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Factors associated with maternal near-miss at public hospitals of South-East Ethiopia: An institutional-based cross-sectional study

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Abstract

Introduction: Maternal near-miss precedes maternal mortality, and women are still alive indicating that the numbers of near-misses occur more often than maternal mortality. This study aims to assess the prevalence of maternal near-miss and associated factors at public hospitals of Bale zone, Southeast Ethiopia.

Methods: Facility-based cross-sectional study design was carried out from 1 October 2018 to 28 February 2019, among 300 women admitted to maternity wards. A structured questionnaire and checklist were used to collect data. Epi-info for data entry and statistical package for social science for analysis were used. The descriptive findings were summarized using tables and text. Adjusted odds ratio with 95% confidence interval and p-value < 0.05 were used to examine the association between the independent and dependent variables.

Result: The prevalence of maternal near-miss in our study area was 28.7%. Age < 20 years, age at first marriage < 20 years, husbands with primary education, and being from rural areas are factors significantly associated with the prevalence of maternal near-miss. The zonal health department in collaboration with the education department and justice office has to mitigate early marriage by educating the community about the impacts of early marriage on health.

Keywords

age at first marriage, maternal near-miss, women

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Introduction

Maternal morbidity is defined as ill-health in a woman during pregnancy, irrespective of pregnancy site or duration, which is caused or aggravated by the pregnancy or its management, but which is not caused by accident or incident. This concept ranges from mild to severe maternal morbidity (SMM). Maternal near-miss (MNM) and potentially life-threatening conditions (PLTCs) are included as SMM.[1]

The World Health Organization (WHO) Working Group on Maternal Mortality and Morbidity Classification modified three pre-existing separate definitions of MNM and defined it as one where, "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy." Moreover, a severe maternal complication is defined as a PLTC occurring during the antepartum, intrapartum, or postpartum period.[1–3]

The disease-specific criterion to identify MNM which was developed by WHO based on five core diagnostic groups were used in this study: (1) hemorrhage leading to

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an emergency hysterectomy, shock, coagulation, or need two or more units of blood transfusion; (2) pregnancy-induced hypertension including pre-eclampsia and eclampsia with clinical or laboratory indication necessitating termination of pregnancy to save the life of women; (3) dystocia leading to uterine rupture and imminent uterine rupture due to prolonged obstructed labor or previous cesarean section; (4) infections causing hypothermia or hyperthermia or clear manifestation of infection; and (5) anemia with a hemoglobin level of less than 6 g/dL or clear clinical sign of anemia.[4]

Globally, every day around 800 women lose their lives due to pregnancy-related causes which are easily preventable. In most Sub-Saharan African countries, the improvement of maternal health made sluggish progress. The estimated global maternal mortality rate in 2013 was 289,000 per year and from this, the Sub-Saharan African countries share the highest burden. Even though high maternal deaths are occurring within these countries, the exact figure for each center categorizes these events as rare. This leads to a reduced level of power to allow the studies to investigate the potential risk factors. In this situation, MNM can serve as a proxy for maternal death which could help to evaluate the quality of maternity care in certain health facilities.[5]

In 2014, WHO report indicated that 9 million women are victimized by near-miss. Because of this, in low- and middle-income countries specifically among the humblest women, the burden of MNM is high.[1–3,6] The magnitude of MNM ranges up to 0.04% using management-based criteria and as high as 15% using disease-specific criteria. Furthermore, the burden of this problem is worse among low- and middle-income countries.[7,8] For instance, the incidence of MNM in Ethiopia ranges from 8% to 29%.[9–11] This could emasculate the normal functioning of women.[12] Age of women above 35 years,[13–15] being from rural residence, having an uneducated male partner,[16] not having formal education or having low educational levels, and low socioeconomic status[17] were factors significantly associated with MNM. Furthermore, lack of knowledge about danger signs during pregnancy, presence of the first delay in decision making,[18] having a history of chronic hypertension and anemia,[9,19] and having previous caesarian section and/or abortion were significantly associated with MNM.[15]

One of the major public health concerns globally including Ethiopia is MNMs. Therefore, for achieving the sustainable development goal 3 of target 1, reducing the incidence of MNM is crucial.[20] Besides, investigating the causes of MNM will benefit maternity care practitioners for providing quality care by enhancing the readiness of the facilities. Moreover, investigating MNM events rather than maternal death has the following merits: MNM is more common than maternal mortality; reviewing near-miss yields more likely palpable evidence on the pathways that lead to SMM; since the women survived, examining the care received is less threatening to providers; we can learn from the women themselves since they can be a witness; and every near-miss case can be used as a free lesson and opportunity for improving maternity care. Therefore, this study intends to assess the prevalence of MNM and associated factors at public hospitals of Bale zone, Southeast Ethiopia.

Material and methods

Study design, population, and sampling procedures

A facility-based cross-sectional study design was carried out from 1 October 2018 to 28 February 2019, at three public hospitals of Bale zone, namely, Robe, Ginnir, and Delomena. Bale zone is located in Southeast Ethiopia which is 435 km far from the capital city of Ethiopia. The 3-month average admission before preceding the survey was 2835 in Robe, 2748 in Ginnir, and 2595 in Delomena Hospital.

All women who are admitted to the maternity units of the selected hospitals during pregnancy, childbirth, or postpartum period are the source population. All those women who are admitted to the maternity unit of the selected three hospitals during pregnancy, childbirth, or postpartum period during our data collection period were the study population. Furthermore, all those women admitted to the maternity unit of the three selected hospitals during pregnancy, childbirth, or postpartum period were included in the survey. But, those women admitted to maternity units of the selected three hospitals during pregnancy, childbirth, or postpartum period because of an accidental or incidental problem were excluded.

With the basic assumption of 95% confidence interval (CI), 5% margin of error, and 23.3% proportion of MNM,[11] a single population proportion formula was used to calculate the sample size. Then, by adding a 10% non-response rate, the final calculated sample size was 300. The final sample was proportionally allocated across the three hospitals based on the annual caseloads admitted at the maternity unit. Therefore, 115 samples were allocated for Robe, 100 for Ginnir, and 85 for Delomena hospitals. Finally, using a systematic random sampling method, every seventh interval, the study participants were selected from all selected hospitals.

Data collection tools and procedure

Both chart review and interview were made by two independent data collectors who were not working in the selected hospitals. Therefore, using a pre-tested structured questionnaire, exit interviews were conducted about demographic, personal, community, obstetric, administrative, and care provider–related variables. On the contrary, chart reviews were done to diagnose MNM using the disease-specific criteria developed by WHO. In general, two data collectors for each hospital were recruited, and one author was assigned as a supervisor for each hospital.

Data quality assurance

The questionnaires were designed and modified in English and then were translated to the local languages (Amharic and Afan Oromo). To ensure the consistency of the questionnaire, it was translated back to English by another expert. A pre-test was conducted at Goba referral Hospital on 5% of the sample. One day training was given to data collectors and supervisors. The supervisor was monitored the data collection process to assure the quality of data. Daily, the field supervisor checked the completeness of the collected data. Before data entry, the completeness, accuracy, and consistency of data were checked. Then, incomplete questionnaires were excluded from the analysis. Furthermore, data were entered into Epi Info, version 7.2, and checked for outliers. The interview was conducted privately. Patients' card was reviewed to determine the occurrence of MNM.

Data processing and analysis

The coded data were checked and cleaned by entering into Epi Info version 7.2.1 and exported to statistical package for social science (SPSS) version 21 for analysis. The descriptive part of the results was presented using tables, frequencies, mean, standard deviation, and text. To present the analytic part of the findings, a bivariate logistic regression analysis was done. Those variables with a significance level (p-value) < 0.05 in the bivariate analysis were entered into a multivariable logistic regression model for further analysis and to adjust the confounding factor. Adjusted odds ratio (AOR) with 95% of CI and significance (p-value) < 0.05 was used to examine the degree of association between the independent variables and MNM.

Result

Two hundred ninety-six women completed the interview with the response rate of 98.7%.

Socio-demographic variables

Of the 296 study participants involved in the study, 240 (81.1%) women were aged between 20 and 34 years with a mean age of 25.1 (±5.2). Two hundred seventy (91.2%) women were married, 188 (63.5%) were Oromo ethnic group, and the majority of the study participants accounting for 74.7% were housewives (Table 1).

Table 1. The distribution of socio-demographic characteristics of study participants in public hospitals of Bale zone, 2019.

Variables	Frequency	Percentage (%)
Age of respondent		
<20 years	41	13.8
20–34 years	240	81.1
>34 years	15	5.1
Marital status of respondents		
Married	270	91.2
Single/divorced/widowed	26	8.8
The ethnicity of the respondents		
Oromo	188	63.5
Amhara	88	29.7
Others	20	6.8
Religion		
Muslim	129	43.6
Orthodox	105	35.5
Protestant/Catholic	62	20.9
Occupation of the respondents		
Housewife	221	74.7
Farmer	18	6.1
Government employee	17	5.7
Others[a]	40	13.5
Educational status of women		
Unable to read and write	54	18.2
Able to read and write	60	20.3
Primary school	101	34.1
Secondary school	50	16.9
Above secondary school	31	10.5
Income of the women		
Low	61	20.6
Moderate	165	55.7
High	70	23.7
Husband's educational status		
Unable to read and write	49	16.6
Able to read and write	12	4.0
Primary school	81	27.4
Secondary school	103	34.8
Diploma and above	51	17.2
Residence area of the respondents		
Rural	157	53
Urban	139	47
Distance from health facility		
<10 km	126	42.6
>10 km	170	57.4

[a]Others: student, daily laborer merchant, private employee, and unemployed.

Obstetrics-related variables

About 233 (78.7%) of our study participants were booked for antenatal care (ANC) service, and 173 (58.4%) were self-referred. From a total of 296 study participants, 211 (71.3%) reported that the current pregnancy is planned and wanted whereas regarding parity, 130 (43.9%) of the participants were multiparous (Table 2).

Administrative and medical personnel–related variables

Of the 296 study participants, 8 (2.7%) reported that there was a power supply problem during their hospital stay, 22 (7.4%) encountered delay in decision making, and 47 (15.9%) reported that there was a delay in receiving care (Table 3).

Table 2. The distribution of obstetrics-related variables in public hospitals of Bale zone, Southeast Ethiopia, 2019.

Variables	Frequency	Percentage (%)
ANC history		
Booked	233	78.7
Not booked	63	21.3
Number of ANC visit		
First visit	43	18.5
Second visit	56	24.0
Third visit	68	29.2
Fourth visit	38	16.3
More than four visits	28	12.0
Type of ANC visit		
First visit	44	18.9
Repeat visit	189	81.1
Source of referral		
Self-referred	173	58.4
Health facility	123	41.6
Type of pregnancy		
Planned and wanted	211	71.3
Others	85	28.7
Parity of the women		
Primiparous	136	45.9
Multiparous	130	43.9
Grand multiparous	30	10.1
Gestational age		
Unknown	21	7.1
<28 weeks	37	12.5
29–36 weeks	20	6.8
37–42 weeks	214	72.3
>42 weeks	4	1.3
Duration of labor		
Less than 24 h	253	85.5
More than 24 h	43	14.5
Type of care providers		
Specialist/emergency surgeon	55	18.6
Midwife	206	69.6
General practitioner	35	11.8
Duration of hospital stay		
Less than 7 days	238	80.4
More than 7 days	58	19.6

ANC: antenatal care.

Table 3. Distribution of administrative and medical personnel–related variables in public hospitals of Bale zone, Southeast Ethiopia, 2019.

Variables	Frequency	Percentage (%)
Presence of a power supply problem		
Yes	8	2.7
No	288	97.3
Lack of transportation		
Yes	18	6.1
No	278	93.9
Lack of lifesaving materials		
Yes	12	4.1
No	274	95.9
Availability of blood product		
Yes	144	48.6
No	152	51.4
Presence of delay in decision making		
Yes	22	7.4
No	274	92.6
Presence of delay in receiving care		
Yes	47	15.9
No	249	84.1
Presence of senior care provider		
Yes	86	29.1
No	210	70.9

Table 4. The prevalence of MNM in public hospitals of Bale zone, Southeast Ethiopia, 2019.

Variables	Frequency	Percentage (%)
Severe hemorrhage		
Yes	22	7.4
No	274	92.6
Severe pre-eclampsia or eclampsia		
Yes	48	16.2
No	248	83.8
Dystocia		
Yes	8	2.7
No	288	97.3
Sepsis		
Yes	15	5.1
No	281	94.9
Anemia with < 6 g/dL		
Yes	30	10.1
No	266	89.9
The overall prevalence of maternal near-miss		
Yes	85	28.7
No	211	71.3

Prevalence of MNM

From the five parameters used to measure the occurrence of MNM, 22 (7.4%), women encountered severe hemorrhage leading to shock. About 48 (16.2%) of our study participants developed pregnancy-induced hypertension which necessitates termination of pregnancy to save the life of women. The overall prevalence of MNM is 85 (28.7%) (Table 4).

Factors associated with the prevalence of MNM

In binary logistic regression analysis, those variables significantly associated were exported to multivariable logistic regression analysis to control confounding factors. Those variables significantly associated in binary logistic regression are the age of respondent, age at first marriage, educational status, monthly income of the respondent, husband educational status, residence area, distance from the health facility, source of referral, type of care provider, lack of transportation, and delay in receiving care. Finally, age of

Table 5. Bivariable and multivariable logistic regression analysis of factors associated with the prevalence of MNM in public hospitals of Bale zone, Southeast Ethiopia, 2019.

Variables	MNM		Crude OR with 95% CI	Adjusted OR with 95% CI
	Yes	No		
Age of respondent				
<20 years	10	31	3.54 (1.02–12.24)	**3.72 (2.68–7.11)***
20–34 years	66	173	2.99 (1.03–8.46)	3.88 (0.90–15.52)
⩾35 years	8	7	1.00/3	1.00
Age at first marriage				
>20 years	44	82	1.69 (1.02–2.81)	**2.69 (1.32–5.48)***
20–34 years	41	129	1.00	1.00
Educational status				
Unable to read and write	22	32	0.22 (0.07–0.70)	1.14 (0.21–6.06)
Able to read and write	29	31	0.16 (0.05–0.51)	1.26 (0.25–6.24)
Primary school	21	80	0.56 (0.18–1.79)	2.92 (0.64–13.33)
Secondary school	9	41	0.68 (0.99–2.41)	2.56 (0.59–11.16)
Diploma and above	4	27	1.00	1.00
Monthly income of the respondent				
Low	24	37	0.17 (0.07–0.44)	0.38 (0.11–1.30)
Middle	54	111	0.23 (0.10–0.53)	0.69 (0.22–2.13)
High	7	63	1.00	1.00
Husband educational status				
Unable to read and write	22	27	0.23 (0.09–0.59)	0.72 (0.19–2.70)
Able to read and write	4	8	0.37 (0.09–1.54)	0.23 (0.04–1.40)
Primary school	30	51	0.32 (0.13–0.76)	**1.26 (1.08–2.92)***
Secondary school	21	82	0.76 (0.30–1.78)	0.72 (0.24–2.16)
Diploma and above	8	43	1.00	1.00
Respondents' residence area				
Rural	60	97	0.36 (0.21–0.61)	**1.79 (1.07–4.43)***
Urban	25	114	1.00	1.00
Distance from health facility				
<10 km	23	103	1.00	1.00
>10 km	62	108	0.39 (0.23–0.67)	1.33 (0.62–2.85)
Source of referral				
Self-referred	62	111	0.41 (0.24–0.71)	0.47 (1.22–0.98)
Health facility referred	23	100	1.00	1.00
Type of care provider				
Specialist/emergency	20	35	1.00	1.00
Midwife	48	158	1.65 (0.70–3.91)	2.04 (0.82–5.11)
General practitioner	17	18	3.11 (1.49–6.50)	1.25 (0.07–1.90)
Lack of transportation				
Yes	12	6	0.18 (0.06–0.49)	0.06 (0.01–1.33)
No	73	205	1.00	1.00
Delay in diagnosing the problem				
Yes	9	38	0.20 (0.08–0.50)	1.75 (0.63–4.84)
No	76	173	1.00	1.00

MNM: maternal near-miss; OR: odd ratio; CI: confidence interval.
*p-value is significant at $p < 0.05$. 1.00 = reference for category.

respondent, age at first marriage, husband's educational status, and residence area are factors significantly associated in multivariate analysis after adjusting confounding factors.

Those women aged less than 20 years are almost 4 times more likely to develop MNM compared to their counterparts (AOR = 3.72; 95% CI: 2.68–7.11). The odds of experiencing MNM is almost 3 times more likely for women whose age at first marriage is less than 20 years compared to their counterparts (AOR = 2.69; 95% CI: 1.32–5.48). Women whose husbands were educated up to primary school are 1.26 times more likely to develop MNM compared to those whose husbands are educated up to diploma or above (AOR = 1.26; 95% CI: 1.08–2.92). Those women from rural areas are almost 2 times more likely to encounter MNM compared to urban resident women (AOR = 1.79; 95% CI: 1.07–4.43) (Table 5).

Discussion

The prevalence of MNM in our study area is 28.7%, which is higher than the study done in developed countries ranging from 0.14% to 0.75%.[21–23] Also, this finding is higher than the finding in middle-income countries ranging form 1.5%–7.7%.[24–26] This variation could be attributed to sociodemographic factors, tools used to assess MNM, and the presence of advanced technologies used to detect the occurrence of MNM early and intervention provided.

A study done in Brazil revealed that the prevalence of MNM ranges up to 2.11% which is lower than the current findings and 3.2% in a university hospital of Syria.[14,25,27] This difference could be caused by the variation in sociodemographic characteristics and tools used to measure MNM.

The prevalence of MNM in Sub-Saharan African countries ranges from 2.21% to 12% which is lower than the current finding.[18,28–30] The majority of our study participants are from rural areas where transportation access is difficult. This could be attributed to the low healthcare-seeking behavior of our study participants.

The study conducted in central Uganda revealed that the MNM is 27% which is consistent with the current finding. This similarity could be attributed to similar socioeconomic status of the countries.

The study done in Amhara regional state referral hospital identified the prevalence of MNM as 23.3%, which is in line with our current finding. This similarity might be because of the same socio-demographic characteristics and tools used to measure the current finding.[11]

Those women aged less than 20 years are almost 4 times more likely to develop MNM compared to their counterparts (AOR = 3.72; 95% CI: 2.68–7.11). This finding is contrary to the other study revealing that age above 35 years is a risk factor for MNM. This variation could be because in our study area, there is a high prevalence of early marriage which can lead to high MNM.[13,15]

The odds of experiencing MNM is almost 3 times more likely in women whose age at first marriage is less than 20 years compared to their counterparts (AOR = 2.69; 95% CI: 1.32–5.48). This could be attributed to the presence of early marriage that can result in an increased incidence of obstructed labor, cesarean section, pregnancy-induced hypertension, and others. All these can result in an increased incidence of MNM.

Women whose husbands were educated up to primary school are 1.26 times more likely to develop MNM compared to those whose husbands are educated up to diploma or above (AOR = 1.26; 95% CI: 1.08–2.92). This finding supports the study done by Mulugeta and others revealing that having an uneducated partner and having a low educational level are factors significantly associated with the occurrence of MNM.11 Being a cross-sectional study was one of the limitations because it does not show the cause-and-effect relationship.

Conclusion

The overall prevalence of MNM in our study area is high. Age < 20 years, age at first marriage < 20 years, husbands with primary education, and being from rural areas are factors significantly associated with the prevalence of MNM. The Ministry of Health in collaboration with different stakeholders has to mitigate early marriage by educating the community on its impact on women later in life.

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Author contributions

A.M., G.F., K.S., G.G., S.D., and B.L. designed the study and were involved in drafting, statistical analysis, and correcting the article. All the authors read the article, critically revised it for important intellectual content, and approved the final version of the article.

Availability of data and materials

In the main article, all the available data and material used are presented and upon request, data will be forwarded by the corresponding author.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval and consent to participate

Ethical clearance was secured from the ethical review board of Madda Walabu University with ref. No: RPD/0272/2011 which was issued on 20 September 2018. Then, an ethical clearance letter was submitted to the respective hospitals. There was no invasive procedure which was done on client. Hence, informed verbal consent was secured. In addition, all clients included in the survey were mentally conscious and understood the information told to them. Therefore, after obtaining permission from the respective hospitals, the purpose of the study was explained to the study participants, and informed verbal consent was secured from them. Also, to assure the privacy and confidentiality of the information, participants' name or address was not to be recorded.

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