

Four Years Maternal Missed Mortality Ratio and Mortality Index at A Tertiary Care Hospital in Azad Kashmir

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ABSTRACT

Objective: To calculate the Maternal Near Miss Mortality Ratio and Mortality Index at a tertiary care hospital in a developing country with limited healthcare resources.

Study Design: Retrospective analytical study.

Place and Duration of Study: Department of Gynecology and Obstetrics, Shaikh Khalifa Bin Zayed Al Nahyan Hospital Azad Kashmir and Combined Military Hospital, Muzaffarabad Pakistan, from Jan 2015 to Dec 2018.

Methodology: Four hundred and forty-nine severe maternal outcome cases admitted in Intensive Care Unit were included in our study. Maternal Near Miss Mortality Ratio and Mortality Index were calculated. SPSS version 23.00 used for statistical analysis.

Results: The maternal near missed mortality ratio was 11:1, mortality index 8.68%, severe maternal outcome 1.58% with 39 maternal deaths. Most common causes of maternal morbidity were hemorrhage (56.1%); hypertensive disorders (24%); sepsis (3.5%) and cardiovascular diseases (1.8%). Hypertensive disorders of pregnancy (30.7%), hemorrhage (25.6%) and sepsis (25.6%) were the common causes of maternal deaths. The total ICU time in patient with near-miss was 1.9±1.7 days versus 2.6±3.14 days in deaths, $p < 0.001$. Operative delivery was statistically significantly (p value < 0.001) more common mode of delivery in severe maternal outcomes (66.6%) and maternal deaths (33.3%).

Conclusion: Our study has shown 1.58% severe maternal outcomes amongst admitted pregnant, maternal near missed mortality ratio being 11:1, mortality index being 8.68%. Eclampsia, hemorrhage and sepsis are major cause of maternal death.

Keywords: Eclampsia, Hemorrhage, Maternal Mortality, Morbidity.

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INTRODUCTION

Maternal mortality continues to be one of the inordinate burdens among public health issues worldwide. The maternal mortality rate is 189 per 100,000 live births in Pakistan and 46 per 100,000 live births in AJK in 2020-2021.^{1,2} In the USA, 50 to 100 women suffer severe maternal morbidity (SMM) for every mortality with an increase in near miss mortalities over the years.³ Maternal health can be improved by early detection of potential life-threatening conditions and implementing the standardized care.⁴ This is possible by understanding the current burden of SMM and the adequacy of healthcare settings. There are various indicators of quality of care including maternal mortality rate, maternal near miss incidence ratio, severe maternal outcome ratio (SMOR), maternal near miss mortality

ratio (MNMMR) and mortality index (MI). A higher MNMIR and lower MI value indicates better women health.

Various studies have shown preference for MNMMR and MI over MMR as indicators of women's healthcare due to a decline in MMR worldwide and impracticality in countries where maternal death are rare.^{5,6}

Our institute is one of three tertiary care hospitals providing specialized care to a population of 4.1 million in AJK. According to the authors' knowledge, no loco-regional data is published on indicators of maternal care except MMR. The purpose of this study is to calculate the MNMMR and MI at a tertiary care hospital in a country with limited healthcare resources.

METHODOLOGY

After the approval from hospital Ethical Review Committee (IERC # DME-722), this retrospective analytic study was conducted at Department of Obstetrics & Gynecology at Shaikh Khalifa Bin Zayed

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Al Nahyan Hospital AK CMH, Muzaffarabad Pakitan, from January 2015 to December 2018. OpenEpi sample size calculator was used to calculate sample size with expected MI of 26%.⁵

Inclusion Criteria: Patients during pregnancy, childbirth or within 42 days of delivery; from all ages, singleton/multiple pregnancies with life threatening complications were included.

Exclusion Criteria: The women who were referred to higher healthcare settings or whose final outcome was unknown were excluded.

The primary outcome was to calculate Maternal Near Missed Mortality Ratio (MNMMR) and Mortality Index (MI). The secondary outcomes of this study included incidence, causes and factors effecting severe maternal morbidity. The diagnosis was based on World Health Organization (WHO) criteria for disease, organ involvement and treatment given.⁶ The MI was calculated as percentage of maternal death and maternal missed morbidity plus deaths.⁷

Statistical Package for Social Sciences (SPSS) version 23.0 was used to analyze results. The qualitative data was presented as frequency and percentage and quantitative data The *p*-value of ≤ 0.05 taken as significant. MNMMR was calculated as ratio of near miss morbidity to maternal deaths.

RESULTS

A total of 29,080 obstetric patients were treated at our institute. 462 obstetric patients were admitted in our Intensive Care Unit. 13 patients were excluded from our final analysis as they were transferred to higher level of care and their final outcome was not available.

The mean age of our study population was 28.18 years \pm 5.66 and mean ICU stay was 2.03 days \pm 1.92. The incidence of severe maternal outcome (SMO) was 449 (1.54%). Our institute had 39 maternal deaths. The overall maternal near missed mortality ratio (MNMMR) was 11:1. The overall mortality index (MI) was 8.68%. The major causes of severe maternal outcomes and maternal death are given in Figure-1.

The lower segment cesarean section 286 (79.4%) was the most common mode of delivery in SMO. 33(7.3%) patients required hysterectomy and 23(5.12%) required other surgical procedures to control hemorrhage. The comparison of age, interventions done, time of admission on maternal outcome is given in Table-II.

DISCUSSION

A study from Zimbabwe reported Maternal Near Miss Ratio of 9.3 per 1000 deliveries and an MI of 10.6% which correlate with our results.⁸ MNMMR ranging from 5:1 to 21:1 have been reported in other developing countries.^{9,10,11} Tura *et al.* reported MI of 4.5% and 16.9% using Sub-Sahara versus WHO criteria respectively.¹² We are following the WHO criteria for the diagnosis of MNM, MNMMR and MI. Other studies have shown a MNMMR of 5:1 and MMR of 625 per 100,00 live births. They also reported that 82.1% of serious maternal outcomes (SMO) were referred from other hospitals.¹³ We did not comment on the number of referrals from other hospital or local birth attendants (dais) which could be a major reason of increased ratio of SMO at our tertiary-care referral hospital.

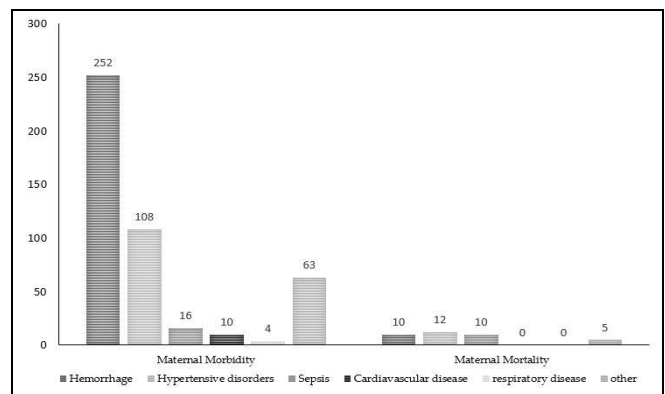


Figure-1: Major Causes of Severe Maternal Outcome and Mortality

In USA, there is increasing SMO with reduced MMR of 23.8 per 100,000 live births.¹⁴ MNMMR in other developed countries ranges from 38.1% in China to 62.4% in Turkey and MI of 1.57% in Turkey^{15,16} These better outcomes are indicators of provision of enhanced healthcare in the developed countries.

Our study has shown fourteen causes the fatal SMO. The commonest cause of mortality was hypertensive disorder followed by hemorrhage and sepsis. Hemorrhage, eclampsia and sepsis are the most prevalent causes of maternal deaths globally. Woldeyes *et al.* reported uterine rupture (27%), hypertensive disorder (24%) as major causes of SMO with 28% maternal fatality by eclampsia.¹⁷ A study conducted in Peshawar (2017) stated 96.2% direct causes of maternal death. PPH (33.9%), eclampsia (28.4%) and pulmonary embolism 15% were the most common causes of maternal demise.¹⁸ These results do not correlate with our study, where hypertensive disorders of pregnancy are the main cause of deaths.

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Table-I: Description of Severe Maternal Outcomes (n=449)

Variables		Morbidity n (%)	Mortality n (%)
Sepsis		6(1.5%)	10(25.6%)
Hemorrhage	Antepartum hemorrhage	26(6.3%)	3(7.7%)
	Postpartum hemorrhage	128(31.2%)	3(7.7%)
	Placental abruption	19(4.6%)	1(2.6%)
	Ruptured ectopic	19(4.6%)	1(2.6%)
	Ruptured uterus	13(3.2%)	1(2.6%)
	Placenta previa	33(7.8%)	1(2.6%)
	Placenta accrete	10(2.4%)	-
	Placenta percreta	4(1%)	-
Hypertensive disorders of pregnancy	Severe pre-eclampsia	25(6.0%)	-
	Eclampsia	79(19.3%)	8(20.5%)
	HELLP syndrome	4(10.3%)	4(1%)
Cardiovascular diseases	Pulmonary embolism	-	3(0.7%)
	Peripartum cardiomyopathy	2(0.5%)	1(2.6%)
	Valvular Heart disease	2(0.5%)	-
	Myocardial infarction	1(0.2)	-
	Deep venous thrombosis	1(0.2%)	-
Respiratory disease	Acute Respiratory Distress Syndrome	2(0.5%)	-
	Bronchial asthma	1(0.2%)	1(2.6%)
	Pleural effusion	1(0.2%)	-
Pulmonary edema of unknown etiology		4(0.9%)	2(5.1%)
Complicated diabetes mellitus		4(1%)	-
Epilepsy		3(0.7%)	-
Hematological disorders	Disseminated intravascular coagulopathy	1(0.2%)	2(5.1%)
	Idiopathic Thrombocytopenic purpura	2(0.5%)	-
Amniotic fluid embolism		1(0.2%)	1(2.6%)
Life threatening anemia		2(0.5%)	-
Obstructed labor		6(1.5%)	-
Abortion/ Miscarriage		2(0.5%)	-
Others		5(1.2%)	-

Table-II: Comparison of Risk Factors and Maternal Outcome (n=449)

Variables		Severe maternal Morbidity n(%)	Maternal mortality n(%)	p-value
ICU stay (days)		1.9±1.7	2.6±3.14	<0.001
Procedure	Cesarean section / Hysterotomy	273(66.6%)	13(33.3%)	<0.001
	Vaginal delivery	66(16.1%)	8(20.5%)	
	Other Surgical interventions	32(7.8%)	1(2.6%)	
	Non-surgical management	21(5.1%)	10(25.6%)	
	Not-specified	18(4.4%)	7(17.9%)	
Time of admission to ICU	0800-2000hours	203(49.5%)	26(66.7%)	0.123
	2000-0800hours	190(46.3%)	12(30.8%)	
Age groups (years)	≤18	2(0.4%)	-	0.657
	18-35	377(84%)	38(8.5%)	
	≥36	27(6%)	1(0.2%)	

This may be due to a few factors: greater prevalence of hypertensive disorder at our locality; negligible difference between numbers of the two SMO; co-existing morbidity and underreporting of hemorrhage.

SMO (91.9%) and death (97.4%) were more common in pregnant ladies aged between 18 to 35 years in our study. However, age of the patients and

time of admission to ICU are not significant effect modifiers on maternal deaths. MacDorman *et al.* reported maternal mortality to be two time higher in age 35-39 years, four time in women aged 40-44 and 11 times higher for age 45-54years as compared to pregnant women less than 35 years.¹⁹ Restrepo-Mendez *et al.* identified in their study that risk of death is two times higher in adolescent childbearing mothers

than those in their 20s.²⁰ The reason for difference in these studies and our results may be the fact that teen (20.44%) pregnancies and pregnancy in women aged >35 years (26.2%) were rare in our study population.

Our study has shown ICU stay of 2.6 days \pm 3.14 in maternal death versus 4.1days \pm 3.9 (2-27) reported by Yugi²¹ This difference may be attributable to the fact that the ICU in our hospital have limited beds that are shared with other specialties resulting in higher turnover and shorter stays in ICU.

Cesarean delivery (79.2%) was more common in patients with SMO but hysterectomy was required in 35(14.6%) patients with major obstetric hemorrhage in our study. They did not correlate with maternal death. Similar results have been reported by other authors.²²

LIMITATIONS OF STUDY

Our tertiary care hospital is situated in a remote area with difficult terrain and fewer hospital therefore, we cannot extrapolate our results on MNMMR / MI at tertiary care setting at metropolitans.

CONCLUSION

Our study has shown 1.58% severe maternal outcomes amongst admitted pregnant, maternal near missed mortality ratio being 11:1, mortality index being 8.68%. Eclampsia, hemorrhage and sepsis are major cause of maternal death.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

AE & MZ: Data acquisition, data analysis, critical review, approval of the final version to be published.

AI & AT: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

UY & NS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Rehman S, Jeelani K. Analysis of maternal mortality in Jammu and Kashmir: a retrospective study based on review of field data. *Asian J Med Sci* 2022; 13(4): 56-61. <https://doi.org/10.3126/ajms.v13i4.41351>
2. Shaeen SK, Tharwari ZH, Bilal W, Islam Z, Essar MY. Maternal mortality in Pakistan: challenges, efforts and recommendations. *Ann Med Surg* 2022; 81: 104380. <https://doi.org/10.1016/j.amsu.2022.104380>
3. Geller SE, Koch AR, Garland CE, MacDonald EJ, Storey F, Lawton B. A global view of severe maternal morbidity: moving beyond maternal mortality. *Reprod Health* 2018; 22(15): 98. <https://doi.org/10.1186/s12978-018-0527-2>
4. Centers for Disease Control and Prevention. Severe maternal morbidity indicators and corresponding icd codes during delivery hospitalization. 2017.
5. Egal JA, Kiruja J, Litorp H, Osman F, Erlandsson K, Klingberg-Alvin M. Incidence and causes of severe maternal outcomes in somaliland using sub-saharan african maternal near-miss criteria: a prospective cross-sectional study in a national referral hospital. *Int J Gynaecol Obstet* 2022; 159(3): 856-864. <https://doi.org/10.1002/ijgo.14236>
6. Venkatesh S, Chinmayi, Ramkumar V, Sheela CN, Thomas A. Implementation of who near-miss approach for maternal health at a tertiary care hospital: an audit. *J Obstet Gynaecol Ind* 2016; 66(4): 259-262. <https://doi.org/10.1007/s13224-015-0684-y>
7. Souza JP. Maternal Near Miss. WHO Department Of Reproductive Health And Research. Training Course in Sexual and Reproductive Health Research. Geneva 2011.
8. Chikadaya H, Madzivire MG, Muniania SP. Incidence Of Maternal Near Miss in the Public Health Sector of Harare, Zimbabwe: A Prospective Descriptive Study. *BMC Pregnancy Childbirth* 2018; 18:458: 1-6. <https://doi.org/10.1186/s12884-018-2092-7>
9. Kulkarni R, Kshirsagar H, Begum S, Patil A, Chauhan S. Maternal near miss events in India. *Indian J Med Res* 2021; 154(4): 573-582. https://doi.org/10.4103/ijmr.IJMR_928_19
10. Gupta D, Nandi A, Noor N, Joshi T, Bhargava M. Incidence of maternal near miss and mortality cases in Central India tertiary care center and evaluation of various causes. *N Indian J Obgyn* 2018; 4(2): 112-116. <https://doi.org/10.21276/obgyn.2018.4.2.4>
11. de Lima THB, Katz L, Kassari SB, Amorim MM. Neonatal near miss determinants at a maternity hospital for high-risk pregnancy in Northeastern Brazil: a prospective study. *BMC Pregnancy Childbirth* 2018; 18(1): 401. <https://doi.org/10.1186/s12884-018-2020-x>
12. Tura AK, Zwart J, van Roosmalen J, Stekelenburg J, van den Akker T, Scherjon S. Severe maternal outcomes in Eastern Ethiopia: application of the adapted maternal near miss tool. *PLoS One* 2018; 13(11): <https://doi.org/10.1371/journal.pone.0207350>
13. Beyene T, Chojenta C, Smith R, Loxton D. Severe maternal outcomes and quality of maternal health care in south Ethiopia. *Int J Womens Health* 2022. 3; 14: 119-130. <https://doi.org/10.2147/IJWH.S341912>
14. CDC. Severe Maternal Morbidity in the United States. Centers for Disease Control and Prevention, 2023.
15. Mu Y, Wang X, Li X, Liu Z, Li M, Wang Y, et al. The national maternal near miss surveillance in China: a facility-based surveillance system covered 30 provinces. *Medicine* 2019; 98(44): e17679. <https://doi.org/10.1097/MD.00000000000017679>
16. Oğlak SC, Tunç S, Obut M, Sekker E, Behram M, Tahaoğlu AE. Maternal near-miss patients and maternal mortality cases in a Turkish tertiary referral hospital. *Ginekol Pol* 2021; 92(4): 300-305. <https://doi.org/10.5603/GP.a2020.0187>

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17. Woldeyes WS, Asefa D, Muleta G. Incidence and determinants of severe maternal outcome in Jimma University teaching hospital, South-west Ethiopia: a prospective cross-sectional study. *BMC Pregnancy Childbirth* 2018; 18(1): 255. <https://doi.org/10.1186/s12884-018-1879-x>.
 18. Iqbal M, Muhammad Zia, Akhtar Z, Naz T. The three delays of maternal mortality in a teaching hospital. *J Med Sci* 2017; 25(2): 231-235.
 19. MacDorman MF, Thoma M, Declercq E, Howell EA. Causes contributing to the excess maternal mortality risk for women 35 and over, United States, 2016-2017. *PLoS One* 2021; 16(6): e0253920. <https://doi.org/10.1371/journal.pone.0253920>
 20. Restrepo-Méndez MC, Victora CG. Maternal mortality by age: who is most at risk? *Lancet Glob Health* 2014; 2(3): e120-e121. [https://doi.org/10.1016/S2214-109X\(14\)70007-5](https://doi.org/10.1016/S2214-109X(14)70007-5)
 21. Yugi L, Tan G, Chengming S, Xuri S. The ICU is becoming a main battlefield for severe maternal rescue in China: an 8-year single-center clinical experience. *Crit Care Med* 2017; 45(11): e1106-e1110. <https://doi.org/10.1097/CCM.0000000000002597>
 22. Mawarti Y, Utarini A, Hakimi M. Maternal care quality in near miss and maternal mortality in an academic public tertiary hospital in Yogyakarta, Indonesia: a retrospective cohort study. *BMC Pregnancy Childbirth* 2017; 17: 149. <https://doi.org/10.1186/s12884-017-1326-4>
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