Journal of Clinical and Experimental Reproductive Medicine

Chhabra et al, J Clin Exp Reprod Med. 2024;1(1):12-25.

Research Article

Need of going beyond creating rural health facilities and community based care for prevention of maternal deaths

Shakuntala Chhabra[1,*], Kanade M[2]

[1]Obstetrics and Gynecology, Senior Consultant, Tapanbhai Mukesh Bhai Patel Memorial Hospital, Shirpur and Research Central and Proposed Medical College, Kharde, Shirpur, Dhule, Maharashtra, India

[2]EX Station Manger Dr. Sushila Nayar Hospital, Utavali, Melghat, Amravati, Maharashtra, India

*Author for correspondence:
Email: chhabra_s@rediffmail.com, drschhabra22@gmail.com

Received date: June 06, 2024
Accepted date: August 12, 2024

Abstract

Context: Maternal deaths (MD), continue to be a global problem. For prevention it is essential that steps are taken from woman's home to referral health facility because maternity journey is slippery. Women do slip, and disappear during pregnancy, birth and post birth. It is essential to know about danger points to prevent falls by providing quality care, during pre-pregnancy, pregnancy, birth, and post birth.

Objective: Analysis of information recorded in summaries of maternal death cases as part of surveillance for response.

Participants: Information in context of 54 women who died during maternity over last 10 years in a remote, forestry and hilly region in villages being served through nurse midwives (NM).

Methods: Analysis of information from death summaries which were being made after each death. Death summaries of maternal deaths over 10 yrs were analyzed.

Results: Severe anemia was major factor which contributed to many MDs, indirectly, as well as directly. It was also revealed that social perspectives mattered a lot.

Conclusion: There is need to understand reasons for not using or by-passing health facilities with essential services, transfers which sometimes are either delayed or not needed. Regular update of service providers seems to be essential for them to understand better what is visible, try to understand what existed, but is not visible and provide, timely appropriate services.

Keywords: Maternal deaths, Rural, Low resources, Causes, Social accountability, Perspectives

Background

Globally around 80% of maternal deaths (MD) occur due to complications during pregnancy, birth, and post-birth [1]. Most of the MDs are preventable by the approach which starts at individual homes and continues at health facilities, equipped for appropriate, effective and timely interventions and continues back at their homes. Many rural women, specially, those who live in extreme poverty, do not have access to appropriate, and affordable health facilities. Sometimes they do not use the available health facility because of their own beliefs, or they are not able to use the facility due to the regulations in the health system.

Material and Methods

Study setting

Service villages around the village with health facility, study center.

Study design

This is an observational study.

Inclusion study sample

All maternity related deaths in villages being served during the decade just over.

In view of the persisting high maternal, perinatal and child mortality in the villages in central part of a region ably well doing province, a health facility was created in one of the villages. Hospital-based multispecialty health services were started with a concept of social accountability of the medical institute situated in the nearby district. It was soon realized that for a real impact on the maternal health, it was essential to provide community-based mother and child services. Attempts were made to provide community based basic prenatal care, guidance and advocacy to each pregnant woman for safe pregnancy, safe birth, and safe post birth by once a month visit by nurse midwives (NM) to each village. NM were assigned to fixed villages to have rapport. Each pregnancy was followed for outcome, irrespective of the place, type of birth and outcome. Over a decade details of maternity related deaths have been analyzed. Study is analysis of records of maternal death cases kept on regular basis as soon as death occurred, not a planned study. Analysis was essential for future actions. And on analysis which needed no approvals it was felt that information needed sharing.

Results

As per base data collected in the first year, there were 56% home births in the villages being served, 27.07% at public health facilities, 10.39% at referral base hospital, which was the study center and 06.54% at other places. After a decade, in the recent year, there were 19% home births, 61.55% at public health facilities, 17.10% at referral base hospital, and 2.35% at other places. Maternal mortality ratio (MMR) in the base data year was 300 and in 2022-2023 it was 71. Facility based births have increased and overall situation is improving but preventable MDs have still occurred. So, it was decided to do a detail analysis of each case, for further actions to prevent MDs. **Table 1** depicts information about gravidity (number of pregnancies) and parity (number of viable births) across different age groups, maximum maternal death cases, 46 (85.1%), were women of age 20-29 years. As per gravidity/parity status, maximum maternal deaths cases were primigravida 21 (38.9%) (**Table 1**).

Analysis of information was also done about the gestational age at the first antenatal checkup and the status at the time of death in context of duration of pregnancy. Of 34 pregnant women who had their first antenatal checkup at or before 14 weeks, maximum number of deaths had occurred beyond 37 weeks gestation postnatally. Understanding of the relationship between the timing of antenatal care and the status of pregnancy at the time of death provided valuable insights about quality care because deaths occurred in spite of almost timely first checkup (**Table 2**).

Maternal deaths across various demographic and socioeconomic variables revealed that majority of the women 52 (96.29%) belonged to lower economic class and only 2 (3.7%) from lower middle class. Majority 29 (53.70%) had studied up to primary level, 2 (3.7%) women were illiterate, 17 (31.48%) had studied up to secondary level, and 6 (11.11%) had higher secondary level with no death case was a graduate. Total 32 (59.3%) women died due to direct causes, mostly due to postpartum hemorrhage after home births, with anemic state. Seventeen (31.5%) women died of indirect causes. Overall, there was correlation between education and causes of maternal deaths, with indirect causes more among illiterate or primary school educated. All the 4 cases of MDs who were adolescent girls, had direct causes (100%). For the women between 20-29 years, (46 cases), 24 (52.21%) deaths were due to

Table 1. Age and parity of cases of maternal deaths.

Gravidity, Parity	**Age**		
	≤19	**20-29**	**≥ 30**
G1	4	21	0
P1-P2	0	20	0
P3-P4	0	5	3
≥ P5	0	0	1
Total	**4**	**46**	**4**

Table 2. Gestational age at first antenatal checkup and status at death.

Pregnancy at first antenatal checkup	**Total women**	**Duration of pregnancy at death**	**Numbers**	**Status at death- Pregnancy / Postnatal**	
				Pregnancy	Postnatal
≤14 Weeks	34	≥ 20-<28 weeks	3	1	2
		≥ 28-<34 weeks	5	5	0
		≥ 34-<37 weeks	2	2	0
		≥ 37 weeks	24	0	24

≥ 20 - <28 weeks	14	≥ 28-<34 weeks	3	3	0
		≥ 37 weeks	4	3	1
		≥ 34-<37 weeks	7	0	7
≥ 28 - <34 weeks,	6	≥ 37 weeks	6	0	6
Total	**54**		**54**	**14**	**40**

direct causes, 17 (37%) due to indirect causes, and 5 (10.9%) due to unspecified causes. Regarding education, out of 29 cases with primary education, 17 deaths (58.6%) were due to direct causes, mainly PPH, 7 (24.1%) due to indirect, mainly cardiogenic shock because of pulmonary embolism, heart disease, sepsis, anemia and 5 (17.2%) were due to unspecified causes. Of the total 54 cases, 52 (96.2%) deaths cases were women of low economic status, 30 deaths (55.6%) were due to direct causes mainly PPH, 17 (32.7%) due to indirect, and 5 (9.6%) unspecified. This detailed breakdown enables a deeper understanding of the relationship between various demographic factors and maternal deaths, guiding about targeted interventions to address specific factors (**Table 3**). Out of total 54 maternal deaths, maximum death cases were postnatal, 40 (74%). However, 14 (26%) women died undelivered. Out of 40 postnatal deaths 27 (67.5%) had live births and 10 (25%) intrauterine deaths and 3 (7.5%) still births with 5 (22.7%) neonatal deaths (**Table 4**). **Table 5** depicts details of all 54 death cases with crux of the problems.

Table 3. Causes of maternal deaths in the context of variables.

VARIABLES		**Causes**					
AGE IN YEARS	**TOTAL**	**Direct**	**%**	**Indirect**	**%**	**Unspecified**	**%**
≤ 20	4	4	100.0	0	0.0	0	0.0
≥ 21-≤ 29	46	24	52.2	17	37.0	5	10.9
≥ 30-≤ 39	4	4	100.0	0	0.0	0	0.0
Total	**54**	**32**	**59.3**	**17**	**31.5**	**5**	**9.3**
Education							
Illiterate	2	2	100.0	0	0.0	0	0.0
Primary	29	17	58.6	7	24.1	5	17.2
Secondary	17	9	52.9	8	47.1	0	0.0
Higher Secondary	6	4	66.7	2	33.3	0	0.0
Total	**54**	**32**	**59.3**	**17**	**31.5**	**5**	**9.3**
Socio Economic status							
Upper	2	2	100.0	0	0.0	0	0.0
Lower	52	30	57.7	17	32.7	5	9.6
Total	**54**	**32**	**59.3**	**17**	**31.5**	**5**	**9.3**
Profession							
Home maker	3	2	66.7	1	33.3	0	0.0
Laborer	51	30	58.8	16	31.4	5	9.8
Total	**54**	**32**	**59.3**	**17**	**31.5**	**5**	**9.3**
Parity							
P0	31	19	61.3	9	29.0	3	9.7
P1-P2	20	12	60.0	7	35.0	1	5.0
≥ P3	3	1	33.3	1	33.3	1	33.3
Total	**54**	**32**	**59.3**	**17**	**31.5**	**5**	**9.3**

Table 4. Antecedent, maternal disorders and fetal outcome in case of maternal deaths.

Antecedent Disorders	**Live baby***	**Fetal outcome**			
		Intra uterine death + Still birth	**Neonatal death**	**Undelivered**	**Total**
Direct					
Eclampsia with Intracranial hemorrhage	1	1	1	7	10
Eclampsia with Multi organ failure	2	0	2	0	4
Anemia with primary post-partum hemorrhage with hypovolemic shock	2	3	1	0	6
Anemia with primary post-partum hemorrhage with sickle cell disease with sickle cell crisis	1	3	0	3	7
Puerperal sepsis with cerebral malaria	1	0	0	0	1
Placenta previa with primary PPH with Hemorrhagic shock	0	1	0	0	1
Secondary PPH due to retained placenta	2	0	0	0	2
Eclampsia with HELLP syndrome	1	0	0	0	1
Indirect					
Cardiogenic shock	2	0	1	2	5
Encephalitis	1	0	0	0	1
Burn with hypovolemic shock	1	0	0	0	1
Pulmonary embolism	3	0	0	0	3
Swine flu	0	0	0	1	1
Heart disease	1	2	0	1	4
Pyrexia of unknown origin	1	0	0	0	1
Dengue with severe thrombocytopenia	1	0		0	1
Unspecified					
Intracranial lesion	1	0	0	0	1
Anaphylactic shock (Transfusion reaction)	1	0	0	0	1
Witchcraft	0	1	0	0	1
Nothing known	0	2	0	0	2
Total	**22**	**13**	**5**	**14**	**54**

*27 Live Births, with 5 Neonatal deaths; HELLP: Hemolysis Elevated Liver Enzymes and Low Platelet

Table 5. Crux of problems in maternal deaths.

Sr. no.	Age in years	Education	Profession /Economic class	Gravidity / Parity	Pregnancy at first checkup	Risk factors	First contact with doctor Pregnancy/ Labor/O.P/ I.P / Home	Place of delivery/ Mode	Place of death	At death Pregnant /in labor/ Postnatal	Cause of death	Crux of problem
1	24	8th	Laborer/ Lower class	G2P1L1	4 Months	Moderate anemia	8 Months Outpatient	Vaginal delivery at home	Sub district hospital Dharni	Postnatal	Severe anemia with postpartum hemorrhage	Severe anemia, home birth, post-partum hemorrhage and hemorrhagic shock
2	22	12th	Housewife/ Lower class	Primigravida	3 Months	Nil	3 Months Outpatient	Vaginal delivery at Primary health center	Home	Postnatal	Encephalitis	Day 13 PNC, psychotic behavior, had blackish vomiting, lack of care seeking, Encephalitis.
3	23	10th	Laborer/ Lower class	G3P1L1A1	Refused registration	Not known	7 Months Inpatient	Vaginal delivery at PHC	Home	Postnatal	Post-partum hemorrhage	Anemia, refusal of treatment, home birth, post-partum hemorrhage and hemorrhagic shock.
4	22	10th	Laborer/ Lower class	Primigravida	5 Months	Pre-eclampsia	7 Months	Vaginal delivery at Home	SDH Dharni	8 Months pregnant	Cerebral hemorrhage following eclampsia	Pre-eclampsia with non-adherence to treatment, eclampsia with intracranial hemorrhage.
5	26	10th	Laborer/ Lower class	Primigravida	4 Months	Moderate anemia	5 Months Outpatient	Vaginal delivery at Home	Home	Postnatal	Sickle cell crisis	Sickle cell disease with severe anemia, sickle cell crisis, home birth, cardiac arrest.
6	25	8th	Laborer/ Lower class	G2P1L1	4 Months	Moderate anemia	Intrapartum Inpatient	Vaginal delivery SDH Dharni	Women's hospital Amravati	Postnatal	Postpartum suicide by burning	Gender based violence
7	20	10th	Laborer/ Lower class	G2A1	9 Months	Gestational hypertension	9 Months Home	Vaginal delivery at home	Home	9 Months pregnant	Cerebral hemorrhage following eclampsia	Pre-eclampsia, refusal of treatment, eclampsia and cerebral hemorrhage.

8	22	10th	Laborer/ Lower class	G2P1L1	6 Months	Moderate anemia with placenta previa type III	Intrapartum Inpatient	Vaginal delivery at SDH Dharni	On the way to Amravati hospital	Postnatal	Hemorrhagic shock secondary to post-partum hemorrhage in case of placenta previa with laboring vaginal birth	Placenta previa, refusal of treatment, preterm vaginal delivery at hospital, postpartum hemorrhage and died because of hemorrhagic shock, lack of appropriate therapy.
9	19	5th	Laborer/ Lower class	G3A2	6 Months	Moderate anemia	Post-partum Inpatient	Vaginal delivery at home	SDH, Dharni	Postnatal	Severe anemia with post-partum hemorrhage with cardiac failure	Preexisting anemia, home birth, post-partum hemorrhage, heart failure.
10	22	10th	Laborer / Lower class	G3P1L1A1	Not registered	Not known	Intrapartum inpatient	Vaginal delivery at SDH Dharni	Women's hospital Amravati	Postnatal	Hemorrhagic shock secondary to post-partum hemorrhage	Severe anemia, severe pre-eclampsia, postpartum hemorrhage.
11	22	Illiterate	Laborer/ Lower class	G2A1	8 Months	Moderate anemia with cough since 5-6 months	Post partum Inpatient	Vaginal delivery at Home	Home	Postnatal	Not known	Anemia, pulmonary tuberculosis,preterm, home birth, lack of care.
12	20	8th	Laborer/ Lower class	G2A1	7 Months	Gestational hypertension	7 Months Inpatient	Vaginal delivery at women's hospital Amravati	Women's hospital Amravati	Postnatal	Eclampsia with multiorgan failure	Preeclampsia/ eclampsia, preterm still born delivery, multiorgan failure, delayed therapy.
13	21	12th	Laborer/ Lower class	Primigravida	7 Months	Severe anemia	7 Months Inpatient	Vaginal delivery at women's hospital Amravati	Government medical college, Nagpur	Postnatal	Intrauterine	Anemic, early onset preeclampsia, preterm intrauterine death with multi organ failure, delayed therapy.
14	30	10th	Laborer/ Lower class	G4P3L2D1	4 Months	Severe anemia	8 Days postnatal inpatient	Vaginal delivery at home	SDH, Dharni	Postnatal	Retained placenta with septicemic shock	Anemia, home birth, post-partum hemorrhage. septicemia, acute renal failure.
15	34	10th	Laborer/ Lower class	G4P1L1A2	5 Months	Moderate anemia	2 Days postnatal inpatient	Vaginal delivery at home	On the way to SDH, Dharni	Postnatal	Retained placenta with secondary postpartum hemorrhage with shock	Anemia, home birth, secondary post-partum hemorrhage due to retained placenta.

16	24	8th	Laborer/ Lower class	G2P1L1	3 Months	Severe anemia	Intrapartum Inpatient	Vaginal delivery at PHC	PHC	Postnatal	Post partum sepsis with secondary post-partum hemorrhage.	Severe anemia, post-partum sepsis, secondary postpartum hemorrhage, delay in therapy.
17	25	Illiterate	Laborer/ Lower class	G3P2L1D1	4 Months	Moderate anemia with gestational hypertension	No contact with doctor	Vaginal delivery at Sub centre	On the way to Khandwa from sub centre	Postnatal	Eclampsia with cerebral hemorrhage associated with other organ failure.	Gestational hypertension, anemia. stillbirth at sub-centre, post-partum eclampsia and intracranial hemorrhage, delay in appropriate therapy.
18	26	4th	Laborer/ Lower class	Primigravida	3 Months	Moderate anemia	No contact with doctor	Vaginal delivery at home	Home	Postnatal	Postpartum sepsis with pulmonary embolism	Anemia, home birth, postpartum sepsis, thrombophlebitis, pulmonary embolism, lack of care.
19	28	6th	Laborer/ lower class	G3P1L1A1	5 Months	Moderate anemia	9 Months Inpatient	Vaginal delivery at home	PHC	Postnatal	Not known	Anemia, home birth
20	23	12th	Housewife/ upper lower class	G2P1L1	4 Months	Moderate anemia	6 Months Outpatient	Vaginal delivery at sub centre	Women's hospital Amravati	Postnatal	Cardiogenic shock	Anemia, chest pain, breathlessness
21	24	4th	Laborer/ Lower class	G2A1	4 Months	Moderate anemia	6 Months Inpatient	Pregnant	SDH, Dharni	6 Months pregnant	Cardiogenic shock with severe dehydration due to gastroenteritis	Gastroenteritis with severe dehydration, cardiogenic shock, delayed therapy.
22	21	8th	Laborer/ Lower class	Primigravida	6 Months	Severe anemia	8 Months Outpatient	Vaginal delivery at women's hospital Amravati	General hospital Amravati	Postnatal	Blood transfusion reaction	Severe anemia, post-partum blood transfusion reaction.
23	25	10th	Laborer/ Lower class	Primigravida	4 Months	Severe anemia	8 Months Inpatient	Pregnant	Women's hospital Amravati	8 Months pregnant	Sickle cell crisis with acute lung injury	Severe anemia, sickle cell crisis, acute lung injury, delay in appropriate therapy.
24	29	10th	Laborer/ Lower class	G4P3L2	4 Months	Moderate anemia with gestational hypertension	9 Months Outpatient	Vaginal delivery at SDH Dharni	Women's hospital Amravati	Postnatal	Severe anemia with severe pre-eclampsia with multi organ failure	Anemia, severe preeclampsia, multi organ failure, delay in appropriate therapy.

25	24	12th	Housewife/ Upper lower class	G2A1	3 Months	Moderate anemia	3 Months (Private hospital outpatient)	Pregnant	District hospital Amravati	9 Months ANC	Swine flu	Anemia, swine flu, respiratory failure, delay in appropriate therapy.
26	20	10th	Laborer/ Lower class	Primigravida	3 Months	Moderate anemia	6 Months Inpatient	Vaginal delivery at SNH Utavali	SNH, Utavali	Postnatal	Pulmonary edema and intra cranial hemorrhage	Anemic, eclampsia, abruptio placenta, intracranial bleed, pulmonary edema.
27	23	8th	Laborer/ Lower class	G2P1L1	4 Months	Moderate anemia	5 Months Outpatient	C-section at women's hospital Amravati	Women's hospital Amravati	9 Months pregnant	Heart disease (not specified) with pulmonary edema	Heart disease, during emergency C- section died on OT table.
28	24	8th	Laborer/ Lower class	G2A1	5 Months	Moderate anemia	No contact with doctor	Pregnant	Home	8 Months pregnant	Hypovolemic shock due to ante-partum hemorrhage	Anemia, placental abruption.
29	20	10th	Laborer/ Lower class	Primigravida	3 Months	Moderate anemia	Post-partum Inpatient	Vaginal delivery at Home	Home	Postnatal	Post-partum thromboembolism with right side hemiplegia	Home birth, post-partum thromboembolism, delay in appropriate therapy.
30	19	12th	Laborer/ Lower class	Primigravida	3 Months	Moderate anemia	6 Months Outpatient	Pregnant	General hospital Amravati	6 Months pregnant	Heart disease with pulmonary edema with sub-acute endocarditis with embolism	Anemia, heart disease diagnosed in second trimester, embolism, pulmonary edema, lack of care.
31	20	4th	Laborer/ Lower class	Primigravida	6 Months	Severe anemia	Post partum Inpatient	Vaginal delivery at home	GMC Nagpur	Postnatal	Post partum septicemia with multi organ failure	Preterm vaginal delivery at home. Post partum sepsis and acute renal failure.
32	23	4th	Laborer/ Lower class	G2P1L1	5 Months	Moderate anemia	Postpartum	Vaginal delivery at home	SNH Utavali	Postnatal	Pulmonary embolism	Anemia, pulmonary embolism.
33	25	10th	Laborer/ Lower class	G2P1L1	3 Months	Moderate Anemia with Gestational hypertension	Postpartum	Vaginal delivery at home	Home	Postnatal	Eclampsia with cerebral hemorrhage	Anemia, eclampsia, cerebral hemorrhage, non-compliance to advice.
34	24	5th	Laborer/ Lower class	G3P2L1	4 Months	Moderate anemia	Post-partum	Vaginal delivery at home	On way to hospital	Postnatal	Heart disease with heart failure	Anemia, heart disease, home birth, delay in appropriate care.

35	25	5th	Laborer/ Lower class	G3P1L1A1	4 Months	Mild anemia with gestational hypertension	9th Month	Vaginal delivery at Women's general hospital, Amravati	Women's General Hospital, Amravati	Postnatal	Eclampsia with HELLP syndrome	Eclampsia, multi organ failure
36	20	3rd	Laborer/ Lower class	Primigravida	3 Months	Mild anemia	9th Month	Vaginal delivery at home	On way to SDH	Postnatal	Sickle cell crisis with pulmonary edema	Anemia, sickle cell disease, sickle cell crisis, pulmonary edema.
37	28	4th	Laborer/ Lower class	G4P3L3	4 Months	Severe anemia with sickle cell disease	Post-partum	Vaginal delivery at Home	At home	Postnatal	Severe anemia with sickle cell disease, heart failure with embolism	Severe anemia, sickle cell disease, embolism, home birth.
38	20	5th	Laborer/ Lower class	Primigravida	4 Months	Mild anemia	4th Month	Vaginal delivery at home	On way to Bairagad PHC	Postnatal	Retained placenta with embolism with heart failure	Home birth, retained placenta, delay in appropriate treatment.
39	35	4th	Laborer/ Lower class	G5P1L1A3	4 Months	Mild anemia	7th Month	Pregnant	SDH Dharni	Antenatal	Eclampsia with cerebral hemorrhage	Eclampsia with cerebral hemorrhage, lack of right care.
40	18	10th	Laborer/ Lower class	Primigravida	4 Months	Mid anemia	6th Month	Vaginal delivery at GMC, Nagpur	GMC ,Nagpur	Postnatal	Pyrexia of unknown origin with head injury.	Pyrexia of unknown origin and in hospital patient had head injury and intracranial bleed.
41	27	5th	Laborer/ Lower class	Primigravida	4 Months	Mild anemia	Postpartum	Vaginal delivery at sub centre	Home	Postnatal	Cerebral malaria or puerperal sepsis with encephalitis or puerperal sepsis with late eclampsia	Malaria and puerperal sepsis, lack of asepsis.
42	28	5th	Laborer/ Lower class	G4P1L1A2	3 Months	Mild anemia	Postpartum	Vaginal delivery at home	GMC ,Nagpur	Postnatal	Acute fatty Liver with ascites with renal failure.	Home birth, delay in appropriate treatment.
43	22	5th	Laborer/ Lower class	G2P1L1	3 Months	Mild anemia /fever	Intrapartum	Emergency C-section at SNH, Utavali	Home	Postnatal	Dengue with severe thrombocytopenia	Postpartum dengue with severe thrombocytopenia, referred to Amravati instead she was admitted to SDH Dharni, condition deteriorated, referred again but died during transfer, delay in appropriate treatment.

44	23	5th	Laborer/ Lower class	G3P2L2	3 Months	Severe anemia	Postpartum	Vaginal delivery at home	Home	Postnatal	Severe anemia with heart failure.	Severe anemia, home birth, heart failure.
45	24	4th	Laborer/ Lower class	G2A1	5 Months	Mild anemia	7th Month	Pregnant	At GMC Nagpur	Antenatal	Antenatal sepsis	High grade fever, intrauterine fetal death with sepsis. DIC
46	19	4th	Laborer/ Lower class	Primigravida	4 Months	Mild anemia	7th Month	Pregnant	SDH Dharni	Antenatal	Hepatitis	Hepatitis, condition deteriorated and died before evaluation.
47	21	6th	Laborer/ Lower class	Primigravida	3 Months	Severe anemia	6th Month	Pregnant	On the way to Daferin hospital, Amravati	Antenatal	Sickle cell crisis with congestive cardiac failure	Sickle cell disease with sickle cell crisis CHF.
48	22	8th	Laborer/ Lower class	Primigravida	5 Months	Gestational hypertension	6th Month	Pregnant	Irvin hospital, Amravati	Antenatal	Antepartum eclampsia with cerebral hemorrhage	Severe preeclampsia progressed to antepartum eclampsia. Refusal to seek medical care. Delayed therapy. Cerebral hemorrhage due to eclampsia.
49	20	10th	Laborer/ Lower class	G2A1	7 Months	Mild anemia	Postpartum	Vaginal delivery in ambulance on way to SDH, Dharani	Superspecialist hospital, Amravati	Postnatal	Postpartum shock, renal failure	Preterm delivery in ambulance on the way to SDH, Dharani. Postpartum hemorrhage which could not be managed timely. Died due to acute I) Hypovolamic shock with AKI II) Atonic/ Traumatic PPH, delay in treatment.
50	20	10th	Laborer/ Lower class	Primigravida	5 Months	Intracranial lesion	Intrapartum Inpatient	Vaginal delivery at Dharanmahu sub-centre	SDH, Dharni	Day 34, Postnatal	Undiagnosed intracranial lesion	Intracranial lesion, Vaginal delivery at Dharanmahu sub-centre.

51	25	5th	Laborer/ Lower class	G2P1L1	4 Months	Mild anemia	5 Months	Vaginal delivery at SDH, Dharni	Irvin hospital, Amravati	Postnatal	Cardio respiratory failure	Preterm delivery at SDH, Dharni. As per the postpartum report cardiac respiratory failure following septicemia with respiratory distress
52	21	12th	Laborer/ Lower class	Primigravida	3 Months	Mild anemia	4 Months	C-section at SDH, Dharni	SDH, Dharni	Postnatal	Acute cardiac respiratory arrest due to sickle cell crisis	Her relative made her drink 2 glass of water without asking hospital staff and doctor. After few hours she expressed difficulty in breathing. Patient was attended immediately by doctor and hospital staff. Despite of intensive treatment, she succumbed on 26/08/2022, 7.30 PM. Her postmortem report revealed the cause of death as "Acute cardio respiratory arrest due to sickle cell crisis"
53	26	10th	Laborer/ Lower class	G2P2	3 Months	Mild anemia	5 Months	Vaginal delivery at Irvin Hospital, Amravati	District hospital Amravati	Postnatal	Sickle cell crisis	Her Hb was 3 gm and she had edema all over the body. At Dafrin hospital she was transfused three blood bags and two platelets. On 27/9/2022 she had labor pain and at 6 pm she had normal vaginal delivery. In postmortem report sickle cell crisis was found to be the cause of death.

54	26	6th	Laborer/ Lower class	Primigravida	3 Months	Severe anemia with cardiac disease	4 Months	C-section at GMC, Nagpur	GMC, Nagpur	Postnatal	Ante partum eclampsia with presented with Septicemia with septic shock with accelerated Hypertension with Cardio respiratory Arrest	After C-section the patient was stable through the night. On 28/4/23 she was given one unit platelets along with IV fluids. On 29/4/23 she was stable. On 30/4/23 at 1.10 pm in the afternoon, she died. The relatives refused postmortem. Cause of death in 26 year old P1 IUD 1 Post LSCS day 4 with antepartum eclampsia, septicemia with septic shock, accelerated hypertension with CRA

Discussion

MMR, the number of women who die per 100,000 live births, during pregnancy, or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy from any cause related to or aggravated by pregnancy or its management, excluding accidental or incidental causes, birth and post birth. It varies greatly across the regions, due to the differences in preconception health of women, anemia, women's, education, economic status, variations in care during pregnancy, birth, post birth, access to emergency maternity care, and other factors which affect mother's and baby's health. Providing appropriate comprehensive care by skilled healthcare providers at home or, close to the places of their residence, is well recognized strategy to facilitate care and birth at health facility. However, in spite of the system, women either do not go to any health facility or by-pass the available facility because of the lack of resources of the household or health system's policies, or the readiness of the nearest facility to provide care with available teams, right attitude of women's, families and community service providers, transfer system, and so on. However, beliefs also have big impact on their decisions of utility of services and birth places. Agrawal *et al.* [3] reported that each year in India, roughly 28 million women experienced pregnancy and 26 million live births occurred, and an estimated 67,000 MDs occur and one million new-born die. India has shown an appreciable decline in MMR from 398 in the year 1997-98, to 254 in 2004-06, 130 in 2014-2016, and 113 in 2016-18 according to the special bulletin on Maternal Mortality in India [4]. As per the National Health Policy (NHP) document 2017, the national target for MMR was 100 by 2020, which has not been achieved, worst is that in some States, MMR is still very high. However, in some States, target of 70 has been achieved but in such States also, there are black dots, like the one in the province of study villages [5]. So, it is essential to have continuous surveillance and response for each region. In order to achieve the National Rural Health Mission and Millennium Development Goal of less than 100 MMR everywhere, there is a need to accelerate the pace of decline of MMR [6]. When services were initiated in the rural and remote region, MMR was 400, and in the State, MMR was 68 [7] and 2019-2020 MMR was 46 and in 2020-2021 it was 57 and in 2021-2022 it was 113 and in 2022-2023 it was 61 [8]. In the villages being served in 2013-2014 it was found 300, however there were challenges in collecting information when services were started and 162 in 2019-20 and 148 in 2020-2021 and in 2021-2022 it was 53 and in 2022-2023 it was 25, over all in the region it was 188 in 2020-2021, 190 in 2021-2022 and unfortunately 264 in 2022-2023. So there has been impact of health facility and services. As is well known MD Reviews (MDR) and MD Surveillance Response (MDSR) are strategies to find gaps and accordingly take action to improve the quality of care and reduce maternal mortality, neonatal mortality, and severe illnesses and the same is being done in the villages. Analysis of the information of each death can identify the real cause, including the delays at various levels that contribute to MDs. The information needs to be used to adopt measures to fill the gaps in service delivery as well as service acceptance. In the region from where this information in being shared, there is extreme poverty and there are access problems. Over all 54 women who died over a decade have their own stories. The crux was severe anemia, in last few days of pregnancy, traumatic births at home, missed diagnosis at health facilities and women's refusal to stay with health facility (**Table 5**). Looking at the situation it seems that having health facilities, and even community based maternal services will not change the scenario, unless social perspectives are taken care, be it women or their families and communities. It needs best of the counseling, focus group discussions, role plays, better understanding of many more things so that women may be made to understand the need of care and get timely appropriate care. Elimination of maternal deaths requires improvement as per the need in the pre-conception health and avoidance of clinical errors by refining clinical skills and increasing the availability and quality of services. Health providers need to be with updated knowledge. Most important, there has to be right attitude of healthcare providers, and they must have concern for each woman who seeks care. Analysis of records of deaths cases revealed that there were problems of communication, between health systems and women, knowledge and attitude at health facilities, and strong beliefs of women and families, about not staying with health facility, which lead to loss of lives. Women left hospitals and died on the way, or at home within hours of discharge from hospitals. Sometimes they were discharged by the healthcare providers without understanding the real problem. Some women took discharge against medical advice and died within hours of discharge. Women who died needed services which were not difficult to get even in the region with low resources. Some women did not seek care because of their beliefs or lack of faith in the available health system. The extent of bypassing the nearest facility in a rural Ugandan setting was 29%, and was found to be associated, primarily with the readiness of the nearest facility to provide care as well as the wealth of the household. In these women also these two things played some role. Also, deaths are not always because of obstetric causes as pregnant women are not immune to other illnesses. During pregnancy disorders like, haemoglobinopathies or cardiac diseases become more dangerous. Also, something seriously needs to be done preconception for prevention and treatment of anemia, as it appears that most pregnant women were anemic, some even severely and very severely anemic during pregnancy. Of all the maternal death cases, 15 (27.78% of 54) had severe anemia (Hemoglobin <7 gms/dl) in the days before they died. Obvious reasons seem to be extreme poverty and lack of required food which lead to multiple deficiencies. Also, bio-fuel mass, which almost 80% of families use for cooking, hot water, bath and also for protection from cold in the villages, might be contributing to their anemia. WHO considers MMR of around 20, reasonable. Present study in rural areas revealed that a lot was needed to reach this goal. McConnell *et al.* [9] reported that at South Carolina, effects of an intensive home visiting program of the nurses on adverse birth outcomes for the intervention group were not significantly better for any maternal and newborn health, primary or secondary outcomes in the overall sample or in either of the pre specified subgroups. Assignment to participate in an intensive home visiting program of nurses did not significantly reduce the adverse birth outcomes. So, there are reasons not obvious. Shah *et al.* [10] reported that MMR reduced from 607 (19 deaths) in 2002–2003 to 161 (five deaths) between 2010–2011 in rural India. The institutional delivery rate increased from 23% to 65%. The trend of falling MD was significant over the times, with an annual reduction of 17%. There was significant reduction in adjusted MDs due to direct causes, during intrapartum and post-partum periods, and those which occurred at home. However, reduction in MDs due to indirect causes and during antepartum period were not statistically significant. In the present analysis 16 (29.6%) out of 54 women died due to PPH, one had placenta Previa not managed rightly, leading to hemorrhagic shock after birth and 2 women died of secondary PPH

due to retained placenta. Shah *et al.* [11] reported that most MDs of rural India were occurring at hospitals and due to indirect causes. Anemia along with other hematological causes like sickle cell disease have been leading causes of maternal deaths often due to post-partum hemorrhage. In the present analysis 7 (12.9%) out of 54 women died due to Sickle Cell crisis. One woman landed up in sepsis preceding death. These women and their families refused hospital admission for intra and post-partum care. Total 15 (27.7%) out of 54 women died of eclampsia, (10 had intracranial hemorrhage, 4 with multi organ failure and one developed hemolysis elevated liver enzymes and low platelet count (HELLP) syndrome). The main issues in these cases were non-compliance to treatment advised. Other causes included undiagnosed placenta Previa, pyrexia of unknown origin, dengue and thrombocytopenia, heart disease, and gender-based violence too. Kinney *et al.* [12] opined that maternal and perinatal death surveillance and response (MPDSR) is health system's process which entails the continuous cycle of identification, notification and review of maternal and perinatal deaths, followed by actions to improve service delivery and quality of care. The MPDSR system in India is to record and review all maternal and perinatal deaths but underreporting of deaths remains a major implementation challenge. Fear of blame and malpractice litigation among health workers are important factors in underreporting, suggestive of an increased humidification of birth care by taking MPDSR implementation as an entry point, an increasing public notion of MDs being caused by malpractice, and a tendency to perceive the judicial system as the only channel to claim accountability for MDs, the development of strategies to avoid personalized accountability for deaths. The same was tried in the remote rural region. Antecedent maternal disorders and fetal outcomes in cases of maternal deaths revealed that with mothers dying many babies are also lost. Out of 54 mothers, 14 died during pregnancy and 40 delivered in which 18 babies were lost.

Information reveals need of timely interventions aimed at prevention of maternal deaths and improving fetal neonatal outcomes by working on technical as well as nontechnical aspects.

Conclusion

Analysis of 54 deaths which occurred in the service villages over a decade revealed maximum MDs were amongst women of 20 to 29 years (46 (85.18%)), believed to be best years. Maximum deaths were in women with first pregnancy 21 (38.9%). Out of 54 women, 52 (96.2%) women were of low economic status. Most deaths were preventable even in the region with low resources.

Conflict of Interest

Authors have no conflict of interest.

Funding

Nil.

Acknowledgement

Thanks are due to NM assigned villages and residents who have worked at rural hospital over the years on deputation from main institute in rotation.

References

1. Agrawal N, Patel S, Badkur M. Three delay model: to find out the reason for maternal deaths. Int J Res Med Sci 2020; 8(4):1273.
2. Akaba GO, Nnodu OE, Ryan N, Peprah E, Agida TE, Anumba DO, et al. Applying the WHO ICD-MM classification system to maternal deaths in a tertiary hospital in Nigeria: A retrospective analysis from 2014–2018. Plos One. 2021 Jan 4; 16(1):e0244984.
3. Vimalesvaran S, Ireland J, Khashu M. Mind your language: respectful language within maternity services. The Lancet. 2021 Mar 6; 397(10277):859-61.
4. Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. Journal of Health and Social Behavior. 2010 Mar; 51(1_suppl):S28-40.
5. Vedam S, Stoll K, McRae DN, Korchinski M, Velasquez R, Wang J, et al. Patient-led decision making: Measuring autonomy and respect in Canadian maternity care. Patient Education and Counseling. 2019 Mar 1; 102(3):586-94.
6. Kinney MV, Day LT, Palestra F, Biswas A, Jackson D, Roos N, et al. Overcoming blame culture: key strategies to catalyse maternal and perinatal death surveillance and response. Bjog. 2022 May; 129(6):839.
7. Eziawdres D, Worku W, Taye M. Maternal satisfaction with delivery services and its associated factors among mothers who gave birth at public health centers in Yeka Sub City, Addis Ababa, Ethiopia. Health Services Insights. 2021 Oct; 14:11786329211050722.
8. Melberg A, Teklemariam L, Moland KM, Aasen HS, Sisay MM. Juridification of maternal deaths in Ethiopia: a study of the maternal and perinatal death surveillance and response (MPDSR) system. Health Policy and Planning. 2020 Oct; 35(8):900-5.
9. Mubiri P, Kajjo D, Okuga M, Marchant T, Peterson S, Waiswa P, Hanson C. Bypassing or successful referral? A population-based study of reasons why women travel far for childbirth in Eastern Uganda. BMC Pregnancy and Childbirth. 2020 Dec; 20:1-10.
10. Menéndez C, Quintó L, Castillo P, Fernandes F, Carrilho C, Ismail MR, et al. Quality of care and maternal mortality in a tertiary-level hospital in Mozambique: a retrospective study of clinicopathological discrepancies. The Lancet Global Health. 2020 Jul 1; 8(7):e965-72.
11. Arruda CL, Ferreira D'Agostini Marin D, Depieri Michels B, Martins Rosa V, Iser BP. Maternal mortality in South region of Brazil: an analysis from 2000 to 2018. Journal of Obstetrics and Gynaecology. 2022 Oct 3; 42(7):2715-21.
12. McConnell MA, Rokicki S, Ayers S, Allouch F, Perreault N, Gourevitch RA, et al. Effect of an intensive nurse home visiting program on adverse birth outcomes in a Medicaid-eligible population: A randomized clinical trial. JAMA. 2022 Jul 5; 328(1):27-37.
13. Shah P, Shah S, Kutty RV, Modi D. Changing epidemiology of maternal mortality in rural India: time to reset strategies for MDG-5. Tropical Medicine & International Health. 2014 May;19(5):568-75.
14. Sengupta A, Sahoo M, Khan A, Shaikh R, Khan R. Maternal health status in tribal India: A 5-year intervention program and its outcome. Indian Journal of Community Medicine. 2020 Apr 1;45(2):189-93.
15. Collier AR, Molina RL. Maternal mortality in the United States: updates on trends, causes, and solutions. Neoreviews. 2019 Oct 1;20(10):e561-74.