

# Maternal Near-miss and its Associated Factors in Governmental Health Centers in Northern Oromia Regional State, Ethiopia

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Original article</p>	<p><b>Background &amp; aim:</b> Maternal near-miss (MNM) is a condition of maternal mortality in which women survive accidentally or by best hospital care. This is useful to examine the excellence of obstetric care. The study aimed to assess MNM and its associated factors in governmental health centers in Northern Oromia, Ethiopia, from September 11 in 2014 to March 30, 2018.</p>
<p><i>Article History:</i> Received: 01-Aug-2019 Accepted: 13-Dec-2019</p>	<p><b>Methods:</b> This retrospective record review was conducted in governmental health centers in Sandafa town, from April 10 to May 5, 2018 by reviewing the medical records of 1,667 treated mothers. The study participants were selected through simple random sampling. The data were collected using standard tools by trained data collectors. The data entered into EpiData version 3.1 and analyzed by SPSS version 20. Multiple logistic regressions were used to identify the associations between independent and outcome variables. The variables with <math>P &lt; 0.25</math> during bivariate analysis were included in the multivariable logistic regression model. Finally, the variables with <math>P \leq 0.05</math> were considered the determinants of MNM.</p>
<p><i>Key words:</i> Maternal Near-miss Northern Oromia Maternal Morbidity Health Centers Northern Oromia Ethiopia</p>	<p><b>Results:</b> In this study, there were 344 (20.6%) MNM cases. The place of residence (AOR=1.4; 95% CI: 1.03-1.81; <math>P=0.031</math>), duration of labor (AOR=6.5; 95% CI: 4.5-9.5; <math>P=0.001</math>), and antenatal care (ANC) visits (AOR=6.53 [4.5, 9.5]; <math>P=0.001</math>) were the factors significantly associated with MNM.</p> <p><b>Conclusion:</b> The study revealed that the frequency of MNM was high in the study area. The place of residence, duration of labor, and ANC visits were significantly associated with MNM.</p>

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## Introduction

According to World Health Organization (WHO), a maternal near-miss (MNM) is a condition in which a woman who nearly died survived from a complication that occurred during pregnancy, childbirth, or within 42 days of pregnancy termination (1). Recently, a review of cases at the severe end of the maternal morbidity spectrum during delivery has been performed to complement the assessment of maternal health services, and these cases were called MNM (2). The identification of MNM cases is based on the presence of 25 criteria regarding

organ and system dysfunctions (e.g., cardiovascular, respiratory, renal, coagulation, hepatic, neurologic, and uterine), which were identified through clinical-, laboratory-, and management-based parameters (2). The identification of severe maternal morbidity is based on a list of potentially life-threatening conditions from which MNM cases would emerge (3).

The number of MNM globally varies from 20 to 920/100,000 live births. In Sub-Saharan Africa, 1 in 16 women had a lifetime risk of

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MNM; however, in developed countries, only 1 in 4,100 women had a lifetime risk of MNM (4, 5, 6). In Brazil, 140 MNM cases and 14 maternal mortalities were identified (7). In India, there were 66 MNM cases and 17 maternal mortalities (8). In western Rajasthan, India, 112 MNM cases and about 60.7% of the near-miss patients were critical on admission (9).

A study carried out in Egypt reported 71 MNM cases and 6 maternal mortalities (10). According to a study conducted in Kelantan, Malaysia, there were 47 MNM cases and 2 maternal mortalities (11), and 501 MNM cases were reported in southeast Iran (12). A study performed in Addis Ababa, Ethiopia, identified 238 MNM cases (13), and another study conducted in Debre Markos referral hospital in Ethiopia reported 403 (29.7%) MNM cases (12). Generally, developing countries carry a high burden of maternal mortality and morbidity that may be attributed to the improper management of obstetric emergencies at referral hospitals, poor referral practices, and poor access/utilization of healthcare services (14).

The results of a study conducted on MNM revealed that MNM occurred more than two times among rural women, compared to that reported for urban subjects (15). According to the evidence, having no antenatal care (ANC) visits was identified as a risk factor of MNM (6). Based on the literature, it was shown that higher age, higher parity, bad obstetric history, as well as the availability and accessibility of healthcare services, were the factors associated with MNM (4, 6, 12, 16). The results of studies conducted in Debre Markos and Addis Ababa in northeast Ethiopia revealed that the pregnancy out of marriage, multiparity and multigravidity, rural residence, and no ANC visits were the factors associated with MNM (6, 13, 17).

The Federal Ministry of Health in Ethiopia is striving to reduce the rate of maternal mortality in the country. In this regard, several measures were taken up to now, including the organization and mobilization of the Health Development Army at all levels to promote behavioral changes, distribution of ambulances to all districts, provision of free maternity services at all levels of healthcare systems, education of human task forces, and equitable placement of health professionals in health

facilities, as well as the provision of adequate drugs, medical supplies, and equipment (15). However, there was no clear finding on MNM and related factors in the study area. Therefore, the present study aimed to identify MNM cases and associated factors in the governmental health centers in the study area.

## Materials and Methods

This retrospective record review was conducted in North Shewa Zone, Oromia Regional State, Ethiopia, in public health centers within April 10 to May 5 in 2018, by reviewing the records of mothers who were treated at Sandafa and Wolego health centers during September 11 in 2014 to March 30 in 2018. The mothers with a medical record for ANC visits, delivery, abortion, or post-natal care within 42 days of delivery/termination of pregnancy were included in the study. In addition, the patient medical records with incomplete data regarding the important variables were excluded from the present study.

The sample size was calculated using single population proportion ( $n = [Z_{\alpha/2}]^2 P[1-P]/d^2$ ) based on the frequency of mothers who presented with or without complication during delivery and 42 days following the childbirth reported as 23.3% in a previous study (16), with 95% confidence level and 2% marginal error. Calculated with these assumptions, the final sample size was obtained at 1,717. The sample size was proportionally allocated to both health centers based on the patient flow. Finally, 1,130 and 586 study participants from Sandafa and Wolego health centers were selected using simple random sampling, respectively.

A structured data extraction tool was developed in English and translated to Afaan Oromoo and then back-translated to English to check for consistency by the language experts of both languages. The tool contains four parts, including 7 items in sociodemographic part, 2 items in health facility-related part, 12 items in obstetric history part, and 35 items in WHO assessment tools in the MNM part. The tools were pretested on 5% of the actual sample size to check for the inclusion of the necessary variables. The data were collected by well-trained data collectors and supervisors recruited based on their previous experience on data collection and supervision.

The MNM is defined as a life-threatening complication that occurred during pregnancy, delivery, and within 42 days after termination/delivery of pregnancy. The complications are classified as direct and indirect obstetric complications using the disease-specific criteria of MNM developed by the WHO (1). The direct obstetric complications are obstructed or prolonged labor, hemorrhage, infections, ruptured uterus, severe preeclampsia or eclampsia, and unsafe abortion. Indirect obstetric complications are anemia, malaria, hepatitis, tuberculosis, and cardiovascular diseases. The MNM cases were determined based on the data from medical records collected through checklists on clinical criteria related to a specific disease, management-specific domain, and organ system dysfunction, or failure that the mother faced during the time of pregnancy, delivery, and within postpartum/postabortion 42 days.

The STROBE Statement was used to analyze and report the data (18). The data were cleaned and entered into EpiData software (version 3.1) and exported to SPSS software (version 20) for analysis. Descriptive statistics, such as frequency, percentage, and inferential statistics, were also obtained in the study. Odds ratios with a 95% confidence interval were used in logistic regression to assess the association between each independent variable and

outcome variable. Those variables with p-value less than 0.25 were entered into the final model. Those variables with p-value less or equal to 0.05 after multivariable logistic regressions were considered statistically significant in association with outcome variables.

The study was approved by the Institutional Research Ethics Review Committee of Jimma University in Ethiopia. The letters of permission were obtained from the Sandafa town administrative Health office for Sandafa and Wolego health centers. All the information acquired from the patient medical records was kept confidential by avoiding the name of the study participants.

## Results

### Sociodemographic characteristics of participants

The medical records of 1,667 patients were reviewed, and the medical records of 50 subjects were excluded due to missed data for important variables. The mean age of the study participants was 24.87±4.5 years. Out of the total 1,667 medical records, 1,237 (74.2%) cases were within the age range of 20-29 years, and 1,654 (99.2%) women were married. Out of all records, 1,114 (66.8%) mothers were from Sandafa town (Table 1).

**Table 1.** Distribution of maternal near-miss based on sociodemographic status of women within September 11 in 2014 to March 30 in 2018 in Sandafa town health centers in Ethiopia

Variable	Maternal near-miss status		Total N (%)
	Near-miss N (%)	Non Near-miss N (%)	
<b>Age</b>			
<19	33 (19.6%)	135 (80.4%)	168 (100%)
20-29	255 (20.6%)	982 (79.4%)	1,237 (100%)
30-39	56 (21.4%)	206 (78.6%)	262 (100%)
<b>Marital status</b>			
Married	337 (20.4%)	1,317 (79.6%)	1,654 (100%)
Not married	7 (53.8%)	6 (46.2%)	13 (100%)
<b>Place of residence</b>			
Urban areas	207 (18.6%)	907 (81.4%)	1,114 (100%)
Rural areas	137 (25%)	416 (75%)	553 (100%)

### Obstetric history of participants

Out of the total 1,667 medical records, 249 (27.2%) primigravida mothers were identified

to be MNM cases, and out of the MNM cases, 260 (27.7%) items were reported as nulliparity mothers. About 13 (34%) mothers who suffered

from MNM had previous obstetric complications, and 302 (19.3%) cases had ANC follow-ups (Table 2).

**Table 2.** Distribution of maternal near-miss based on obstetric history of women within September 11 in 2014 to March 30 in 2018 in Sandafa town health centers in Ethiopia

Variable	Near-miss N (%)	Non Near-miss N (%)
<b>Gravida</b>		
1	249 (27.2%)	665 (72.8%)
2-4	91 (12.9%)	615 (87.1%)
≥5	4 (8.5%)	43 (91.5%)
<b>Parity</b>		
0	260 (27.7%)	680 (72.3%)
1	44 (10%)	394 (90%)
≥2	40 (13.8%)	249 (86.2%)
<b>Live birth</b>		
0	260 (27.6%)	681 (72.4%)
1-2	72 (11.7%)	543 (88.3%)
≥3	12 (10.8%)	99 (89.2%)
<b>History of obstetrics complication</b>		
Yes	13 (34%)	25 (66%)
No	331 (20.2%)	1,296 (79.8%)
<b>Gestational age (week)</b>		
<28	9 (37.5%)	15 (62.5%)
28-37	189 (19.5%)	778 (80.5%)
38-46	146 (21.6%)	530 (78.4%)
<b>ANC visit</b>		
Yes	302 (19.3%)	1,265 (80.7%)
No	42 (42%)	58 (58%)
<b>Number of ANC visits</b>		
0	42 (41.6%)	59 (58.4%)
1-3	151 (15.4%)	830 (84.6%)
≥4	151 (25.8%)	434 (74.2%)
<b>Spontaneous labor</b>		
Yes	288 (18.1%)	1,303 (81.9%)
No	56 (73.7%)	20 (26.3%)
<b>Labor duration</b>		
≤5 h	102 (13.5%)	651 (86.5%)
>5 h	242 (30.6%)	549 (69.4%)

ANC: Antenatal care

### Causes of maternal near-miss

Obstructed/prolonged labor, hemorrhage, preeclampsia, eclampsia, abortion, infection, anemia, and congestive heart disease (CHD) were the identified direct obstetric causes for MNM in the study facilities, and anemia and CHD were reported as the rare indirect obstetric causes.

### Magnitude of maternal near-miss and associated factors

A total of 344 MNM cases were identified from 1,667 medical records among which 308

and 36 MNM cases were from Sandafa and Wolego health centers, respectively. Based on the bivariate analysis, the maternal place of residence, duration of labor, ANC visits, history of obstetric complication, and number of live births fulfilled the criteria for the final model. The results of the multivariate analysis revealed that the maternal place of residence, ANC visits, and duration of labor were the factors associated with MNM. The mothers who lived in rural areas were observed to be 1.4 times more likely to develop MNM complications, compared to the mothers who were from urban areas (AOR=1.4; 95% CI: 1.03-1.8).

Those mothers who had no ANC follow-up were 6.53 times more likely to develop MNM than those cases who had ANC visits during pregnancy (AOR=6.53; 95% CI: 4.5-9.5). Those subjects who were reported with a labor

duration of 6 h or more were 6.5 times more likely to have MNM complications than those mothers who had a labor duration of 5 h or less (AOR=6.5; 95% CI: 4.5, 9.5) (Table 3).

**Table 3.** Associated factors with maternal near-miss within September 11 in 2014 to March 30 in 2018 in Sandafa town health centers in Ethiopia

Variable	Near-miss N (%)	Non Near-miss N (%)	COR (95% CI)	AOR (95% CI)	P-value*
<b>Place of residence</b>					
Sandafa	207 (18.6%)	907 (81.4%)	1	1	
Outside Sandafa	137 (24.8%)	416 (75.2%)	1.4 (1.13-1.84)	1.4 (1.03-1.81)	0.032
<b>ANC visit</b>					
Yes	302 (19.3%)	1,265 (80.7%)	1	1	
No	42 (42%)	58 (58%)	3.03 (2-4.6)	6.53 (4.5-9.5)	0.001
<b>Labor duration</b>					
≤5 h	102 (13.5%)	651 (86.5%)	1	1	
>5 h	242 (30.6%)	549 (69.4%)	6.06 (4.33-8.5)	6.5 (4.5-9.5)	0.001

AOR: Adjusted odd ratio, COR: Crude odd Ratio, \*: Adjusted P-value, CI: Confidence Interval, ANC: Antenatal care

## Discussion

The obtained results of the present study revealed 344 cases that represented the MNM ratio of 72 per 1,000 live births. This ratio was higher, compared to the MNM ratio obtained from a study conducted in Addis Ababa hospitals in Ethiopia, which was reported as 49 cases per 1,000 live births (8). In this regard, the discrepancy may be due to the differences in the health-seeking behavior of society. This ratio of the present study was much lower than that reported for Debre Markos referral hospital, which was presented as 384 per 1,000 live births (7). This discrepancy may be due to the differences in the study facility and patient flow.

The results of the present study revealed that the maternal place of residence had a statistically significant association with MNM. This finding showed that the mothers who were from rural areas were 1.4 times more likely to develop MNM complications than those mothers who lived in urban areas. This result might be due to the fact that mothers from rural areas may lack adequate health information, and there might be a lack of sufficient health facilities and different supplies. Moreover, it might be due to the fact that the mothers from rural areas could not get the opportunity to have quality ANC visits, which makes it impossible to identify and manage health problems leading to

complications during pregnancy, delivery, and postnatal period.

According to the obtained results of the present study, it was also shown that having no ANC visit during pregnancy had a statistically significant association with MNM. Those mothers who had no ANC visit during pregnancy were 6.53 times more likely to develop MNM than those who had ANC follow-ups. This finding is in line with the results of various studies conducted in different parts of the world (7, 8, 17). This may be due to the fact that ANC follow-ups during pregnancy will help to identify and manage complications earlier and provide mothers with the opportunity for health education and information regarding the danger signs during pregnancy, delivery, and postpartum period and give the advantage of skilled birth attendance.

The results of the present study also revealed that the duration of labor had a statistically significant association with MNM. This means that as the labor duration is longer, the probability of developing obstructed/prolonged labor is higher. The chance of developing MNM for mothers with a labor duration > 5 h is 6.5 times higher, compared to that reported for the mothers who had a labor duration ≤ 5 h. This may be due to the fact that when the labor duration gets longer, the delivery may be complicated; the fetomaternal condition may be

worsening and causing negative fetomaternal outcomes. This finding is consistent with the results of a study conducted in the Debre Markos referral hospital (5).

In the present study, the standard questionnaire was used based on the literature together with the WHO standard tool for MNM. However, this study was carried out by reviewing the patient medical records; therefore, there might be some drawbacks in obtaining adequate information due to the incompleteness of the records.

### Conclusion

There was a high frequency of MNM cases at the health facilities of the present study. In this study, it was observed that obstructed labor, hemorrhage, preeclampsia, eclampsia, abortion, infection, CHD, and anemia were the complications that caused MNM. The results of the present study also revealed that maternal place of residence, duration of labor, and ANC visits were the factors statistically associated with MNM.

Health managers and healthcare providers should pay attention to increase the utilization of ANC and provision of health education on how to prevent complications during pregnancy, delivery, and postnatal period. Health managers and nongovernmental organizations should focus on the accessibility of health facilities in rural areas for all pregnant mothers in need of healthcare in any obstetric emergency.

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### Conflicts of interest

Authors declared no conflicts of interest.

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