Postpartum	10 (13.89%)
Postprocedure	3 (4.17%)
General condition at admission :	
Stable	15 (20.83%)
Critical	
• altered sensorium	57 (79.17%)
• shock	
• cardiac failure	
• acute respiratory distress	
Admission-death interval :	
< 2 hours	18 (25%)
< 12 hours	49 (68.05%)
< 24 hours	56 (77.78%)
> 24 hours	16 (22.22%)
Obstetric stage at death :	
Antepartum	30 (41.67%)
Intrapartum	5 (6.94%)
Postpartum	23 (31.94%)
Postprocedure	14 (19.44%)
Blood transfusion :	
B.T. needed	35 (48.61%)
B.T. given	16 (22.22%)

Table 5 — *3 delays associated with the maternal deaths*

Type of delay	Specific detail of delay	No of csases
1	Delay in seeking aid	26
2	Transport delay	9
1+2	Delay in seeking aid+ transport delay	21
1+3	Delay in seeking aid + lack of blood	2
1+2+3	Lack of blood	1
3	Refusal of treatment at private hospital	1
	Lack of expertise/ training/education at hospital	1
	Lack of blood at hospital or non-availability of donor	1
	Lack of monitoring equipment/efficient ICU at hospital	1
Grid chart not filled up by primary informant		7

information, medicines, financing and governance[10,11].

Being an exercise in medical audit, MDRs generate some lessons to improve the quality of care being provided to women in pregnancy and thereafter. From this analysis of FBMDRs, the following disquieting observations and immediate remedial actions required were derived :

(1) Janani SurakshaYojana has not improved antenatal care coverage although institutional delivery rate has increased dramatically. Hence anemia and eclampsiaare still rampant.

(2) Anemia eradication programs especially for women in reproductive age need to be implemented in the community on a war-footing.

(3) Pregnant women, their families and community health workers like ANMs and ASHAs need to be made aware of the warning signs of eclampsia and severe pregnancy-induced hypertension.

(4) Health-care providers in peripheral health care facilities need to be educated on early referral protocols before the condition becomes critical.

(5) IEC campaigns need to be strengthened in the community to dispel fears, myths and misconceptions regarding effects of blood donation on the donor if blood transfusion services are to be made efficient.

(6) Community-based MDRs (verbal autopsies) need to supplement FBMDRs so that delay 1 and 2 can be minimised.

(7) Care provided at the tertiary hospital itself did not measure up to the required standards. Care of the patients in obstetric wards before and after delivery and in the ICU needs to be improved.

(8) Case-note documentation was sub-standard in many cases.

(9) ASHAs who accompanied the patients to the hospital should be educated on the importance of regular ANC, BP check-ups and haemoglobin estimations.

(10) Postpartum contraceptive options are not routinely offered to women after delivery so that many leave the hospital with unmet need for contraception although several options free of cost are available in government hospitals. Lack of family planning (FP) counsellor and the extremely heavy case-load in obstetric units was chiefly responsible for the poor uptake of contraceptive methods.

Conclusion

Facility-based MDRs put each maternal death in the proper socio-economic-obstetrical context so that a holistic view of the case is taken and an overarching solution is sought in order to prevent such deaths in future. This study underscores the important point that although many patients reach the hospital in a critical condition due to delay 1 and 2 sdue to community-linked factors, as hospital-based HCPs clinicians and hospital administrators also need to address supply-side deficiencies (delay 3 factors) honestly and speedily rather than shift the blame solely towards the community conditions.

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