

Why Some Mothers Could Be Saved and Not Others? Evaluating Different Phases of Delay in Causing Maternal Near Misses and Maternal Deaths

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ABSTRACT

Introduction: The factors playing key role in determining death and survival among the Maternal Mortality (MM) and Maternal Near Miss (MNM) cases are multidetermined and interdependent. It ranges from initial illness to perception of patients to seek healthcare services and initiation of management at primary health care settings.

Aim: To evaluate the factors responsible for causing delay at different phases and thereby assess the key determinants of survival and death of mothers.

Materials and Methods: This cross-sectional observational study was undertaken at the tertiary care centre and teaching hospital in northern India from October 2015 to December 2016. Study population consisted of all women who were identified as MNM and MM which occurred at Centre. Attendants accompanying the patient, mostly nearest kin who were able to give details of her health were questioned. Details regarding the sequence of events that caused her severe morbidity were taken right from recognition of morbid status to landing up in the tertiary setup. Approximate duration of delay for each case of MNM and MM was assessed. Any delays in accessing or receiving medical care were recorded, if available. Data Entry was done on MicroSoft Excel spreadsheet. Proportions were calculated for qualitative data. Mean score with confidence interval was calculated for

quantitative data. Qualitative data was analysed by Chi-Square test and t-test was applied for quantitative data.

Results: Out of 31,111 live births during the study period, there were 249 maternal near miss cases and 131 maternal deaths. Delay in women seeking help was observed in a total of 92.36% of cases in MNM group and 97.70% of cases in MM group ($p=0.034$). The study discovered significant differences when referral status ($p=0.4904$) as well as when number of referrals ($p=0.041$) were considered. There was a significant difference between the women of the two groups who reported only first phase delay ($p=0.033$). The major pregnancy related morbidities were haemorrhage and hypertensive disorders of pregnancy. Patients with hypertensive disorders of pregnancy with delay more than 12 hours survived the acute insult but were unable to cope with dysfunction of multiple organs and passed on after prolonged intensive care whereas in cases of Postpartum Haemorrhage (PPH), delay >6 hours were observed with extremely poor prognosis.

Conclusion: Delay in taking decisions to seek healthcare is a major cause of MM. There is a little difference in outcome in terms of survival and death of mothers with delay in any of three phases despite increased intervention taken in adequate referral facilities. Precious time lost in deferral and referral contributes immensely to poor prognosis of mothers as compared to direct referral to an adequate health facility.

Keywords: Maternal mortality, Prognosis, Survival

INTRODUCTION

The Maternal Mortality Rate (MMR) declined from 167 in 2011-13 to 130 in 2014-16 [1]. However, world is still far away from the target set out at Sustainable Development Goals (SDGs) of reducing global MM to less than 70 deaths per 100,000 live births by 2030 [2]. The concept of "MNM" was introduced in maternal health care to evaluate the large base formed by maternal morbidity beneath the iceberg of MM [3-6]. The factors playing a key role in determining death and survival among the MM and MNM cases are multidetermined and interdependent. It ranges from initial illness to perception of patient to seek healthcare services and initiation of management at primary health care setting. Thaddeus S and Maine D concept of three delays model is an effective tool to analyse the crucial circumstances surrounding the event of childbirth of MNM and MM cases [7]. Outcome is profoundly influenced by duration of delays at three levels namely first, second and third.

Phase I delay: Delay on the part of the individual, the family, or both in deciding to seek care at a health facility. Several factors may influence the ultimate decision to approach health care like attitude of family members, socioeconomic status, perception of health status of women, religious barriers, traditional restrictions on

women to seek health care, prior appraisal with the health system and hence prior conjecture of quality of service [7].

Phase II delay: Delay in reaching an adequate health care facility. Depends mainly on factors of transportation feasibility which may include travel cost, condition of roads, distance of health facility from home and availability of accompanying person [7].

Phase III delay: Delay in receiving adequate care at the facility. The factors relevant to phase III delay include pertinent referral facility, availability of supplies, equipment and competence of available personnel [7].

Death or survival of a woman can be a consequence of a delay of one or all three phases. Although not intricately related to each other, they can influence the outcome at another phase. Hence, an unfortunate woman may face misadventure even staying a few steps away from the best health care facility, if she or family members remain ignorant or unobservant of her critical health status [7]. Delayed decision to pursue treatment already puts a mother at devastated health status and if complemented by poor transportation facilities can lead her to land in the finest of healthcare at the point of death. Even with the best expertise in terms of medical and surgical intervention and availability of

equipment, blood products etc. she may be in terminal decline. It also puts an extra burden on the health infrastructure to arrange for equipment, lifesaving products in short period of time. In health care centres where the load of emergency obstetric cases is already high, coordinating and establishing the conformance may cause Phase III delay [8]. Prognosis may depend largely on the availability of intensive care facilities too. Knight HE et al., recognised six groups of factors, which may hinder adequate response to obstetric emergencies namely drugs and equipment, policy and guidelines, human resources, facility infrastructure, patient-related and referral-related aspects [9]. A number of innovative steps in this regard can be adopted. National level programs to generate public awareness for recognition of danger signs in pregnancy can be taken and canvassed by proficient intellectuals or celebrities to spread the issue. The model of Pulse Polio Immunisation in India can serve as an exemplary event and can be adopted to fulfill the objective. Spreading empathy towards helping pregnant women in times of critical status with more digital programs can contribute to decreasing delay in community level. Political will to resolve issues of transportation for providing communication facilities to ailing mothers can go a long way. Educating and training obstetricians in managing initial lifesaving interventions like intubation, central line catheterisation, cardiac resuscitation etc. will save precious time in saving critically ill mothers.

There were only few studies undertaken in India to evaluate different phases of delay which may contribute to survival or death of a mother [10,11]. Hence, the aim of the study was to evaluate factors responsible for causing delay at different phases and thereby to assess the key determinants of survival and death of mothers.

MATERIALS AND METHODS

The present cross-sectional observational study was carried out in the Department of Obstetrics and Gynaecology from October 2015 to December 2016 in a tertiary care centre and teaching hospital in northern India in New Delhi. Approval was taken from the Institutional Ethics Committee (IEC/VMMC/SH/Thesis/October/2015) for undertaking the observational study. Informed written consent in all near-miss cases were taken.

Inclusion criteria: Study population consisted of all women who were identified as MNM and MM occurring during the study period.

Exclusion criteria: Among these patients whose relatives were either not available or not willing or are unable to provide details to participate in the face-to-face interview process were excluded from the study.

The three phases of delays i.e., Phase I- delay in deciding to attend a health care facility; Phase II- delay in reaching an adequate health care facility; and Phase III- delay in receiving adequate care at that facility; are subsequential and inter-linked [8].

Maternal Near-Miss (MNM): "A woman who has suffered from life-threatening conditions during pregnancy or within 42 days of pregnancy termination, either due to termination of pregnancy or childbirth and sustained oneself regardless of getting emergency medical/surgical interventions or otherwise [12]".

A woman is identified as MNM, when at least 3 criteria (one from each category) are fulfilled [12]:

1. Any symptom or clinical sign.
2. Investigations.
3. Cardiorespiratory collapse as indicated from any single criteria or interventions undertaken as a result of different adverse events and abnormalities associated with them.

Maternal Mortality (MM): "A woman who died during pregnancy or within 42 days of termination of pregnancy, regardless of the duration and site of the pregnancy, due to any cause which is related to or is escalated by the pregnancy or its management, but

not from accidental or incidental causes [13]."

For all the women enrolled, the causes of MNM and MM were identified. Facility based MNM-Review (MNM-R) and Maternal Death Review (MDR) proforma were filled. Attendants accompanying the patients mostly nearest kin who were able to give details of her health were interviewed. Details regarding the sequence of events that caused her severe morbidity were taken right from recognition of morbid status to landing up in the tertiary setup. Approximate duration of delay for each case of MNM and MM was assessed. Any delays in accessing or receiving medical care were recorded if available.

STATISTICAL ANALYSIS

Data entry was done on Microsoft Excel spreadsheet. In data analysis, for qualitative data, proportions were calculated. Mean score with confidence interval was calculated for quantitative data. Test of significance of differences between proportions and means were calculated. Qualitative data was analysed by Chi-Square test and t-test was applied for quantitative data. Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) software for Windows version 20.0.

RESULTS

There was a total of 31,925 deliveries during the study period out of which total number of live births were 31,111. There were 249 women who experienced a severe complication, nearly died but survived. A total of 131 women could not be saved despite all efforts. Analysis of demographic factors revealed women belonging to lower socioeconomic status and those who were unable to read and write were at high risk of dying from childbirth. Most of these women did not attend the minimum antenatal visits. Patients who went through referral from multiple health centres had higher chances of dying than those who came directly or with referral from single health centre. The referral from hierarchy of health institutions caused significant delay deteriorating the health condition of mothers [Table/Fig-1] [14].

Parameters	Maternal Near Miss (MNM) (n=249) (N, %)	Maternal Mortality (MM) (n=131) (N, %)	p-value
Age range (Years)			0.29 *
Mean±SD	26.55±4.16	26.02±5.05	
Socioeconomic status (PCMII)*** [14]			<0.001**
Lower	175 (70.9)	117 (89.3)	
Middle+Upper	74 (29.7)	14 (10.7)	
Educational status			<0.001**
Illiterate	184 (73.9)	120 (91.6)	
Literate	65 (26.1)	11 (8.4)	
Booking status			<0.001**
Unbooked	227 (91.2)	123 (93.9)	
Booked (≥3 Visits)	22 (8.8)	8 (6.1)	
Parity status			0.705**
Primipara	77 (30.9)	43 (32.8)	
Multipara	172 (69.0)	88 (67.1)	
Referral status			0.4904**
Referred	178 (71.4)	98 (74.8)	
Self-Admitted	71 (28.5)	33 (25.2)	
Number of referrals (Referred)			0.041**
n=178	n=98		
1	115 (64.6)	51 (52.0)	
>1	63 (35.4)	47 (47.9)	
Delivery status			0.179**
Antenatal	180 (72.3)	86 (65.6)	
Postnatal	69 (27.7)	45 (34.3)	

Period of Gestation (Weeks) (Antenatal)	n=180	n=86	
<12	23 (12.8)	1 (1.2)	0.004**
12-28	15 (8.3)	14 (16.3)	
>28	142 (78.9)	71 (82.6)	
Mean±SD	30.74±10.09	33.08±6.01	
Mean hospital stays (Days)	8.94±3.06	3.27±6.9	<0.001*
ICU admission			
Yes	159 (63.9)	90 (68.7)	0.34**
No	90 (36.1)	41 (31.2)	
Mode of delivery			
Vaginal delivery	108 (43.4)	48 (36.6)	0.0003**
Lower Segment Caesarean Section (LSCS)	89 (35.7)	39 (29.8)	
Laparotomy for rupture uterus	16 (6.4)	2 (1.5)	
Others	36 (14.5)	42 (32.1)	
A. Abortion	12 (4.8)	7 (5.3)	
B. Ectopic	24 (9.6)	1 (0.8)	
C. Undelivered	0	34 (26)	

[Table/Fig-1]: Descriptive characteristics of MNM and MM groups.

*Independent t-test; **Chi-square test; ***SEC STATUS (PCMI): Socioeconomic status (per capita monthly income): <938 (Lower); 938-6253 (Middle); ≥6254 (Upper); (Modified BG prasad scale,2017) [14]; SD: Standard deviation; ICU: Intensive care unit

Delay in women seeking help was observed in a total of 92.36% of cases in MNM group and 97.70% of cases in MM group. A total of 7.63% and 2.3% of patients in MNM and MM group respectively had no delay at any phase with significant difference ($p=0.034$). When only first phase delay was considered, the difference in both the groups was significant ($p=0.033$). However, most cases of MM could not be ascribed to a single phase of delay and more frequently a combination of delay in different phases was in play to

Phases of delay	Maternal near miss (MNM) (n=249) N (%)	Maternal mortality (n=131) N (%)	p-value
No delay	19 (7.63)	3 (2.29)	0.034
First delay	37 (14.85)	31 (23.67)	0.033
Second delay	8 (3.21)	1 (0.76)	0.136
Third delay	42 (16.86)	21 (16.03)	0.835
First+Second	10 (4.01)	1 (0.76)	0.072
First+Third	117 (46.98)	71 (54.19)	0.181
Second+Third	11 (4.41)	2 (1.52)	0.141
All phases delay	5 (2.0)	1 (0.76)	0.355

[Table/Fig-2]: Comparison of phases of delay in Maternal-Near-Miss (MNM) and Maternal Mortality (MM) groups.

*Chi-square test

Primary determinant/ Diagnosis	Maternal near-miss (N=249)	Maternal mortality (N=131)	Time from recognition of symptoms to reporting in hospital	Maternal near miss N (%)	Maternal mortality N (%)	p-value
Haemorrhage	103 (41.36%)	29 (22.13%)	<3 h	55 (53.4)	7 (24.1)	0.005*
			3-6 h	27 (26.2)	8 (27.5)	0.983*
			>6 h	21 (20.4)	14 (48.3)	0.003*
Hypertensive disorders of pregnancy (Pre-eclampsia/ Eclampsia)	54 (21.68%)	45 (34.35%)	<6 h	24 (44.5)	29 (64.4)	0.047*
			6-12 h	13 (24)	10 (22.2)	0.828*
			>12 h	17 (31.4)	6 (13.3)	0.033*
Obstetric sepsis	48 (19.27%)	30 (22.9%)	-	-	-	-
Medical disorder or dysfunction	22 (8.83%)	24 (18.32%)	-	-	-	-
Severe anemia	21 (8.43%)	3 (2.29%)	-	-	-	-
Incidental/accidental (Anaphylaxis)	1 (0.4%)	0	-	-	-	-

[Table/Fig-3]: Duration of delays with respect to clinical presentation.

*Chi-square test

cause deterioration in the health of women's health. Most common delay observed was a combination of first delay and third phase delay in a total of 46.98% in the MNM group and 54.19% in MM [Table/Fig-2].

Among the direct causes gestational hypertensive disorder accounted for the highest proportion of deaths i.e., 34.35%. Among the women who survived, most of them were suffering from haemorrhage followed by hypertensive disorder and sepsis. In present study, patients with hypertensive disorders of pregnancy who reached the institution within six hours of first recognition of symptoms, all of them could be saved. Those reporting within 6 to 12 hours had prognosis depending on their stage of presentation. There were women who reached the institution with more than 12 hours delay. Despite all interventions and efforts, six unfortunate mothers survived the acute insult but were unable to cope with dysfunction of multiple organs and passed on after prolonged intensive care. Whereas in cases of PPH, delay >6 hours were observed with extremely poor prognosis. Although they underwent maximum number of interventions, 14 mothers could not be saved. A delay of <3 hours was associated with good prognosis and appropriate intervention undertaken at the proper time could save their lives. A delay for 3-6 hours leaves patients with organ dysfunction mostly [Table/Fig-3].

More than one phase of delay was present in most of the women contributing to her ill-health. Attendants accompanying the patients were interviewed and causes were elaborated [Table/Fig-4].

DISCUSSION

The huge difference in maternal deaths in high and low-income countries currently is primarily due to variation in the management of time while dealing with obstetric complications. Judicious use of the precious moments with skilled obstetric care can save mothers from dying. However, any delay in providing such can bring devastating effects which may range from long time morbidity to death. Delay in different phases hence can reflect standards of obstetric care in a community. According to an estimate by the World Health Organisation, 88-98% of maternal deaths can be prevented with effective referral systems providing prompt access to emergency obstetric care [15]. In the study, high incidence of Phase 1, Phase 3 and Phase 1+3 delay in both MNM and MM groups was observed. A combination of delays poses a greater health risk as the cumulative effect causes collation of risk factors for causing morbidity and mortality in mothers.

Phase 1 delay may be the event most perplexing to settle as it deals with the conceptual and behavioural phenomenon of patient and family members [16] and have been discovered in many studies in India even in Tertiary health centres [17-19]. In present study, first phase delay was observed in 67.84% in MNM cases and 79.38% in MM cases either in isolation or in combination with other phases

Causes of first phase delay		
	MNM cases (N=169)* N (%)	MM cases (N=104)* N (%)
Heedless and unsuspecting of the symptoms	72 (42.60)	47 (45.19)
Financial strain	45 (26.62)	34 (32.69)
Non-availability of accompanying persons	28 (16.56)	13 (12.5)
Unattended kids	17 (10.05)	7 (6.73)
Could not specify	7 (4.14)	3 (2.88)
Causes of second phase delay		
	MNM cases (N=34)* N (%)	MM cases (N=5)* N (%)
High travel costs	18 (52.94)	4 (80)
Long distance from home	11 (32.35)	1 (20)
Worse condition of roads	5 (14.7)	0
Causes of third phase delay		
	MNM cases (N=175)* N (%)	MM cases (N=95)* N (%)
Non-availability of blood bank	77 (44)	61 (64.21)
Non-availability of operation theatre.	55 (31.42)	16 (16.84)
Absence of competent staff	27 (15.42)	11 (11.57)
Non-availability of specific group blood	16 (9.14)	7 (7.36)

[Table/Fig-4]: Causes of different phases of delay.
*As more than one phase of delay is present in most of the women in both groups (MNM and MM), the number represents women with single and combination of different phases of delay

of delay. The whole process of answering a call and hence making a decision is coaction of observation and impression influenced adequately by social, cultural practice and economic rearing [16,20]. In present study, the reasons found from conducting intensive individual interviews to explore their perspectives on coming to health facilities consequent to morbidity appraisal were heedless and unsuspecting of the symptoms, financial strain and unattended kids [Table/Fig-4]. In a study from Uttar Pradesh, India, users insisted on conduction of delivery at nearby First Referral Unit (FRU) or private facilities mostly due to the issue of distance, lack of money and transport, and being unaccustomed to the surroundings of the health centre [10]. In a study in less developed district of Kerala, out of 14 maternal deaths, first delay occurred in five cases where poverty, economic constraints, apprehension of the health system and gender issues were primary causes for such mishaps [11]. In present study, mothers haemorrhaging from ectopic pregnancy were high among MNM cases. This could be due to non-recognition of the entity and hence its complications, thereafter mothers were died suffering from complications of raised Blood Pressure (BP). Most of the relatives of these unfortunate mothers could not assess the seriousness of raised BP or were not aware of the morbid condition. In a country where doctor (modern medicine) and population ratio is 0.77:1,000 [21] as per population estimate of 1.33 billion, one on one counselling may not be possible for all cases. Instilling counsellors for these high-risk cases can help mothers and relatives to recognise early danger signs and report early.

Phase II delay was observed in 13.63% in MNM cases and 3.81% in MM cases in the present study either in isolation or in combination with other phases of delay. In a study in Kerala, this was observed in 50% of maternal deaths which was attributed to the difficult terrain of the region [11]. Due to better condition of roads of Delhi, the primary causes of second phase delay remained high costs of travelling and long distance to the tertiary centre which is located in the southern part of Delhi [Table/Fig-4]. These were the cases where referral health care units could not provide for vehicles due to multiple referrals at a time or the patients were too poor to access

private mode of transport due to odd hours of the day when public transport was not at ease to find.

The most detrimental cumulative effect was evident with Phase III delay in both the groups. With health care personnel at primary level being unable to recognise and procure adequate diagnosis of disease, the delayed referral is the adverse sequel. The poor state of affairs may exacerbate with lack of funds, shortage of blood products, technical incompetence among health care personals, disagreeable attitude towards patients [22-24], particularly in low income countries with a few obstetric tertiary units receiving huge caseloads of critically ill women. Third phase delay was observed in a total of 70.25% and 72.50% of patients in the MNM and MM group, respectively either in isolation or in combination with other phases of delay. The main reasons ascribed for third phase delay which are also causes of referral in this study were non-availability of blood bank, operation theatre and competent staff. The institution is well equipped to provide comprehensive emergency obstetric care but with swarming loads of referrals in critical conditions, it is on rare occasions difficult to meet the demands of blood products and vacant operation theatre. Though the cases are pursued with strict adherence to saving critical mothers, decisions are biased in situations of concurrently occurring obstetric emergencies. This is though quite rare and only five cases in total (2 MNM and 3 MM) had to wait for blood products or operation theatre in the institution. Rare blood groups pose a challenging task due to non-availability and consumption of time as a result of subsequent outsourcing for procurement.

In present study, three patients despite no delays could not be saved. One of them was haemorrhaging from placenta previa and the other two were suffering from complications of hypertensive disorders of pregnancy when they reported to the hospital. Kasongo Project team while screening for fetopelvic dystocia found that it is difficult to screen women and predict the committal of Emergency Obstetric care and hence primary prevention is a myth in deterring the cases of MM [25]. With no recognisable determinants of clinical risk factors in most of the cases of MNM and MM, it can be deduced that a large proportion of serious complications remain largely unpredictable as validated by other studies as well [7,26].

Limitation(s)

This study was conducted in this institution for a period of one year, hence representing the data of a single tertiary centre. Large-scale state-wide representative data on all MNMs and deaths will provide a better understanding of the causes of delay and also guide to provisions of amendments in health policy. The study failed to evaluate the standards of antenatal care which has a huge confounding effect on the prognosis and survival of pregnant mothers.

CONCLUSION(S)

Delay in taking decisions to seek healthcare being ignorant of the warning signs of the ensuing complication are a major causes of MM. Non-availability of blood bank and operation theatre facilities remains the most common causes for referral causing third phase delay calling for improvement in health infrastructure of the country. There is a significant difference between multiple deferral and referral than direct referral to an adequate health facility contributing immensely in terms of prognosis and survival of mothers.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Mar 03, 2020
- Manual Googling: Jun 10, 2020
- iThenticate Software: Jul 28, 2020 (7%)

ETYMOLOGY: Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

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