

A case control study of maternal near-miss events in a tertiary health centre in Bihar

Sandhya Kumari¹, Reena Kumari², Ahmad Nadeem Aslami^{3*}

¹Assistant Professor, Department of Obstetrics & Gynaecology, ANMMCH, Gaya, Bihar, India

²Associate Professor, Department of Obstetrics & Gynaecology, ANMMCH, Gaya, Bihar, India

³Assistant Professor, Department of PSM, JLNMC Bhagalpur, India

Received: 06-12-2020 / Revised: 29-12-2020 / Accepted: 11-02-2021

Abstract

Background: Globally, approximately 830 women died every single day due to complications related to pregnancy and childbirth in 2015. The study on maternal deaths can reveal the quality of health care delivery system. Maternal near miss (MNM) cases are women who survived the critical events during pregnancy and childbirth. MNM can act as an adjunct to maternal death inquiries because these cases occur more frequently than deaths and they can provide clue to problems that had to be overcome for the provision of better maternal health care. The study aims at evaluating the determinants of such MNM events among postnatal women admitted in ANM medical college, Gaya. **Methods:** A case-control study was done in postnatal women. A structured pre-tested questionnaire was given to 82 participants (27 cases and 55 controls). Data was collected regarding bio-data, sociodemographic characteristics, medical illnesses, previous and current pregnancies with their outcomes and complications. **Results:** Most women were admitted to ICU. Rest were having hypertensive complications and severe anaemia. The study showed height, type of family, presence of danger signs during pregnancy as significant determinants of maternal near miss events. **Conclusion:** The study of maternal near-miss provides an insight into the causes of maternal mortality in this region. The maternal morbidity and mortality can be reduced by providing proper antenatal care at primary health centre and community health centre and better intensive care in referral tertiary care centres.

Keywords: Maternal near-miss events, case-control study, maternal deaths, ICU.

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

The most critical event that occurs in a woman's life is pregnancy and childbirth. It can cause serious health issues in women and can lead to her death also. Pregnancy being a normal physiological process of reproduction brings a lot of medical attention nowadays. Complications during pregnancy and childbirth remain an important cause of morbidity and mortality in low-income countries.[1] One third of global maternal death was contributed by India and Nigeria in 2010. Although India has succeeded in reducing maternal mortality ratio (MMR) from 560 per lakh live births 1990 to 167 per lakh live births in 2015.[2] Confidential enquiries of maternal deaths have been used for many years to understand health systems and services failures. But it has its own limitations, particularly in low mortality settings. So, a new concept of maternal near miss (MNM) has been explored in maternal health as an adjunct to death enquiries. Women who nearly died but survived complications have been studied as surrogates of maternal deaths. MNM have been considered as useful approaches to improve maternal health care.[3] The world health organization (WHO) published MNM criteria based on markers of clinical management and organ dysfunction that will enable identification and systemic collection of data on MNM. The MNM case is defined as "a women who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy". In practical terms, women considered near miss cases when they survive life threatening conditions like organ dysfunctions. Severe maternal outcomes are MNM and maternal deaths combined.[4] Bihar has high maternal death burden with MMR being 208 per lakh live births reported in

2013. The studies on near miss cases have been scarce in this region of India. Therefore, this study on maternal mortality related events like near miss and perinatal outcomes is necessary for further understanding of associated issues. Our study aimed to highlight the determinants of maternal near-miss to contribute effectively to the adoption of measures to reduce maternal morbidity and mortality.[5]

Material and Methods

A retrospective facility based case-control study was conducted in the department of obstetrics and gynaecology (OBG), ANM Medical College, Gaya, Bihar. This is a tertiary care referral hospital. It provides 24 hour obstetric services for both low and high risk pregnant women. Even in Corona period, it continued its services in district hospital, Gaya. The sample size was calculated on the basis of a study done by Suhurban SA *et al* using the Epi info 2000 software.[6] In this study, the proportion of hypertensive's among cases and controls were 53.6% and 22.1% respectively. Considering alpha error of 5% and 80% power of the test with 1:2 ratio for cases and controls, the final sample size was 82, of which 27 were cases and 55 were controls. The study was approved by institutional ethical committee. The study period was from July 2020 to December, 2020. All postnatal women who were admitted in the OBG ward of hospital during the study period were included in the study. The postnatal women fulfilling the criteria of MNM as defined by WHO near miss approach were taken as cases. All postnatal women who did not fulfil the criteria for MNM were taken as controls. Matching was done to reduce bias in the study. It was based on age and gestational age at the time of the delivery, irrespective of the outcome. A semi-structured, pre-tested questionnaire was used to collect patient's information. It comprised of three distinct parts. Part I contained information regarding patients bio-data. Part II covered information about various socio-demographic characteristics of the mother. It also included past history of medical illness, previous pregnancies

*Correspondence

Dr. Ahmad Nadeem Aslami

Assistant Professor, Department of PSM, JLNMC Bhagalpur, India.

E-mail: ahmadnadeemaslami@gmail.com

and antenatal period of current pregnancy. Part II contained full information about mother during the natal and post-natal period, including the criteria for screening of MNM. The information about the outcome of pregnancy and neonate condition was also collected. A structured interviewer-administered questionnaire was used to collect patient's information after taking informed consent from patient. Medical records were used to extract relevant data regarding the condition of the patient and reports of investigations. The information regarding contributing factors to MNM was collected using WHO sample data collection form. The data was collected from obstetric ward, ICU's and emergency obstetric ward (casualty) of hospital. Data was entered and edited in Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) version 20. Continuous data was expressed as the mean and standard deviation. Categorical data was presented as proportions. Student t-test was used to test the significance of continuous variables. Categorical data was analysed by using Chi-square test. A $p < 0.05$ was considered to be significant. Variable with $p < 0.05$ in univariate analysis was considered for multivariate logistic regression analysis.

Results

Out of 82 participants enrolled in the study, 27 were cases (MNM) and 55 were controls. Among 27 cases of near miss, majority of the cases had ICU admissions (24, 88.9%) as the criterion for considering as near miss. It was followed by severe anaemia (14), hypertensive complications (12), hospital stay for >7 days due to complications (12) and haemorrhage (11). Other criteria fulfilled by the cases include fever and wound infection, cardiac dysfunction, respiratory dysfunction, loss of consciousness/ convulsions, massive blood transfusion, sepsis, jaundice, postpartum collapse, liver dysfunction, neurological dysfunction, renal dysfunction and surgical problems. Table 1 shows socio-demographic and maternal health characteristics. Most of the women were having non-consanguineous

marriage in the groups, 70.4% in cases and 72.7% in controls. The proportion of multiparous women was high in cases (63%) as well as controls (90.9%) and the difference was significant ($p < 0.05$). The proportion of cases living in joint family was higher (70.3%) as compared to controls (40%) and the difference was significant too. The near-miss group was significantly different from the control group in terms of maternal education and presence of danger signs during pregnancy. Most of the women were literate (89%; 73/82). However, the proportion of illiterate women was significantly higher among near-miss cases (22.2%) than controls (5.5%). Presence of danger signs during pregnancy showed a significant difference between near-miss group (29.6%) and control groups (7.3%) with p value of 0.007. There was no significant difference between the two groups in terms of consanguinity, mode of delivery and presence of pregnancy induced hypertension. Table 2 shows comparison of maternal characteristics and antenatal monitoring. Out of total 27 near miss cases and 55 controls, the mean ages were 24.51 years and 23.92 years respectively. The mean height in the control group was higher than the near-miss group. The average weight gain during pregnancy was 8.12 kgs and 9.11 kgs with the standard deviation of 4.12 kgs and 2.93 kgs for the cases and controls respectively. The average age at marriage for cases and control was 18.92 yrs and 20.32 yrs respectively. The average number of ANC visits was nearly similar in both (7.21 vs 7.62). Table 3 analyses maternal near-miss determinants using multivariate binary logistic regression. This analysis included height, type of family, education and presence of danger signs during pregnancy which was found to be significant in univariate and multivariate analysis. Out of these, height, type of family and danger signs during pregnancy (vomiting, headache, blurring of vision, fever, abdominal pain, contractions in early third trimester, swelling of feet etc.) were found to have significant association with the maternal near miss.

Table 1: Socio-demographic and maternal health characteristics

Characteristics	Category (n)	MNM (n=27)	Control (n=55)	P value
		N(%)	N(%)	
Consanguinity	Present (23)	8 (29.6)	15 (27.3)	0.49
	Absent (59)	19 (70.4)	40 (72.7)	
Parity	Primiparous (15)	10 (37.0)	5 (9.09)	0.002*
	Multiparous (67)	17 (63.0)	50 (90.9)	
Type of family	Nuclear (41)	8 (29.7)	33 (60.0)	0.010*
	Joint (41)	19 (70.3)	22 (40.0)	
Mother's education	Illiterate (9)	6 (22.2)	3 (5.5)	0.022*
	Literate (73)	21 (77.8)	52 (94.5)	
Danger signs	Absent (70)	19 (70.4)	51 (92.7)	0.007*
	Present (12)	8 (29.6)	4 (7.3)	
Mode of delivery	Vaginal (28)	10 (37.1)	18 (32.7)	0.699
	LSCS (54)	17 (62.9)	37 (67.3)	
PIH	Yes (12)	6 (22.2)	6 (10.9)	0.173
	No (70)	21 (77.8)	49 (89.1)	

Significant. MNM: Maternal near miss, PIH: pregnancy induced hypertension

Table 2: Comparison of maternal characteristics and antenatal monitoring

Characteristics	Groups	Mean	SD	Difference	t-value	p value
Age (in years)	MNM	24.51	4.65	0.59	0.465	0.598
	Control	23.92	2.72			
Height (in cm)	MNM	153.21	3.91	2.91	3.253	0.002*
	Control	156.11	5.31			
Weight gain (kgs)	MNM	8.12	4.12	0.99	0.212	0.821
	Control	9.11	2.93			
Age at marriage (in years)	MNM	18.92	2.65	1.40	1.354	0.254
	Control	20.32	2.21			
No. of ANC visits	MNM	7.21	1.41	0.13	0.410	0.712
	Control	7.62	1.56			

Significant

Table 3: MNM determinants by multivariate binary logistic regression

Characteristics	p value	Adjusted odds ratio (95% CI)
Height	0.001*	0.712 (0.602 – 0.881)
Parity	0.15	3.211 (0.681 – 14.311)
Type of family	0.008*	6.712 (1.622 – 27.132)
Education	0.079	9.112 (0.712 – 108.122)
Danger signs	0.003*	14.123 (1.242 – 181.329)

*Significant

Discussion

The present study assessed determinants of maternal near-miss among postnatal women admitted in ANMMC, Gaya. The questionnaire covered various aspects of maternal near miss and their determinants and also compared with the normal postnatal women acting as controls. The study finds that the admission to ICU was the main criteria in our study to consider the women as maternal near-miss, followed by severe anemia and hypertensive complications. Kurugodiyavar MD *et al* in their study also found similar results.[7] On doing multivariate analysis, it was found that short height is an important determinant of maternal near-miss in our study. This can be attributed to more number of obstetric interventions in short-statured women. A study done in Kaduna state by Sadiq AA *et al* showed that short height was most important determinant of maternal near-miss.[8] On univariate analysis, parity of the pregnant woman was found significant. But on multivariate analysis, parity did not show any significant differences between cases and controls. A study done in Morocco by Assarag B *et al* and Sarma H *et al* also showed similar results.[9,10] The theory behind increased maternal near-miss events in primiparous women could be attributed to factors including a lack of knowledge, poor nutrition, poor access to care, and inexperience with childbirth. A study done in Jarkhand, India done by Naik J *et al* found that maternal near-miss events occurred more in women of parity between 1 and 2, which is not in accordance with our study.[11] Type of family showed a significant difference between cases and controls. Women who lived in joint families were found to have six times more risk for maternal near-miss. Similar findings were seen by a study done in KIMS hospital, Hubli.[7] Danger sign during pregnancy which included vomiting, headache, blurring of vision, fever, abdominal pain, contractions in early third trimester, swelling of feet etc. were found to have significant association with the maternal near miss. A study was conducted in Ethiopia by Liyew EF *et al* found that the presence of hypertension during antenatal period contributes to the maximum number of cases of maternal near-miss.[12] A reason for this may be because hypertension during pregnancy acts as a stimulator or initiator of the other complications which would lead to maternal near-miss. A study done by Samant PY *et al* found that most common cause of near miss is severe preeclampsia contributing to 51%, while eclampsia and severe postpartum hemorrhage being 10% each, followed by sepsis and ruptured uterus.[13] Although, most studies showed commonest cause to be haemorrhage.[14,15]

Limitations

This study has certain limitation. Many other determinants related to maternal near miss were not included that may influence results. Also, determinants related to obstetric interventions could not be found out as we did not evaluate in detail about such interventions. The follow-up time used by WHO to define maternal near-miss as a duration of 42 days postpartum. But due to our feasibility concern, it was limited to only the length of stay in hospital.

Conclusion

These study findings suggest that the maternal near-miss may be caused by multiple factors that may include socio-economic factors and health related factors. In our study, most of the factors that showed significance are non-modifiable factors. Hence such problems can only be overcome by regular antenatal check-ups for the women who are at “high risk”. Early identifications of these

factors and prompt, appropriate intervention can reduce maternal morbidity as well as mortality. Health workers including ASHA should be trained to identify such risk factors early in the community. Lessons learned from cases of near-misses can be useful in development of health programs to reduce such events.

References

- Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet*. 2006;367(9516):1066-1074.
- Travasso C. India is set to meet target on reducing maternal mortality. *BMJ*. 2015;350:h724.
- Souza JP, Cecatti JG, Haddad SM, Parpinelli MA, Costa ML, Katz L, Say L. Brazilian Network for Surveillance of Severe Maternal Morbidity Group; Brazilian Network for Surveillance of Severe Maternal Morbidity. The WHO maternal near-miss approach and the maternal severity index model (MSI): tools for assessing the management of severe maternal morbidity. *PLoS One*. 2012, 7(8):1-6
- World Health Organization. The WHO near-miss approach for maternal health. 2011, 29. Available at: <https://apps.who.int/iris/bitstream/handle/10665/44692/97jsessionid=E21E83A122B8144DAD4683FOA0C9E404?sequence=1> Assessed on 31 december 2020.
- Horwood G, Opondo C, Choudhury SS, Rani A, Nair M. Risk factors for maternal mortality among 1.9 million women in nine empowered action group states in India: secondary analysis of Annual Health Survey data. *BMJ Open*. 2020, 10(8):12
- Suhrban SA, Nambisan B, Lekshmikutty ST, Brahmanandan M, Radha S. Determinants of nearmiss mortality in a tertiary care centre. 2017;6(2):470–8.
- Kurugodiyavar MD, Andanigoudar KB, Bant DD, Nekar MS. Determinants of maternal near miss events: a facility based case-control study. *Int J Community Med Public Health*. 2019;6:3614-20.
- Sadiq AA, Poggensee G, Nguku P, Sabitu K, Abubakar A, Puone T. Factors associated with adverse pregnancy outcomes and perceptions of risk factors among reproductive age women in Soba LGA, Kaduna State 2013. *Pan Afr Med J*. 2016;25:1–8.
- Assarag B, Dujardin B, Delamou A, Meski FZ, De Brouwere V. Determinants of maternal near-miss in Morocco: Too late, too far, too sloppy? *PLoS One*. 2015;10(1):1–15.
- Sarma H, Kalita A. A prospective study of maternal near-miss and maternal mortality cases in FAAMCH, Barpeta with special reference to its aetiology and management: First 4 months report. *J ObsGynaecol Barpeta*. 2014, 1(2):1
- Naik J, Kumar R, Mathurkar M, Jain S, Jaikhandi S, Thakur MS. Sociodemographic determinants of pregnancy outcome: a hospital-based study. *Int J Med Sci Public Heal*. 2016; 5(9):1 937-41.
- Liyew EF, Yalew AW, Afework MF. Incidence and causes of maternal near-miss in selected hospitals of Addis Ababa, Ethiopia. *PLoS One*. 2017; 12(6):1-13.
- Samant PY, Dhanawat J. Maternal near miss: an Indian tertiary care centre audit. *Int J ReprodContraceptObstetGynecol* 2019;8:1874-9.

-
14. Purandare C, Bhardwaj A, Malhotra M, Bhushan H, Chhabra S, Shivkumar P. Maternal near-miss reviews: lessons from a pilot programme in India. BJOG. 2014;121:105-11.
 15. Taly A, Gupta S, Jain N. Maternal intensive care and near miss mortality in obstetrics. J ObstetGynecolIndsep. 2004;54:478-82.
 16. Naderi T, Foroodnia S, Omidi S, Samadani F, Nakhaee N. Incidence and correlates of maternal near miss in southeast Iran. Int J Reprod Med. 2015;2015:91471

Conflict of Interest: Nil

Source of support: Nil