

*Original Research Article*

## Maternal mortality and near miss at Omdurman maternity hospital (OMH), Sudan 2013

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Abstract

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Maternal mortality and morbidity remain public health problems in the developing countries influenced by access to health care and the quality of service provided. Assessment of Maternal Near Miss (MNM) will provide more information to improve the quality of obstetric care and to reduce maternal mortality and morbidity. This is a prospective cross-sectional study conducted at Omdurman Maternity Hospital (OMH) during 2013 to assess the occurrence of MNM and maternal mortality. Also, to identify the causes of MNM and determine the socio-demographic characteristics of women experiencing MNM and Maternal Death (MD). Modified WHO criteria (clinical, laboratory and management based) for identifying MNM were applied and the data was collected by reviewing all medical records using a structured data abstraction form. During the study period, a total of 305 women with life threatening conditions were identified at OMH: 260 MNM, 45 MD and 35863 Live Births (LB). Maternal Mortality Ratio (MMR) was 125/100000 LB, the Maternal Near Miss Incidence Ratio (MNMIR) was 7.2/1000 LB, MNM to MD ratio was 5.8:1 and the total mortality index was 14.8%. Haemorrhage was the most common cause of MNM, followed by eclampsia, sepsis, hepatitis, cardiac disease and other indirect events: 48.5%, 28.8%, 15.7%, 3.1%, 2.7% and 1.2 % respectively. Highest mortality index was caused by hepatitis, followed by cardiac disease, sepsis, eclampsia and haemorrhage: 46.7%, 22.2%, 12.8%, 11.8% and 8.1% respectively. Maternal mortality and morbidity remain challenging problems in this hospital, with hepatitis as an emerging cause of high mortality index. Progress can be made by improving the referral system, antenatal care (ANC) and hospital delivery, to prevent late presentation.

**Keywords:** Eclampsia, Maternal near miss, Maternal mortality, Omdurman, Post partum haemorrhage, Sudan

### INTRODUCTION

Maternal mortality and morbidity are major problems in the developing countries influenced by access to health care and the quality of service provided. However, severe acute maternal morbidity (SAMM) or maternal near miss (MNM) reflects threats to maternal life.

Improving access to health care and quality of care provided are important priorities to improving women health as reflected by the millennium development goal 5 (MDG5). Although we are approaching 2015, our target in reducing maternal mortality by 75% has not been met

and unlikely to be achieved.

As defined by the WHO working group, MNM is defined as "A woman who nearly died, but survived a complication that occurred during pregnancy, childbirth or within 42 days from termination of pregnancy" (Say et al., 2009). Near miss events occur more frequently than maternal death, and studying of MNM will provide more comprehensive information for improving women health. The survival of a pregnant woman is dependent on many factors including; her basic health, the disease condition, the health care facilities and health care system.

Although, much has been published on maternal mortality in Sudan, few has been published on MNM and nothing has been done before on MNM in this hospital (Abdel Aziem et al., 2011). This study aimed to determine the maternal near miss incidence ratio (MNMIR), MNM to mortality ratio and mortality index. We also aimed to determine causes of MNM and compare socio-demographic characteristics of women experiencing MNM to maternal mortality.

## MATERIAL AND METHODS

This was a prospective cross-sectional study conducted at Omdurman maternity hospital (OMH) during 2013. OMH is the main referral maternity hospital in Sudan for both public and private hospitals with all facilities for comprehensive emergency obstetric care. In addition to providing 24 hours emergency obstetric services, the hospital provides antenatal care (ANC) and delivery services for both low and high risk pregnant women. There are facilities for blood component therapy with an intensive care unit (ICU), 24 hours covered by medical supervision with mechanical ventilation.

All maternal deaths (MD) and maternal near miss (MNM) cases admitted during the study period were included. A maternal death was defined as "the death of a woman while pregnant or within 42 days of termination of pregnancy from any cause (WHO, 1992)". A maternal near miss was defined as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy (Say et al., 2009). A modified WHO criteria for identification of MNM was used, including clinical, laboratory and management based criteria for data collection (Souza et al., 2007).

Cases were identified on daily basis by principal investigators with the assistance of two trained resident registrars for data collection. This was done through daily participation in the morning meeting report and daily visits to labour ward, ICU, operating rooms and postnatal wards. A structured data abstraction form, filled by data collectors was used for data collection. Medical staffs involved in the management of included cases were

questioned in case of missing information from patient records. Maternal mortality during the same period was also analyzed. An ethical clearance was obtained from ethical review committee (ERC) at OMH and an informed consent was obtained from all near miss cases.

For each case information collected includes: age, residence, education, parity, gestational age at time of near miss, nature of obstetric complication, mode of delivery, admission to ICU, presence of organ and / or system dysfunction, duration of hospital stay and the route of admission. Patients were classified by the final diagnosis with respect to haemorrhage, sepsis, hypertension, dystocia, anaemia and other medical disorders. This information was compared between MNM and MD for each condition. The data was analyzed using SPSS version 20, MNM incidence ratio (MNMIR), maternal near miss/ maternal death and mortality index were calculated.

## RESULTS

During the study period, there were 35863 LB, 260 MNM cases and 45 MD at OMH. A total of 367 near miss events were identified among 260 MNM cases, 97 women had more than one or two events. The MMR was 125/100000 LB, the MNMIR was 7.2/1000 LB, MNM to mortality ratio was 5.8:1 and the total mortality index was 14.8%.

Table 1 shows the characteristics of women with near miss and mortality. There was no significant difference between the two groups except for gestational age less than 28 weeks and delivery by emergency C/S ( $P < 0.005$  and  $P < 0.002$  respectively). Both maternal near miss and maternal death shared the same risk factors. Middle age women 21-40 years, primigravida, multiparous, third trimester events and illiteracy are almost similar in both groups. A huge number of MNM cases 219 (84.2%) were referred emergencies, only 41 (15.8%) patients developed their events inside the hospital. It was even higher in the maternal mortality group, 41 cases (91.1%). Among the near miss cases, 145 (55.8%) cases received treatment at ICU, 76 cases (29.3%) were discharged after 5-7 days, the majority 184 (80.2%) stayed for more than one-two weeks in the hospital.

Haemorrhage was the commonest cause of MNM, followed by eclampsia, sepsis, hepatitis, cardiac disease and other indirect causes; 48.5%, 28.8%, 15.7%, 3.1%, 2.7% and 1.2 % respectively. The most common events were due to haemorrhage, followed by hypertensive disorders, organ dysfunction and sepsis (Table 2). Organ or system dysfunction was reported in 73 cases, mainly renal, liver and coagulation dysfunction. Highest mortality index in this hospital was caused by hepatitis, followed by cardiac disease, sepsis, eclampsia and

**Table 1.** Characteristics of maternal near miss cases and maternal deaths at Omdurman maternity hospital 2013.

Characteristics	MNM (N=260)		MD (N= 45)		P value
Age					
< 20 years	035	13.5%	10	22.2%	0.126
21-30 years	117	45.0%	20	44.5%	0.940
31-40 years	097	37.3%	14	31.1%	0.425
> 40 years	011	04.2%	01	02.2%	0.522
Parity					
Primigravida	89	34.2%	12	26.7%	0.319
Multiparous	99	38.1%	19	42.2%	0.161
Grandmultipara	72	27.7%	14	31.1%	0.637
Gestational age					
< 28 weeks	011	04.2%	08	17.8%	0.005
>28 weeks	207	79.6%	34	75.5%	0.247
Perpeurium	042	16.2%	03	06.7%	0.090
Route of admission					
Elective	041	15.8%	04	08.9%	0.229
Referred emergency	219	84.2%	41	91.1%	0.229
Residence					
Rural	159	61.2%	36	80.0%	0101
Urban	101	38.8%	09	20.0%	0.101
Education					
Illiterate	060	23.1%	08	17.8%	0.665
Educated	200	76.9%	37	82.2%	0.665
Mode of delivery					
Not delivered	028	10.8%	09	20.0%	0.050
Vag. delivery at home	027	10.4%	07	15.6%	0.308
Vag. delivery in hospital	044	16.9%	12	26.6%	0.119
Emergency C/S	145	55.8%	14	31.1%	0.002
Elective C/S	016	06.1%	03	06.7%	0.810

**Table 2.** Identified near miss events at Omdurman maternity hospital 2013

Near miss events	Number (N= 367)	%
Haemorrhage	151	41.1%
Abortion / ectopic	011	07.3%
Antepartum haemorrhage (APH)	042	27.8%
Post partum haemorrhage (PPH)	098	64.9%
Hypertensive disorders	075	20.4%
Severe preeclampsia	23	30.7%
Eclampsia	52	69.3%
Sepsis	068	18.5%
Organ dysfunction	073	20.0%
Liver dysfunction	027	37.0%
Renal dysfunction	032	43.8%
Coagulation dysfunction	007	09.6%
Cardiac dysfunction	007	09.6%
Total	367	100.0%

haemorrhage; 46.7%, 22.2%, 12.8%, 11.8% and 8.1% respectively (Table 3).

## DISCUSSION

Maternal near miss (MNM) and its mortality index reflect the quality of care provided by health care providers

(HCP) and the health system. This study showed a maternal near miss incidence ratio (MNMIR) of 7.2/ 1000 LB. Generally, MNMIR has a wide range in developing countries, between 15-40/1000 LB, based on the criteria used for identifying near miss events (Say L et al., 2009; Souza et al., 2007; Roosmelin and Zwart, 2009). This ratio is lower than that reported in a rural hospital in Sudan, 22.1/ 1000 LB, as well as that found in a tertiary

**Table 3.** Comparison of near miss cases and primary causes of maternal deaths at Omdurman maternity hospital 2013

Diagnosis	Near miss (N=260)	Maternal deaths (N=45)	Mortality index %
Haemorrhage	126	48.5%	11
Eclampsia	075	28.8%	10
Sepsis	041	15.7%	06
Hepatitis	008	03.1%	07
Cardiac	007	02.7%	02
Others indirect	003	01.2%	02
Others direct	000	00.0	07

hospital in India 17.8/1000 LB and in many developing countries (AbdelAzim et al., 2011; Roopa et al., 2013; Filippi et al., 2005; Say et al., 2009; Souza et al., 2007). This low MNMIR may be due to the good quality of care in this hospital with the maximum utilization of the available resources.

The maternal mortality ratio in this hospital was 125/100000 LB. This maternal mortality ratio is lower than the national maternal mortality ratio, 216/100000 and even lower than that reported by the maternal death review system 189/ 100000 LB (Sudan House Hold Survey (SHHS) 2010, Federal Ministry Of Health (FMOH), 2013). In this hospital, haemorrhage is still the leading cause of maternal death and MNM. In spite of the availability of 24 hours functioning blood bank with cell separator and well trained personnel in management and prevention of Post Partum Haemorrhage (PPH), we were unable to revive those late referred cases.

This late presentation may be due to the fact that patients bypassed local health services and came directly to OMH, either they did not know of their existence, or they did not trust their quality of care, thereby delaying the treatment that could have prevented the near miss. This is similar to what has been reported by Pattinson in Pretoria (Pattinson and Hill, 2003). In determining the quality of care, risk factors related to patients' behavior and their environment are the least accessible to analyze in women who die. This can be over looked by evaluating maternal near miss.

Total mortality index was 14.8%, meaning that for every maternal death there are at least six maternal near miss cases. This is less than that found in a rural hospital in Sudan: 19.5% and that found in a tertiary hospital in India; 17.8% (AbdelAzim et al., 2011, Roopa et al., 2013). Despite the high morbidity from haemorrhage and hypertensive disorders (48.5% and 28.8% respectively), their mortality index was lower than the other events, (8.1% and 11.8% respectively). This may be due to the availability of optimal blood bank services, use of uterotonics (oxytocin, misoprostol and prostaglandins) for prevention and treatment of post partum haemorrhage (PPH), with early diagnosis and optimal management of Antepartum Haemorrhage (APH). The introduction of magnesium sulfate in the treatment and prevention of all cases of eclampsia and severe preeclampsia in this

hospital reduced the maternal mortality index from hypertensive disorders. In addition to that, this hospital has well trained staff, updated treatment guidelines and sustained availability of essential drugs. This is similar to what has been found by Watersone, indicating improvement in obstetric care in the management of PPH and hypertensive disorders (Watersone et al., 2001).

The maternal near miss to mortality ratio was 5.8:1, meaning that for every five to six life threatening conditions there was a maternal death. This ratio is similar to that found in a rural hospital in Sudan; 5.1:1, in a tertiary hospital in India; 5.6:1 and in a study done in Nepal, 7.2: 1 (AbdelAzim et al., 2011; Roopa et al., 2013; Shrestha et al., 2010). However, it is less than that found in Syria; 60:1 and far from that reported from Western Europe; 117-223:1 (Almerie et al, 2010; Roosmelin and Zwart, 2009). This comparison represents the improvement in quality of care. The higher the ratio, the better the care and if it increases over a period of time, it reflects improvement achieved in the quality of obstetric care. This necessitates ongoing assessment of maternal near miss, maternal mortality and maternal mortality index at this hospital.

Establishment of an ICU in such a busy maternity hospital may have played a role in reducing maternal mortality in critically ill patients. One hundred and forty five (55.8%) were managed in ICU, the rest were managed closely in post natal wards due to lack of available beds or ventilating machines. Omdurman maternity hospital is a main referral hospital, with most of the cases received in terminal condition. These delays are the major causes behind both maternal mortality and morbidity. Delayed transfer and inadequate utilization of available resources are important aetiological factors for severe morbidity and mortality in this hospital. Generally, less than 10% of maternal near miss cases will have the chance to be managed in ICU in low resource settings (Oladapo et al., 2005, Adisasmita et al., 2008).

## CONCLUSION

Maternal mortality and morbidity remain challenging problems in this hospital, with hepatitis as an emerging cause of high mortality index. Progress can be made by

improving the referral system, antenatal care (ANC) and hospital delivery to prevent late presentation.

## ACKNOWLEDGEMENT

Authors would like to thank director general at OMH, the staff working at, blood bank, ICU, labour ward, operating rooms, as well as all clients and data collectors participated in the study.

## CONFLICT OF INTEREST

Authors declare that they have no financial or non-financial competing interest.

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