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Case-controlled Study

Obstetrics mortality and associated factors in intensive care unit of Addis Ababa public hospital in, 2020/21: A hospital based case control study

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ABSTRACT

Background: In low-income nations like Ethiopia, the rate of obstetric death in intensive care units is significant. The indications of admission are Preeclampsia/Eclampsia, postpartum hemorrhage, and puerperal sepsis but, patient outcomes subsequent to intensive care unit admission are sparse. The aim of this study is to assess factors associated with obstetrics mortality in Intensive Care unit.

Methods: A hospital based unmatched case control study was conducted on obstetrics patients admitted to Addis Ababa Public hospital's intensive care unit from October 2018 to November 2020. Multivariable logistic regression analysis was done; Odds Ratio and Confidence Interval (OR and 95% CI) were computed using SPSS version 26. P value < 0.05 was taken as statistically significant.

Result: Obstetrics mortality in intensive care unit was high and accounts 27% from the total intensive care unit admission. Severe pre-eclampsia AOR: 6.33; 95% CI: 2.25–17.79, puerperal sepsis AOR: 4.51; 95% CI: 1.68–12.15, age ≥35 years AOR: 4.09; 95% CI: 1.42–11.77, absence of antenatal care: AOR: 3.74; 95% CI: 1.03–13.5, maternal coexisting diseases AOR: 5.2; 95% CI: 2.22–12.16, and severely decrease of consciousness at admission AOR: 3.78; 95% CI: 1.21–11.79 were significantly associated with obstetrics mortality in Addis Ababa Public Hospitals intensive care unit.

Conclusion: and Recommendation: Maternal age ≥35 years, loss of antenatal care, puerperal sepsis, severe pre-eclampsia, pre-existing medical comorbidities and severe decrease level of consciousness during ICU admission were the most significant factors associated with obstetrics mortality. It is recommended that all pregnant women should have antenatal care so that preeclampsia and maternal comorbidities will be early diagnosed and treated.

1. Introduction

An intensive care unit (ICU) is a structured system for treating critically ill patients that combines intensive and specialized medical care, increased monitoring capability, and multiple modalities of physiologic organ support to keep patients alive during a period of life-threatening organ system insufficiency [1].According to data from 171 countries, 303,000 (80%CI: 291,000–349,000) mothers were died globally in 2015. Starting from the 1990, the annual maternal mortality rate reduction was higher in eastern Asia 5% (4·0–6·0) than the Caribbean 1·8%. The maternal mortality rate (MMR) was 12 (80% CI: 11–14) deaths per 100,000 live births for developed countries while it was 546 (511–652) for sub-Saharan Africa (SSA) in 2015(2).

Between 2000 and 2017, a report by the WHO, United Nations Children's Fund (UNICEF), World Bank Group, and the United Nations Population Division revealed that the maternal mortality ratio dropped by about 38% worldwide [3]. But this is not uniform worldwide and in Sub-Saharan Africa it is still unacceptably high. The inequalities of maternal deaths in some areas of the world reflect a difference in access to quality health services and highlight the gap between rich and poor [4].

By 2030, Africa will not achieve the Sustainable Development Goal (SDG) of 70 per 100,000 live births; instead, the MMR will be around 347 per 100,000 live births. As a result, in order to fulfill the 2030 Sustainable Development Goals, Africa and its partners will need to implement accelerated efforts to reduce the MMR by nearly 13% per year from its 2015 level [5].

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In 2017, the MMR in low-income nations was 462 per 100,000 live births, compared to 11 per 100,000 in high-income countries. The Sustainable Development Goals (SDG) aimed for a global MMR of less than 70 per 100,000 births by 2030, with no nation having a rate more than twice that of the global average. In 2017, Ethiopia's MMR was 401 per 100,000 live births [6].

Obstetric intensive-care unit mortality is high, ranging from 0% to 4.9% of admissions in high-income nations to 2% to 43.6% in low and middle-income countries [6]. Even if ICU mortality of obstetrics patients was high there was evidence that appropriate use of high quality ICU will decrease maternal mortality [7].

Data from the 2019 atlas of African health statistics showed that the MMR of Africa was 542 per 100,000 live births in 2015. This death was reported to be 34 times higher than the Europe's MMR and suggested to be unacceptably high [5].

Millennium Development Goal 5 (MDG5) by world health organization (WHO) planned to reduce MMR by 75% between 1990 and 2015. But the global MMR was only reduced from 385 deaths per 100,000 live births in 1990, to 216 in 2015. The amount of reduction was only about 43·9% and the planned one does not reached yet [2].

According to the study done in three Addis Ababa public hospitals, Ethiopia between January 2015 and December 2017 maternal mortality ratio was 156/100000. Preeclampsia/Eclampsia, postpartum hemorrhage and puerperal sepsis all contribute considerably to direct maternal deaths, with ICU mortality accounting for 27.4% of total hospital deaths [8].

There was no difference in the admission criteria to ICU in developing compared to developed countries, except for the significantly higher maternal mortality rate in developing countries. Studies reporting patient outcomes subsequent to ICU admission are lacking [9]. Similarly obstetrics mortality in intensive care unit and cause of death was under reported in Ethiopia [8]. So the aim of this study was to identify factors affecting obstetrics mortality in the intensive-care unit.

As maternal death often occurs in the ICU, early warning tools may help in identifying critical obstetrics mothers, so that specific treatment would be given accordingly to decrease mortality. In addition this research will help health institutions, policymakers, and other stakeholders offer important maternal care by identifying interventions that are most likely to reduce mother fatalities and improve maternal health across the country. Specifically the results from this study were beneficial for healthcare providers and hospitals management to allocate resources in order to reduce maternal mortality in the intensive-care unit. Overall, there was a scarcity of published data on factors affecting obstetrics intensive care unit mortality both globally and nationally, including Ethiopia. So that, this research will allow for the collection of trustworthy data that can forecast a problem and provide guidance for better management strategies to reduce maternal ICU mortality.

2. Methodology and materials

It is an institutional-based Case control study conducted at three public hospitals From October 2020 to June 2021. This study has been registered with the Research Registration Unique Identifying Number (UIN):7534.https://www.researchregistry.com/register-now#user researchregistry/:~:text = researchregistry 7534. **This study is reported according to STROCSS 2021 guideline** [26].

2.1. Study area, and study design

This study was conducted at three public hospitals of Addis Ababa city administration. Addis Ababa is the capital city of Ethiopia and had 13 Public hospitals and 34 private hospitals. According to 2017 estimations Addis Ababa has a population of 6.6 million people. The study was conducted at Tikur Anbessa specialized hospital, Yekatit 12 Hospital Medical College and Ghandi memorial referral hospitals. The hospitals act as referral centers for the entire country in addition to offering medical services to residents of Addis Ababa.

To determine the variables connected to obstetrics mortality in the intensive-care unit, an unmatched case-control study was carried out. maternal mortality Cases were characterized as obstetric deaths following intensive care unit admission (ICU). maternal mortality Cases for which death certificates were accessed were confirmed. Control cases were pregnant women who were admitted to one of the three intensive care units, survived, and then left the facility. The ratio of cases to controls was one to two (one case: two controls), with two survived obstetrics being used as the control for every obstetrics ICU fatality.

2.1.1. Eligibility criteria

2.1.1.1. Inclusion criteria. All pregnant women hospitalized to the intensive care units of the three hospitals within the times stated, after 28 weeks of pregnancy, or within 42 days following delivery due to obstetric or co-morbid conditions and who were survived or died.

2.1.2. Exclusion criteria

- ✓ Pregnant mother admitted for any accident(road traffic accident, personal fighting,etc)
- ✓ Pregnant women admitted for treatment of poisoning
- ✓ Non obstetrics emergency surgery
- ✓ Obstetrics mothers referred to other hospitals for further investigation or for treatment

2.1.3. Variables

2.1.3.1. Dependent variable. Obstetrics ICU care outcome: Survival or death.

2.1.3.2. Independent variable.

- ❖ Obstetrics sociodemographic factors (age, parity, residence area)
- ❖ Maternal co-existing medical disease
- ❖ ANC follow up
- ❖ Mode of Delivery(SVD or C/S)
- ❖ V/T at admission (GCS,BP,HR,RR and Oxygen Saturation)
- ❖ Admission diagnosis(PIH,Obstetric hemorrhage, Sepsis and Other)
- ❖ Complications in ICU
- ❖ Treatment provided in ICU
- ✓ Magnesium sulphate, Vasopressor, MV,Blood transfusion and other
- ❖ Duration of ICU stay

2.2. Sample size and sampling technique

Sample size was calculated from a previous case control study done in Nigeria using unmatched case control study formula. We calculated sample size by inserting different predictors of obstetrics mortality variables from pervious study both into Open Epi software and formula. Both calculations provided the same result. Postpartum hemorrhage gave the largest sample size and was used in the formula [10].

Power = 80%, $Z_\beta = 0.84$ for 20% beta error.

p_1 = proportion of cases with exposure = 48%

p_2 = proportion of controls with exposure = 28%

r = the ratio of case to control (1case/2 controls) = 2.

$n_{1\,\text{Fleiss}}$ = required sample size for cases using Fleiss's formula.

$n_{1\,\text{Fleiss-cc}}$ = required sample size for cases using Fleiss's formula with continuity correction.

n_1 = Number of cases,n_2 = number of controls. $n_2 = 2n_1$

The sample size formula *without* the correction factor by Fleiss is:

$$n_1 = \frac{\left[Z_{\alpha/2}\sqrt{(r+1)\overline{pq}} + Z_{\beta}\sqrt{rp_1q_1 + p_2q_2}\right]^2}{r(p_1 - p_2)^2} = 70$$

For the Fleiss method *with* the correction factor,

$$n_1cc = \frac{n_1}{4}\left[1 + \sqrt{1 + \frac{2(r+1)}{n_1r|p_1 - p_2|}}\right]^2 = 75$$

$n_2 = 75 \times 2 = 150$, total sample size (75 cases + 150 controls) = 225.

Out of twelve Addis Ababa governmental hospitals, five hospitals were selected by lottery method (Fig. 1). Card numbers of obstetric cases fulfilling inclusion criteria were used from ICUs' registration book. Numbers of samples taken for cases were proportionally allocated to the three hospitals ICU then two controls was taken for each case from the same hospital in order to make cases and control homogenous. Simple random sampling technique was used.

2.3. Data collection technique and procedure

Data were collected from all eligible obstetrics' chart using structured questionnaire. All obstetrics' risk factors were collected from ICU registration logbook, delivery registration log book, maternal chart (card), Health Management Information System (HMIS), death reports, and referral papers. Maternal's charts were reviewed for maternal age, address, ANC, Parity, reason for admission to ICUs, diagnosis, vital sign, treatment provided in ICU, length of ICU stay, outcome and for other necessary data using structured questionnaire tool. The data collectors were two bachelors of degree (BSC) intensive-care unit nurses.

2.4. Data analyzing and processing

Data were checked manually for completeness and then coded and entered into Epi info version 7. Data were cleaned and analysed with SPSS version 26. Student's t-test was used for comparison of sociodemographic variables like age and parity between cases and controls. Hosmer and Lemeshow goodness of fit test for logistic regression were used to test for the model fitness. Multicollinearity was checked by variance inflation factor (VIF). Both binary logistic regression analysis and multivariable logistic regression were performed and association between the outcome and independent variables was assessed. On bivariate logistic regression analysis, a variable with P-value less than 0.2 was considered as a candidate for multivariable logistic regression analysis (Table 2). Multivariable logistic regression analysis was performed to control for confounders and the factors associated with obstetrics death in the ICUs were identified (Table 3). Adjusted odds ratio (AOR) were determined and variables with p value < 0.05 on multivariable logistic regression was declared statistically significant. Confidence intervals (CIs) were used for the odds ratios. Finally, the result was presented by using text, graph and tables.

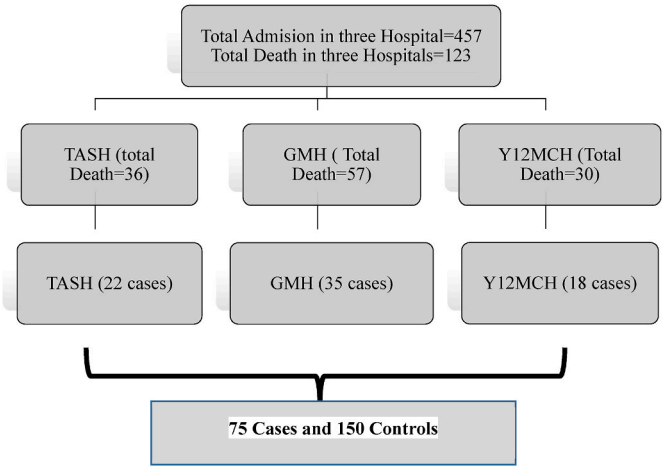

Fig. 1. Schematic presentation of proportional allocation and sampling procedure.

2.5. Quality assurance

Questionnaire was prepared by English language. The questionnaire was pretested on 5% of the sample size before actual data collection in Zewditu memorial hospital which is one of the Addis Ababa public hospitals. Training and orientation about the objectives and relevance of the study on each items included in the study tools and the whole process of data collection was provided for data collectors and supervisor. During data collection, regular supervision and follow up was undertaken. Supervisors checked each questionnaire daily with further cross check by principal investigator for completeness and consistency of data was undertaken.

3. Results

3.1. Sociodemographic factors, co-existing medical disease, and delivery mode of obstetrics patients admitted to Addis Ababa Public Hospitals' intensive care unit

During October 2018 to November 2020, a total of 457 Obstetric patients were admitted to the three selected Addis Ababa Public hospital's intensive-care unit. From the total admission to the ICU, 123 were recorded as death, making Obstetrics intensive care unit mortality 27%. Total sample size was 225 from which 75 were cases and 150 were controls (Table 1).

The mean obstetrics age among the cases was 29.51(±6.31) and the mean among the controls was 28.99(±5.24). The mean maternal parity was 3.01 ± 2.12 and 2.65 ± 1.72 for the cases and controls, respectively. The mean duration of ICU stay was 5.8 ± 4.7 among the cases and 8.16 ± 6.27 days among the controls (Table 1).

3.2. Admission Diagnosis among obstetrics patients admitted to Addis Ababa Public Hospitals Intensive Care Unit

Complications of Anesthesia among the admitted obstetrics cases

Table 1
Sociodemographic factors, co-existing medical disease, and delivery mode of obstetrics patients admitted to Addis Ababa Public Hospitals ICU from October 2018 to November 2020, (75 = Cases, 150 = Controls).

Variables		Case(n = 75),%	Control(n = 150),%	Total(n = 225),%
Age category <35	<35	52(69.3%)	124(82.7%)	176(78.2%)
	≥35	23(30.7%)	26(17.3%)	49(21.8%)
Residence area	In A.A	54(72%)	114(76%)	168(74.7%)
	Out of A.A	21(28%)	36(24.09%)	57(25.3%)
ANC Follow up	No	11(14.7%)	9(6%)	20(8.9%)
	Interrupted	12(16%)	13(8.7%)	25(11.1%
	Yes	52(69.3	128(85.3%)	180(80%)
Coexisting medical disease	Yes	29(38.7 %)	23(15.3%)	52(23.1)
	No	46(61.3%)	127(84.7%)	173(76.9%)
Delivery Mode	C/S	32(42.7%)	49(32.7%)	81(36%)
	SVD	**43(57.3%)**	**101(67.3%)**	**144(64%)**

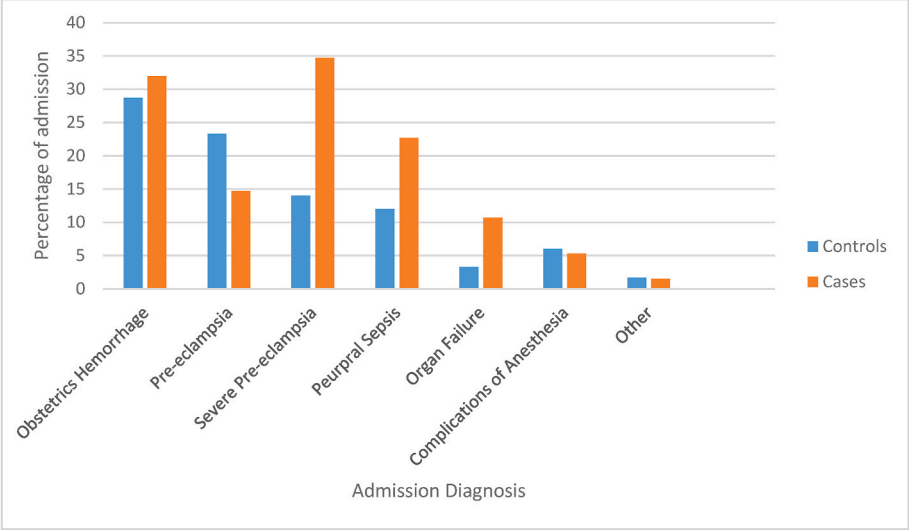

Fig. 2. Admission diagnosis of obstetrics patients admitted to Addis Ababa public hospitals intensive care unit.

were 4(5.3%) and 9(6%) among the controls. These complications of anesthesia were total spinal anesthesia 2(2.65%), cardiac arrest 1 (1.33%), and delayed awakening from anesthesia 1(1.33%) in obstetrics cases. In obstetrics controls total spinal anesthesia 4(2.67%), and delayed awakening from anesthesia 5(3.33%) were found as anesthesia complications that resulted in ICU admission. Bronchial asthma, epilepsy, and amniotic fluid embolism were reported as the other indication and overall account 3.1% of ICU admission (Fig. 2 below).

3.3. Multivariable analysis of factors associated with obstetrics mortality in Addis Ababa Public Hospitals' ICU

Multivariable unconditional logistic regression analysis show that, six [6] risk factors were identified to be significantly associated with obstetrics ICU mortality in Addis Ababa Public Hospitals. These risk factors were age greater than or equal to (≥35), absence of ANC follow up, maternal coexisting diseases, severe pre-eclampsia, peurpral sepsis and severely decrease of consciousness during admission (Table 3)

Our study found that obstetrics age (≥35) years old were 4 times more likely to die compared to obstetrics age (<35) (AOR: 4.09; 95% CI: 1.42–11.77). Obstetrics patients who did not attend ANC were 3 times more likely to die relative to those who had attended ANC (AOR: 3.74; 95% CI: 1.03–13.5). Obstetrics mothers who had coexisting medical diseases were 5 times more likely to die compared to those who had not (AOR: 5.2; 95% CI: 2.22–12.16) (Table 3).

Obstetrics patients admitted with severe pre-eclampsia were 6 (AOR: 6.33; 95% CI: 2.25–17.79) times more likely to die compared to those who had no severe pre-eclampsia. Obstetrics patients admitted with puerperal sepsis were 4 (AOR: 4.51; 95% CI: 1.68–12.15) times more likely to die compared to those who had no puerperal sepsis. Obstetrics patients with severely decrease of consciousness (<9) at admission were 3 (AOR: 3.78; 95% CI: 1.21–11.79) more likely to die relative to mild decrease of consciousness.

4. Discussion

Causes of obstetrics patients' mortality in intensive care unit are multifactorial. In this study advanced maternal age, loss of antenatal care, peurpral sepsis, severe pre-eclampsia, pre-existing medical comorbidities, and severely decrease of consciousness during ICU admission were significantly associated with obstetrics mother's intensive care unit mortality. During this study period the overall obstetrics mortality in intensive care unit was 27%, which is comparable to the study done in Nigerian tertiary hospital ICU (31.09%) [11] and the result was in agreement with the reports from developing countries [5]. Even so maternal death is rare event; the results from this two studies show that it was huge. The reason may be due to both studies were on a more critical obstetrics patients admitted to ICU and mortality in ICU rather than hospital patients and hospital mortality, in addition both study area are in 3rd world countries in which MMR is high.

This study found that obstetrics mothers of age (≥35) years are 4 times higher mortality when compared to maternal age less than 35 years. It was consistent with the study done in France on 11 European countries by Wildman [12], and a case control study done by Diana in Indonesia [13]. In one study increasing parity was significantly associated with maternal mortality in ICU (59.5%) [14]. However, in this study maternal mortality at ICU was not affected by parity. A possible justification may be a pregnant woman is usually young and less likely to suffer from chronic medical comorbidities, so that maternal age would be a confounding factor.

Obstetrics mothers who did not follow ANC during their pregnancy were 3 times more likely to die when compared to those who had ANC follow up. This finding is consistent with a case control study done on obstetric patients at Mizan-Tepi University, Ethiopia by Tegene Legese et al., in 2016 [15], another case control study by Knight in United kingdom in 2017(16) and other studies reported by different authors [17,18]. So adequate ANC during pregnancy can reduce maternal mortality by early actions that can ensure a safe and uncomplicated delivery and this idea was supported by Katia M. S. Figueiredo et al. [19].

This study result showed that obstetrics coexisting medical diseases were significantly associated with obstetrics mortality and it is consistent with a study done in United kingdom (AOR: 5.92; 95% CI: 3.56–9.86) [16], and also comparable to a case control study done in Malaysia [20].

Obstetrics patients admitted with puerperal sepsis were 4 times more likely to die compared to those who had no puerperal sepsis. In line with this, a study done in Brazil found that infection was responsible for nearly half (46.4%) of maternal deaths [21]. The reason behind might be substandard set up, unavailability of highly broad spectrum antibiotics, delayed management, and poor maternal care. In addition to this being pregnant can increase a risk of infection due to immunosuppression, cesarean delivery, and retained placental tissue [22].

According to the study done by Global Network Maternal Newborn

Table 2
Bivariate associations of factors associated with obstetrics patients mortality that were admitted to Addis Ababa Public hospitals intensive care unit.

Variables		Case n (%)	Control n (%)	COR(95%CI)	P Value
Age category	<35	52(69.3%)	124(82.7%)	1	
	≥35	23(30.7%)	26(17.3%)	2.11(1.1–4.03)	0.024*
Parity		3.01 ± 2.12	2.65 ± 1.72	1.11(0.96–1.28)	0.17
ANC Follow up	No	11(14.7%)	9(6%)	3(1.18–7.69)	0.02*
	Yes	52(69.3	128(85.3%)	1	
Comorbidity	Yes	29(38.7%)	23(15.3	3.48(1.83–6.62)	<0.001*
	No	46(61.3%)	127(84.7%)	1	
Delivery Mode	C/S	32(42.7%)	49(32.7%)	1.53(0.87–2.72)	0.14
	SVD	43(57.3%)	101(67.3%)	1	
Obstetrics Hemorrhage	Yes	24(32%)	43(28.7%)	1.17(0.64–2.14)	0.61
	No	51(68%)	107(71.3%)	1	
Peurpral Sepsis	Yes	17(22.7%)	18(12%)	2.15(1.04–4.47)	0.04*
	No	58(77.3%)	132(88%)	1	
Pre-eclampsia	Yes	11(14.7%)	35(23.3%)	0.56(0.27–1.19)	0.13
	No	64(85.3%)	115(76.7%)	1	
Severe Pre-eclampsia	Yes	26(34.7%)	21(14%)	3.26(1.7–6.32)	0.001*
	No	49(65.3%)	129(86%)	1	
Organ Failure	No	67(89.3%)	145(96.7%)	1	
	Yes	8(10.7%)	5(3.3%)	3.46(1.1–10.98)	0.04*
GCS	≥13	28(37.3%)	103(68.7%)	1	
	9–12	29(38.7%)	35(23.3%)	3.1(1.6–5.81)	0.001*
	<9	18(24%)	12(8%)	5.5(2.3–12.8)	0.001*
SBP	90–140	33(44%)	77(51.3%)	1	
	<90	26(34.7%)	41(27.3%)	1.5(0.78–2.8)	0.23
	>140	16(21.3%)	32(21.3%)	1.2(0.57–2.4)	0.68
Heart Rate	Normal	37(49.3%)	80(53.3%)	1	
	Tachycardi	38(50.7%)	70(46.7%)	1.2(0.67–2.1)	0.57
Respiratory Rate	Normal	27(36%)	66(44%)	1	
	Tachypnea	48(64%)	84(56%)	1.4(0.8–2.47)	0.25
Oxygen Saturation No	Normal	32(42.7%)	86(57.3%)	1	
	Hypoxia	43(57.3%)	64(42.7%)	1.8(1.03–3.2)	0.04*
Mechanical Ventilation	Yes	50(66.7%)	71(47.3%)	2.22(1.25–3.96)	0.007*
	No	25(33.3%)	79(52.7%)	1	
Vasopressors and Inotropes No	Yes	48(64%)	74(49.3%)	1.83(1.03–3.23)	0.04*
	No	27(36%)	76(50.7%)	1	
ICU Complications	Yes	18(24%)	11(7.3%)	4(1.77–8.98)	0.001*
	No	**57(76%)**	**139(92.7%)**	**1**	

Where: 1 = reference group, COR = crude odd ratio, CI = confidence interval,*P Value < 0.05.

Health Registry from six low- and middle-income countries obstetric hemorrhage, pregnancy-related infection and pre-eclampsia/eclampsia were related with obstetrics causes of death [23]. But, in this study obstetric hemorrhage was not significantly associated with obstetrics death, and these variations may probably be due to availability of blood and blood products in our study area. The study done in ICU of Sub Saharan Africa reported that limited supply of blood products and inadequate prenatal care were resulted in high maternal mortality [24]. As presented in the result section, obstetrics patients admitted with severe pre-eclampsia were 6 times more likely to die compared to those who had no severe pre-eclampsia; this is due to the fact that severe pre-eclampsia may be complicated with pulmonary edema, loss of consciousness and pulmonary aspiration as well as acute kidney injury which needs hemodialysis and if not would result in death.

A cohort study carried out in the Medical Intensive Care Unit (MICU) of a tertiary care teaching hospital in India, showed that patients with GCS of ≤10 at the time of admission had significantly high mortality (85.3%) as compared with patients with GCS of more than 10 (9.1%) [14]. The result was comparable to this study that severe GCS (<9) during admission was significantly associated with obstetrics cause maternal mortality (OR 3.78) in ICU of Addis Ababa Public hospitals The study done by Paternina-Caicedo et al.(2017) in Colombia abnormal systolic blood pressure(OR 3.89), heart rate (OR 3.29), and temperature (OR 3.53) during intensive care unit admission were all significantly associated with maternal ICU mortality [25]. In contrast, this study found that patients' vital sign during ICU admission were not associated with obstetrics mortality in intensive care unit. The reason may be due to variations in vital sign during pregnancy shows a disease process or due to physiologic changes of pregnancy and the later one does not affect the outcome.

Study done in Nigeria found that presence of organ failure during ICU admission was one of the factors associated with maternal death [10]. However, result from this study does not show presence of organ failure during ICU admission as an attributable to obstetrics ICU mortality. The reason may be due to, inability to early diagnose organ failure before ICU admission, in our setup.

4.1. Strengths

This is the first case control study done on factors associated with obstetrics cause related mortality in intensive care unit of Addis Ababa public hospitals, Ethiopia. As much as possible we try to make cases and controls homogenous by taking cases and controls from the same hospitals which are admitted nearest in terms of time. We conducted our research in a multi-center setting to ensure that our findings could be verified and that we had a sufficient sample size.

4.2. Limitations

Because the number of mothers with obstetrics problems admitted to the intensive care unit was small and matching was problematic, we did not use a matched case control study. As this study was limited to the intensive care unit, it does not reflect hospital mortality because there is a delivery room and in an emergency death of obstetrics patients. Only a few studies on parameters linked to obstetrics mothers critical care unit mortality had been reported.

4.3. Conclusion

In conclusion, advanced maternal age, loss of antenatal care,

Table 3
Multivariable analysis of factors associated with obstetrics mortality in Addis Ababa Public Hospitals' ICU.

Variable	Category	COR(with 95% CI)	AOR (with 95% CI)	P Value
Age Interval	≥35	2.11(1.1–4.03)	4.09(1.42–11.77)	0.009
	<35	1	1	
Parity		1.11(0.96–1.28)	0.98(0.8–1.21)	0.855
ANC follow up	Yes	1	1	
	No	3(1.18–7.69)	3.74(1.03–13.5)	0.044
Coexisting Diseases	Yes	3.48(1.83–6.62)	5.2(2.22–12.16)	P < 0.001
	No	1	1	
Mode of Delivery	C/S	1.53(0.87–2.72)	1.75(0.85–3.58)	0.127
	SVD	1	1	
Pre-eclampsia	Yes	0.56(0.27–1.19)	1.94(0.68–5.55)	0.214
	No	1	1	
Severe Pre-eclampsia	Yes	3.26(1.68–6.32)	6.33(2.25–17.79)	P < 0.001
	No	1	1	
Peurpral Sepsis	Yes	2.15(1.04–4.47)	4.51(1.68–12.15)	0.003
	No	1	1	
Organ Failure	Yes	3.46(1.110.98)	1.75(0.36–8.53)	0.486
	No	1	1	
Level of consciousness (GCS)	Severe	5.5(2.38–12.8)	3.78(1.21–11.79)	0.022
	Moderate	3.05(1.6–5.81)	1.99(0.83–4.8)	0.124
	Mild	1	1	
Oxygen Saturation	Hypoxia	1.81(1.03–3.16)	0.9(0.41–2.01)	0.805
	Normal	1	1	
Mechanical Ventilation	Yes	2.22(1.25–3.96)	1.4(0.61–3.18)	0.43
	No	1	1	
Vasopressor	Yes	1.83(1.03–3.23)	1.19(0.53–2.67)	0.667
	No	1	1	
ICU Complications	Yes	4(1.77–8.98)	2.51(0.88–7.12)	0.084
	No	1	1	

1 = reference group, COR = crude odd ratio, AOR = adjusted odd ratio CI = confidence interval.

peurpral sepsis, severe pre-eclampsia, pre-existing medical comorbidities, and severely decrease of consciousness during ICU admission were the most significant factors associated with obstetrics mother's intensive care unit mortality. Despite the fact that this was not a country-based study, it did identify factors linked to obstetric mortality in the intensive care unit.

4.4. Recommendations

The following recommendations are forwarded based on the finding of this study.

4.5. For stakeholders

- ✓ All mothers should get adequate antenatal care during pregnancy and this will help to early identifying any obstetrics complications and will get treated to reduce maternal mortality
- ✓ Pre pregnancy assessment should be under taken in order to early diagnose a preexisting medical comorbidities that would affect maternal outcome so that they can early treated or avoid pregnancy at all.

4.6. For health professionals

- ✓ Obstetrics patients diagnosed with peurpral sepsis and those with severely decrease of consciousness should treated promptly as it was strongly associated with mortality.

4.7. For researcher

It is better if further study with cohort study is conducted to determine whether this findings can be reproduced.

4.8. Operational definitions

Coexisting disease- Pregnancy unrelated chronic medical disease.

Complications at ICU- A disease a patient did not have during ICU admission and acquired while in the ICU (acute kidney injury, infection in ICU, and pulmonary and cardiovascular complications such as aspiration pneumonia and etc).

Duration of ICU stays - is a period in days the patients stayed in ICU from admission to discharge.

Non-survived- Patients who are not alive at the time of discharge or died in the ICU.

Organ Failure at admission- Presence of specific organ failure at admission e.g Renal, Pulmonary, hepatic etc.

Outcome- Indicate either patient survived or died at the time of ICU discharge.

Survived- Patients, who survived during ICU stay, including patients who improved and got discharged, transferred to the wards.

Ethical approval

Ethical clearance was obtained from Health science college, Addis Ababa University ethical clearance committee. Reference number for Ethical approval: No 4/2021.

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Author contribution

Asaminew Tasew: as a team member He developed the proposal, trained the data collectors, analysed the data & wrote the result and interpreted the result. Eyayalem Melese: as a team member He developed the proposal, trained the data collectors, analysed the data & wrote the result and interpreted the result, over all he leads the research team. Suleman Jemal:as a team member He developed the proposal, trained the data collectors, analysed the data & wrote the result and interpreted

the result and corresponding Author, Lemlem Getachew: as a team developed the proposal, trained the data collectors, analysed the data, wrote the result, and Interpreted the result.

Registration of research studies

Name of the registry: **Research Registration**.

Unique Identifying number or registration ID: esearchregistry7534.

Hyper link: https://www.researchregistry.com/register-now#user-researchregistry/:~:text=researchregistry7534.

Guarantor

I will take the responsibility for the work.I 'm the member in conduct of the study and I have access to the data, and I controlled the decision to publish. Mr EYAYALEM MELESE GOSHU Senior Anaesthetist, Assistant Professor, Department of Anesthesia, School of Medicine, College Of Health Sciences, Addis Ababa University Email: eyayalem.melese@aau.edu.et/eyayalem@yahoo.com: Tele.+251913002201.

Consent

All requirement for research had applied during the process of this research work. Written consent was the first portion in the questioner. We obtained written consent from all who were participating in this study. and it is also included in manuscript.

Availability of data and materials

Data and materials will be shared upon reasonable request.

Provenance and peer review

Not commissioned, externally peer reviewed.

Declaration of competing interest

I assured the journal that no conflict of interest in any related issues.

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Abbreviations and Acronyms

ANC	Antenatal Care
AOR	Adjusted Odd Ratio
COR	Crude Odd Ratio
C/S	Cesarean Section
EDHS	Ethiopian Demographic Health Survey
GCS	Glasgo coma scale
HR	Hazard Ratio
MMR	Maternal Mortality Rate
OR	Odds ratio
SBP	Systolic Blood pressure
TASH	Tikur Anbessa Specialized Hospital
WHO	World Health Organization

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