MATERNAL NEAR MISSES AND DEATH IN SOUTHERN ETHIOPIA: A RETROSPECTIVE STUDY

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ABSTRACT

BACKGROUND: Globally, maternal deaths declined by 44 percent between 1990 and 2015, however it remains unacceptably high in sub-Saharan Africa. In Ethiopia, around 13, 000 of women and 84,437 neonates died annually in 2013. Hence, this study assessed the magnitude of maternal near misses and death in southern Ethiopia.

METHODS: An institution based retrospective cross-sectional study design was conducted from October, 1 to 30, 2016. All mothers registered with pregnancy related complication during August 2014 to September 2016 were included in the study. World health organization maternal near misses' tool were used to collect the data. SPSS version 20.0 was used to calculate various indicators.

RESULT: In this study, 15,059 cases attended obstetric care service during the study period. Among total admission 591 were identified with severe maternal outcomes. The main causes for admission were severe preeclampsia (51.8%) followed by postpartum hemorrhage (24.9%). Out of the total severe maternal outcomes 90 (15.2%) end up with maternal death while the rest (84.8%) were near-misses. One hundred seventy (28.8%) of newborn died during delivery. In the current study, the total maternal near misses and maternal mortality ratio was 33.3 per 1000 live birth and 59.7 per 100,000 live births respectively. In addition, sever maternal outcome and total near-misses ratio to maternal death were 39.2 per 1000 live birth and 5.57:1 respectively.

CONCLUSION AND RECOMMENDATIONS: A significant percentage of women were near misses and suffered from life threatening conditions. It is highly advisable to use an assessment guide protocol and documentation.

KEYWORDS: Ethiopia, Maternal Near Misses

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BACKGROUND

Globally, maternal mortality ratio declined by 44 percent from 385 to 216 deaths per 100,000 live births between 1990 and 20151, however it remains unacceptably high in sub-Saharan Africa2,3,4. Access to quality care during pregnancy, child birth and postnatal seems to be the crucial factor in explaining the disparity in maternal mortality and morbidity between the developing and the industrialized world5,6,7.

Sub-Saharan Africa is the most vulnerable region in the world and 99% of all pregnancy related deaths occur in developing countries1,2. Out of 302, 000 global maternal deaths in 2015, sub-Saharan Africa alone account for 66% (201, 000), followed by southern Asia (66, 000)8.

In Ethiopia, around 13, 000 of women died annually and maternal mortality ratio declined from 1400 in 1990 to 420 per 100,000 live births in 20137. While, the country has been making progress over the past two decades on maternal health; still significant obstacles in terms of access to and provision of obstetric care services, particularly in rural areas9,10.

A maternal near misses and death audit delineates their underlying health, social and economic contributory factors7,8. In the countries with significant number of maternal deaths, health facility records are usually deficient and the causes of some maternal deaths in obstetric registers are ill defined5,6,7,11. The review of maternal death cause provide evidence of where the problem in overcoming maternal deaths may lie, produce analysis of what can be done, and highlight key areas requiring recommendation1,5,11. Now days, near misses audits have been increasingly used to improve the quality of obstetric care in resource limited countries10,12,16. Hence, this study assessed the magnitude of near misses and maternal deaths in Hawassa University comprehensive specialized and Yirgalem hospital.

METHODS

An institution based retrospective cross-sectional study design was conducted from October, 1 to 30, 2016. The study was conducted in Hawassa University Comprehensive Specialized and Yirgalem hospitals, located in the Sidama zone, Southern Nation Nationalities and People Regional State.

The medical record of two fiscal years (August 2014 to September 2016) was reviewed and those who fulfill the criteria were evaluated independently. All mothers registered with pregnancy related complications who had charts with complete information during the study period were included. A total of 15,059 cases were admitted to the hospitals during the study period and more than half 8, 457 of them were from Hawassa University Comprehensive Specialized hospital. Among the total cases 591 near misses cases were reviewed in detail by using world health organization maternal near misses tool17.

All maternal near misses criteria and indicators were evaluated. Near-miss events, maternal deaths, severe maternal outcome, admission to intensive care unit, critical interventions taken and all other world health organization inclusion criteria for baseline assessment of quality of care were incorporated17.Cases was defined according to potentially life-threatening conditions including severe postpartum hemorrhage, severe preeclampsia, eclampsia, sepsis and ruptured uterus; whereas organ or system failure was discussed depending on certain clinical criteria [21]. The ratio of maternal near misses to maternal deaths and indicators were calculated using SPSS version 20.0.

RESULTS

Totally fifteen thousand fifty-nine cases (15,059) attended obstetric care service in both hospitals. Among these cases, 591 (3.92%) of them encountered severe life-threatening conditions. Most of the women 458 (77.5%) with severe life threaten conditions were from Yirgalem Hospital. About half of the respondents 284(48.1%) were aged between 25-34 years and are residing in rural community. The mean age of the respondents was 24.89 (SD +4.99) years old. Nearly half (46.5%) of participants were protestant; majority (65%) were Sidama ethnicity; and almost all (98.8%) were married. More than two thirds of the participants and their partners were able to read and write. Most of the respondents 531(89.6%) had antenatal care follow up (Table 1).

Table 1: Socio-demographic characteristics, southern Ethiopia, 2014-2016

Variables [n=591]	Frequency	Percent
Age in years		
15-24	255	43.1
25-34	284	48.1
35 and above	36	6.1
Not registered	16	2.7
Religion		
Protestant	275	46.5
Orthodox	135	22.8
Muslim	92	15.6
Catholic	53	9.0
Not registered	36	6.1
Ethnic group		
Sidama	384	65.0
Oromo	108	18.3
Amhara	61	10.3
Wolaita	28	4.7
Others1	10	1.7
Health Facility		
Yirgalem hospital	458	77.5
Hawassa university comprehensive specialized Hospital	133	22.5
Marital Status		
Married	584	98.8
Cohabitation	3	0.5
Single	2	0.3
Not registered	2	0.3
Mothers educational level		
Able to read and write	225	38.1
Cannot read and write	197	33.3
Primary (1-8)	108	18.3
Secondary (9-12)	34	5.8
Diploma and above	1	0.2
Not registered	26	4.4
Partner's educational level		
Able to read and write	217	36.7
Cannot read and write	129	21.8
Primary (1-8)	112	19.0
Secondary (9-12)	88	14.9
Diploma and above	19	3.2
Not registered	26	4.4
Parity		
Primipara	191	32.3
Multipara	399	67.5
Not registered	1	0.2
Residence		
Rural	308	52.1
Urban	140	23.7
Suburban	142	24.0
Not registered	1	0.2
Antenatal follow up		
Yes	531	89.8
No	58	9.8

1=Guraghe, Kambata, Hadiya, Siltie and Konso

Maternal severe complications

In this study the main causes for admission were severe preeclampsia (51.8%) followed by postpartum hemorrhage (24.9%). However, eclampsia (70%) and sepsis or sever systemic infection (41.6%) stand the leading complications that occurred after 12 hours of admission (Table 2).

Table 2: Maternal complications lead to near-misses in two hospitals, 2014-2016

Variables [n=591]	Frequency	Percent
Sever postpartum hemorrhage		
Not yet occurred at all	444	75.1
Was present at arrival or within 12 hours of arrival	147	24.9
Sever preeclampsia		
Not yet occurred at all	272	46.0
Was present at arrival or within 12 hours of arrival	306	51.8
Occurred after 12 hours of arrival	13	2.2
Eclampsia		
Not yet occurred at all	504	85.3
Was present at arrival or within 12 hours of arrival	26	4.4
Occurred after 12hours of arrival	61	10.3
Sepsis and sever systemic infection		
Not yet occurred at all	555	93.9
Was present at arrival or within 12 hours of arrival	21	3.6
Occurred after 12 hours of arrival	15	2.5
Ruptured uterus		
Not yet occurred at all	548	92.7
Was present at arrival or within 12 hours of arrival	39	6.6
Occurred after 12hours of arrival	4	0.7

Over all outcome of mothers and newborns

Among total admission (15,059 cases) 591 were identified as severe maternal outcomes. Out of total severe maternal outcomes 90 (15.2%) end up with maternal death while the rest (84.8%) were near-miss cases. Similarly, 400 (67.7%) of newborns were alive at birth and 170 (28.8%) died during labor and information about newborns were not recorded in about 3.5% cases. In the current study, the total maternal near misses and maternal mortality ratio was 501/15,059 (33.3/1000 live birth) and 90/15059 (59.7/10000 live birth) respectively. In addition, severe maternal outcome ratio

was 591/15059 (39.2/1000 live birth). Total near-misses to maternal death ratio were (5.57:1). The maternal mortality index (maternal death to mothers with life threatening conditions) was 90/591 (15.2%).

Critical interventions undergone during management of near-miss cases

Out of the total near-misses case only 102 (17.3 %) undertaken critical intervention to manage the problem. Among these interventions; blood transfusion (57.8%) and admission to intensive care unit (20.6%) were some of them. Majority of the critical interventions were carried out within the first 12 hours of admission. More than half (52.5%) of blood transfusion occurred after 12 hours of arrival to health facilities (Table 3).

Table 3: Critical intervention used to manage near-misses case in two hospitals, 2014-2016

Variables [n=591]	Frequency	Percent
Use of blood product		
Not yet occurred at all	518	87.6
Was present at arrival or within 12 hours of arrival	28	4.7
Occurred after 12hours of arrival	31	5.2
Information was not available	14	2.4
Laparatomy		
Not yet occurred at all	562	95.1
Was present at arrival or within 12 hours of arrival	5	0.8
Occurred after 12hours of arrival	3	0.5
Information was not available	21	3.6
Admission to intensive care unit		
Not yet occurred at all	549	92.9
Was present at arrival or within 12 hours of arrival	18	3
Occurred after 12hours of arrival	3	0.5
Information was not available	21	3.6

Organ dysfunction and maternal death

Among the total maternal near-misses, 261 (44.2%) developed different organ failure that is considered as highly life-threatening conditions. Of these conditions, 147 (56.3%) occurred before or within 12 hours of admission. The most common organ dysfunctions were respiratory (32.2%), cardiovascular (29.9%) and renal dysfunction (20.7%) (Table 4). About 15.2% of total cases died while on the way to health institution to seek care. Among the total death 54 (60%) happened at arrival or within 12 hours of hospital stay, while 36 (40%) of them died after 12 hours of hospital arrival. In the current study the leading causes of maternal death were: obstetric haemorrhage (39%), anaemia (28%), hypertensive disorders (16%), medical or surgical complications (7%), abortion (5%) and pregnancy related infections (5%).

Table 4: Organ dysfunction occurrence among maternal near-misses in two hospitals, 2014- 2016

Variables [n=261]	Frequency	Percent
Cardiovascular dysfunction		
Was present at arrival or within 12 hours of arrival	38	14.6
Occurred after 12 hours of arrival	40	15.3
Total	**78**	**29.9**
Respiratory dysfunction		
Was present at arrival or within 12 hours of arrival	49	18.8
Occurred after 12 hours of arrival	35	13.4
Total	**84**	**32.2**
Renal dysfunction		
Was present at arrival or within 12 hours of arrival	37	14.2
Occurred after 12 hours of arrival	17	6.5
Total	**54**	**20.7**
Hepatic dysfunction		
occurred at arrival or within 12 hours of arrival	5	1.9
Occurred after 12hours of arrival	-	-
Total	**5**	**1.9**
Neurologic dysfunction		
Occurred at arrival or within 12 hours of arrival	8	3.1
Occurred after 12hours of arrival	-	-
Total	**8**	**3.1**
Uterine dysfunction		
Occurred at arrival or within 12 hours of arrival	10	3.8
Occurred after 12hours of arrival	22	8.4
Total	**32**	**12.2**

Table 5: Conditions of women at hospitals arrival, 2014- 2016

Variables [n=591)	Frequency	Percent
Delivery occurred before arrival at hospital		
Yes	95	16.1
No	489	82.7
Not registered	7	1.2
Delivery within 3 hours of hospital arrival		
Yes	221	37.4
No	363	61.4
Not registered	7	1.2
Laparatomy done within 3 hours of hospital arrival		
Yes	8	1.3
No	576	97.5
Not registered	7	1.2
Woman referred from other health facility		
Yes	163	27.6
No	415	70.2
Not registered	13	2.2
Woman referred to other hospitals		
Yes	69	11.7
No	515	87.1
Not registered	7	1.2

Condition of women at arrival

Most of the women 489 (82.7%) gave birth after the hospital's arrival. More than two thirds 363 (74.2%) of them stayed more than 3 hours until they gave birth. Of the total cases 163 (27.6%) were n referred from other health institutions (Table 5).

Interventions provided for the specific conditions of women

Among the total of 147 postpartum hemorrhage cases, 74.8% and 73.4% of them received prophylactic and therapeutic oxytocin respectively. Besides, 35.4%, 23.1%, and 21.9% were managed with ergometrine, misoprostol and manual removal of placenta respectively. Among 43 cases with uterine rupture, 83.7% had undergone hysterectomy (Table 6).

Table 6: Interventions provided for specific conditions of women in two hospitals, 2014-2016

Variables	Frequency	Percent
Oxytocin used to prevent postpartum hemorrhage (n=147)		
Yes	110	74.8
No	36	24.5
Not registered	1	0.7
Other uterotonic drugs used to prevent postpartum hemorrhage		
Yes	83	56.4
No	63	42.9
Not registered	1	0.7
Oxytocin used to manage postpartum hemorrhage (n=147)		
Yes	108	73.4
No	38	25.9
Not registered	1	0.7
Ergometrine used to treat postpartum hemorrhage (n=147)		
Yes	52	35.4
No	94	63.9
Not registered	1	0.7
Misoprostol used to treat postpartum hemorrhage (n=147)		
Yes	34	23.1
No	112	76.2
Not registered	1	0.7
Removal of retained products to treat postpartum hemorrhage		
Yes	32	21.9
No	114	77.6
Not registered	1	0.7
Artery ligation was done to prevent postpartum hemorrhage (n=147)		
Yes	1	0.7
No	145	98.6
Not registered	1	0.7
Hysterectomy to treat postpartum hemorrhage (n=43)		
Yes	36	83.7
No	7	16.3
Not registered	0	0
Abdominal packing to treat postpartum hemorrhage (n=147)		
Yes	10	6.8
No	136	92.5
Not registered	1	0.7
Prophylactic antibiotics used for cesarean section (n=127)		
Yes	98	77.2
No	23	18.1
Not registered	6	4.3
Therapeutic parenteral antibiotic used for treatment (n=141)		
Yes	114	80.9
No	21	14.9
Not registered	6	4.3
Corticosteroids used for fetal lung maturity (n=112)		
Yes	12	10.7
No	100	89.3
Magnesium sulphate used to manage convulsion (n=356)		
Yes	339	95.2
No	10	2.8
Not registered	7	2
Other anticonvulsants used to treat convulsion (n=356)		
Yes	124	34.8
No	225	63.2
Not registered	7	2

DISCUSSION

Material of this study was adapted from "evaluating the quality of care for severe pregnancy complications: the world health organization near-miss approach for maternal health, 2011". As per this document, conducting maternal death and near-miss reviews is very essential step to improve quality of maternal care. Within two fiscal year (2014 to 2016), 15, 059 women attended obstetric care unit in both selected hospitals. Among all women who attended the obstetric units, 3.9% suffered from life threatening conditions. Of which 90 (15.2%) ended up with maternal death. This implies that maternal near-misses and maternal mortality ratio were 33.3/1000 live birth and 597/100,000 live birth respectively with a maternal near misses to maternal mortality ratio of 5.57:1. This finding is consistent with the studies conducted in Syria18 and Tanzania19 in which maternal near misses and maternal mortality ratio was 32.9/1000 and 587 /100,000 live births respectively. The finding of the current study is higher than the finding of studies conducted in rural hospital of Sudan20, Mozambique21, Iraq12 Pakistan22 and Brazil23. However, it is lower than other studies conducted in Ethiopia11,24. The possible reason for

this disparity could be difference in the background of the study population, difference in the time, duration and sample size of the study. For instance, the sample size of the studies done in Sudan and Pakistan is much higher than our sample size and involvement of many health facilities in the study of Mozambique is also another possible explanation. The ratio of maternal near misses to maternal death of the recent study is in line with the study done in Sudan (5.8:1)25.

In the current study the main causes for maternal near-misses were severe preeclampsia, eclampsia, sepsis, postpartum hemorrhage and uterine rupture. This is in line with the studies conducted in Ile-Ife Nigeria26, Sudan25, Pakistan22, Nigeria27 and Debremarkos27. Similarly, this study identified some direct and indirect causes of maternal death including obstetric hemorrhage, anemia, hypertensive diseases, abortion and/ectopic pregnancy and pregnancy related infection. This finding is consistent with the studies done in Nigeria27 and Sudan25. Appropriate and standardized health care is the best way to avert maternal death which could occur due to third delay. Thus, critical intervention was defined as appropriate and standardized care for women who are suffering from life threatening complications. However, many literatures did not assess the way of intervention to track life threatening complications of obstetrics. In our study only 17.3% of total cases undertaken critical care and only 20.6% were admitted to intensive care unit. For instance, among cases that needed blood transfusion 52.5% were provided after 12 hours of hospital stay. The management delays found in this study went in line with study of Mozambique in which more than one fourth of near miss cases treatment was not started immediately21. In this study comparisons of cases were not undertaken and only focused on descriptive findings rather than analytical.

CONCLUSIONS

In the present study significant percentage of women were near misses and suffered from life threatening conditions. Severe preeclampsia, eclampsia, sepsis, and postpartum hemorrhage were identified as the main causes for maternal near-misses. Furthermore, obstetric hemorrhage, anemia, hypertensive diseases, abortion and ectopic pregnancy were identified as the main contributing factors for maternal death in the current study. It is highly advisable to use an assessment guide protocol and improve documentation. Further study needs to be conducted to identify determinant factors of maternal near misses and death

DATA AVAILABILITY

All data and materials in this manuscript could be deposited in publicly available repositories

CONFLICTS OF INTEREST

The authors declare that they have no competing interests

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