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Original Research Article

Utility in the obstetric high dependency unit and intensive care unit in tertiary medical center in Ethiopia: a comparative cross-sectional study

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ABSTRACT

Background: Globally, an estimated 10.7 million women have died due to obstetric complications in the last two decades, and two-thirds of these deaths occurred in sub-Saharan Africa. This study aims to assess the utility of the obstetric high dependency unit and intensive care unit and maternal outcome in a tertiary medical center in Ethiopia.
Methods: A comparative cross-sectional study was conducted on critically ill obstetric clients admitted to St. Paul's Hospital Millennium medical college obstetric HDU from October 2020 to September 2022 and before the establishment of the obstetric HDU (who were admitted to the medical ICU). Binary and multivariate logistic regression was conducted to identify factors associated with maternal mortality before the establishment of the maternal HDU.
Results: The minimum duration in both units was one day. The maximum duration was 14 days for HDU and 26 days for ICU. Following the establishment of the maternity HDU, the ICU admission rate decreased to 1.2 per 1000 deliveries. Obstetric patients diagnosed with DIC and HELLP syndrome upon admission to the ICU had a 4.9 times higher risk of mortality compared to their counterparts. Obstetric women admitted to the ICU and treated with inotropic agents or vasopressors had a 33.8 times higher risk of mortality compared to their counterparts.
Conclusions: Obstetric admissions to the ICU significantly decreased following the establishment of the maternity HDU. Obstetric patients diagnosed with DIC and HELLP syndrome are more likely to develop unfavorably outcome.

Keywords: Maternity, HDU, Outcome, Utility, ICU

INTRODUCTION

Some of pregnant women develop obstetric complications during pregnancy and childbirth, which can lead to maternal death if they do not receive prompt obstetric interventions. Any pregnant woman can experience life-threatening complications with little warning. Even though pregnancy and labor are considered to be physiological

processes, the risk of catastrophic complications is constant and can arise within minutes.[1,2] For women who have progressed to a critical clinical condition with multi-organ involvement or failure, care should be provided in a high dependency unit (HDU), or intensive care unit (ICU) led by an intensivist or sub-specialist. This highlights the importance of obstetric HDUs, which provide intermediate levels of care between a general ward and ICU. An HDU can meet the critical care needs of at least half of the obstetric population and can also help reduce costs, as ICU care tends to be more expensive.[3,4] Resource-limited settings face the highest burden of obstetric critical care, including conditions such as eclampsia, hemorrhage, coagulopathy, and sepsis. All these conditions may benefit from an increased short-term level of monitoring and care, as provided by high-dependency units (HDUs). Data indicate that there is a limited number of maternity high dependency units available in low-income countries and Sub-Saharan Africa.[4-6] The objective of this study was to analyze the utility of the high dependency unit and ICU in an obstetric population in terms of utilization rate, indications for admission, interventions required, and gestational outcome.

Statement of the problem

An estimated 10.7 million women have died across the world due to obstetric complications in the last two decades, and two-thirds of these deaths occurred in sub-Saharan Africa. Five types of obstetric emergencies account for most maternal deaths: hemorrhage (25 percent), infection/sepsis (15 percent), unsafe abortion (13 percent), pre-eclampsia and eclampsia (12 percent), and prolonged or obstructed labor (8 percent). According to WHO, UNICEF, the World Bank, and other stakeholders, most maternal deaths and disabilities could be prevented through access to sufficient care during pregnancy and delivery and effective interventions.[5] Life-threatening complications during pregnancy and childbirth may develop unexpectedly and can rapidly progress to organ failure and even death. Survival depends on quality emergency obstetric and critical care management. The limited critical care resources in Africa often lead to maternal deaths that are potentially preventable.[6] A major limitation in low-resource countries is the limited availability of ICUs and non-availability of spaces for obstetric patients since most of the ICUs admit patients from all medical specialties. This is coupled with the higher cost of ICU management in relation to endemic poverty. The same is true in St. Paul Hospital Millennium Medical College, Addis Ababa, Ethiopia. Considering the existing problem, an obstetric high dependency unit was established since 2021 GC. In the ordinary gynecological ward, this required level of care was often not available in time to prevent further deterioration and preventable maternal mortality. The aim of this study is to report the utility of the high dependency unit and ICU in an obstetric population in terms of utilization rate, indications for admission, interventions required, and gestational outcome.

Significance of the study

This study aims to investigate the significance of an obstetric high dependency unit in a tertiary medical center in Addis Ababa, Ethiopia. It will provide valuable information on the burden of obstetric care encountered prior to the establishment of the obstetric HDU. The findings of this research can serve as a foundation for future studies. Researchers can refer to it as a primary source of literature from Ethiopia. To the best of the investigator's knowledge, this will be the first study to assess the role of the obstetric HDU in St. Paul Hospital Millennium Medical College. The study may assist policymakers in addressing health policy concerns, and the results will aid healthcare providers in making informed decisions to strengthen existing maternal HDUs or establish new ones. Due to the absence of an organized obstetric intensive care unit and its associated costs, complex maternal problems were not adequately addressed. Consequently, these patients were either referred elsewhere or did not receive adequate obstetric care. To address this issue, a maternal HDU was established. The findings provide evidence in support of the importance of its establishment. In summary, the findings of this study will be groundbreaking for the following reasons: First, while various studies in Ethiopia have examined emergency obstetric care, none have specifically focused on the role of obstetric HDUs. Second, despite an extensive literature review, no prior research has been conducted on the utility of obstetric dependency units and ICU in terms of admission rates, indications for admission, required interventions, and gestational outcomes.

Demographic characteristics

A study conducted in India shows that the majority of the clients admitted to HDU were in the age group of 21-25 years, 99 patients (46.48%), with a mean age of 25.39 years.[7] Similarly, a study conducted in India revealed that the mean age of patients with only obstetric morbidity and cases with prior medical disease was 24.6±4.23 and 24.9±4.33 years, respectively. Of the observed patients requiring HDU admission, 31 were primiparas (54.38%) and 26 were multiparas (45.61%).[8] Similar findings were reported from rural central India where the majority of women were in the age group of 21-25 years (54%).[2]

Indications for admission

In Nigeria the leading causes of admission were Massive postpartum haemorrhage 8 (50%) and severe preeclampsia/ Eclampsia 4 (25%). Other indications of admission were HELLP syndrome Amniotic fluid embolism Puerperal/ post abortion sepsis Uterine rupture complication of unsafe abortion peripartum cardiomyopathy.[4] Cardiac disease, accounting for 15% of admissions. HELLP accounted for about 13%, PPH for 11% and coagulopathy for 10% of the admissions.[9,10] Anemia was the commonest medical indication with 22

(10.32%) patients for HDU admission followed by heart disease in pregnancy with 16 (7.51%) patients and Jaundice in 6 (2.82%) patients.[7] A report from Indian shows interventions required during HDU stay were inotropes (24.56%), antibiotics (100%), mechanical ventilation (19.29%) and central venous monitoring (40.35%).[8] In China after the introduction of HDU, the rate of ICU admission reduced by 18.0% (1.23% in 2014-16 vs. 1.01% in 2017-19), and HDU admission (1575 cases) amounted to 7.15% of total obstetric population. So, the establishment of HDU was related to 20% reduction of ICU admission.[11]

Obstetric outcome in HDU

Total 72% of whom survived and 28% were expired.[2] Report from Indea reveals that HDU stay for the sample population ranged from 1 to 7 days with a mean stay of 3.31 days. Out of 185 patients who delivered, 148 (20%) had live births and 37 had still births (20%).[7] Study from UK revealed that most women only required a short stay in HDU. The number of patients who stayed for less than 24 h were 726 (53.4%) compared to 230 (16.9%) who stayed for longer than 48 hr. According to this study during 23-year study period, 36 mothers died. These included both immediate and late deaths.[9]

Objectives

General objective was to analyze the utility of HDU and ICU in an obstetric population in St. Paul hospital millennium medica college 2023. Specific objectives were to determine the obstetric outcome in obstetric population in St. Paul hospital millennium medica college 2023 and to compare the proportion obstetric admission to maternity HDU and ICU among obstetrics population in St. Paul's hospital millennium medica college 2023.

METHODS

Study design, location and duration

Comparative cross sectional quantitative study was conducted. The study was conducted in Addis Ababa, a capital city of Ethiopia, at St. Paul hospital millennium medical college (SPHMMC). Addis Ababa has ten sub-cities in which the city lies at an altitude of 7,546 feet (2,300 meters). It has twelve governmental and nine non-governmental hospitals. St. Paul hospital millennium medical college is largest tertiary referral public Hospitals in the capital under the federal ministry of health. SPHMMC, as it is known today, was established through a decree of the Council of Ministers in 2010, although the medical school opened in 2007 and the hospital was established in 1968 by the late Emperor Haile Selassie and furnished with 250 beds. The college has more than 2500 clinical academic and admin staff. While the inpatient capacity is 700 beds more than 2000 outpatient and emergency clients are visiting our health facility daily. The college has different specialized unit. Intensive care Unit is staffed by emergency and critical nurses and intensivist. Obstetric high dependency unit is one of specialized unit recently stablished providing service for critically ill maternal following labor. Maternity HDU was staffed by midwifery, emergency medicine and critical care physician, emergency and critical nurse and gynecologist. This study conducted on critically ill maternity client admitted to maternity HDU from October 2020 to September 2022 and before the establishment of obstetric HDU (there after referred as medical intensive care Unit). The study period was from 1 August up to 31 August 2023.

Inclusion and exclusion criteria

All women admitted to HDU and ICU either due to obstetric or obstetric with co morbid conditions were included in the study. Exclusion criteria were; pregnant women admitted for treatment of poisoning, road traffic accident, and sequel of ectopic pregnancy. Other exclusion criteria were medico-legal cases and incomplete chart.

Data collection procedures

Demographic information, relevant obstetric history, the reason for admission in HDU and ICU, need for ventilation, type of interventions and outcome of the pregnancy was obtained in a pretested, validated data extraction tool. Data was collected from patient medical record using a checklist which was developed by using information from reviewed research and adapted to this study. The charts of sample population were collected from card rooms using medical registration number. One day training was given for data collectors and misunderstandings was solved prior to the actual data collection period. Data was collected by two midwives and two critical nurses. Critical supervision was performed by the two supervisors and by a principal investigator throughout the course of the data collection. To keep the confidentiality, all collected data was coded and locked in a separate room before entered the computer and names of client was no included in the data collection format.

Data processing and analysis

Data cleansing, editing, and coding was done before data analysis using Epi data version 4.6 software. Any errors identified at this time was corrected by reviewing the original data using data code. Then, we have transferred to SPSS version 26 for the final analysis. The proportions were compared by chi square test. Cross tabulation of independent variable with outcome variable was performed. On binary logistic regression variable with $p<0.25$ were taken to multivariate logistic regression and $p<0.05$ was considered as significant at 95 confidence level.

Data quality assurance

Data quality was assured by a properly training data collectors on each item included in the study tools,

objective, and relevant of study. Also, quality of data was managed by using properly designed extraction checklist. Pretest was conducted on 5% of sample at St. Peter specialized hospital. Charts of the study sample population was assessed for completeness. The filled checklists were checked for completeness daily by the supervisors and principal investigator.

Sample size determination and sampling technique

Sample size calculation was not employed. All obstetric clients admitted to medical ICU before establishment of maternity HDU was used. So, before 2020, 250 obstetric clients were admitted to Medical ICU. Among admitted case only 200 charts fulfil inclusion and exclusion criteria. To make match for comparison 200 patient cards were collected from Client chart who were admitted to obstetric HDU. Since the opening of obstetric HDU, 410 women were admitted to obstetric HDU. To select 200 sample, simple random sampling was employed. After listing the 410 medical registration number, sample unit picked randomly. So, the final sample size was 400.

Operational definitions

Utilization: The role of established obstetric high dependency unit in terms of causes of admission of, admission rate and obstetric outcome. Obstetric HDU: Is an area for management of high-risk pregnancies requiring vigilant monitoring and interventions by specially trained teams. HDU is an area in a hospital where patients can be cared more extensively than in a normal ward, but not to the point of intensive care.

RESULTS

Socio demographic characteristic of obstetrics women admitted to maternity HDU vs. ICU

From 2021-2022, about 16,705 obstetrics clients were admitted to St Paul's hospital millennium medical college. From this figure 410 were admitted to HDU. Maternity admission rate was 24.5 per 1000 deliveries. Maternity admission to ICU accounts for 9.8 per 100 deliveries. After the establishment of maternity HDU, ICU admission rate was dropped to 1.2 per 1000 deliveries. Demography of our study population revealed (Table 1) median age at admissions to maternity HDU was 26.5 with interquartile range (IQR) (22-32). Similarly mean age of obstetric clients admitted to medical ICU was 26 with IQR (24.0-30.00). Minimum age at admissions was 15 for and 16 for ICU. Minimum of 8 weeks Gestational age was reported at maternity HDU. Maximum gestation age at both maternity HDU and ICU were 42 weeks. Median gestational week of maternity women who admitted to HDU and ICU were 36 and 37 respectively. Median, Minimum, and maximum number Parity of obstetrics women admitted to HDU and ICU were same for both units. The minimum duration was the same for both unit which was one day. The maximum duration at 14 and 26 days for HDU and ICU respectively.

Table 1: Descriptive statistics of obstetrics clients admitted HDU vs. ICU (n=400).

Variables	Minimum	Maximum	Median	SD	Percentiles	
					25	75
Age (HDU)	15	40	26.5000	6.02283	22.25	32.00
Age (ICU)	16	40	26.0000	4.63329	24.0	30.00
Gestational age (HDU)	8	42.00	37.0000	7.08917	33.00	39.00
Gestational age (ICU)	20	42	36.0000	4.22750	33.00	40.00
Parity in HDU	0.00	6.00	1.00	1.43	0.00	2.00
Parity in ICU	0.00	6.00	1.00	1.19	1.0000	2.00
Gravida (HDU)	1.00	7.00	2.0000	1.52	1.0000	3.0000
Gravida (ICU)	1	6	1.0000	1.32	1.00	2.00
Duration in HDU	1	14	2.716	3.00	2	5
Duration in ICU	1	26	4.0000	4.57232	2	8

Admission diagnosis

The most common cause of admission to the high dependency unit was DIC & HELLP syndrome and pre-eclampsia, accounting for 28% of cases. On the other hand, the most frequent indication for admission to the intensive care unit was eclampsia, representing 48% of cases. None of the obstetrics clients admitted to the HDU had malaria as an indication, while 4 clients had malaria as the indication for admission to the ICU. About 90% of obstetrics clients admitted to the ICU developed complications, whereas only 18% had complications in the HDU. Among the complications, 60% were related to cardiovascular problems, and acute kidney injury accounted for 48% in HDU and ICU respectively.

Complications in HDU vs. ICU

Of total women who admitted to HDU 18% has Pregnancy induced complications, with highest figure in ICU (90%). Among women with complications in HDU, 60% were cardiac and 35% and 5% were respiratory failure and renal failure related complications respectively.

Table 2: Descriptive statistics of admission diagnosis to HDU vs. ICU (n=400).

Category	Response	N		%	
		HDU	ICU	HDU	ICU
Eclampsia	Yes	32	96	16	48
	No	168	104	84	52
Preeclampsia	Yes	56	60	28	30
	No	144	140	72	70
Severe anemia	Yes	12	20	6	10
	No	188	180	94	90
Malaria	Yes	0	4	0	2
	No	200	196	100	98
Obstructed labour	Yes	8	0	4	0
	No	192	200	96	100
Uterine rapture	Yes	2	0	1	0
	No	198	200	99	100
DIC and HEELP syndrome	Yes	56	92	28	46
	No	144	108	72	54
Post partum hemorrhage (PPH)	Yes	30	28	15	14
	No	170	172	185	86
Antepartum hemorrhage	Yes	30	0	15	0
	No	170	200	85	100
Sequel of abortion	Yes	8	4	4	2
	No	192	196	196	98
Chorio-amnionitis	Yes	6	81	3	4
	No	194	924	197	196
Sepsis	Yes	8	24	4	12
	No	192	176	196	188
Pregnancy induced complications	Yes	36	180	18	90
	No	164	20	82	10

Table 3: complications in HDU and ICU (n=400).

Type of complications	N		%	
	HDU	ICU	HDU	ICU
Cardiac	24	8	60	4.3
Respiratory	14	52	25	28.3
Renal	2	96	5	52.2
Central nerve systems	0	28	0.00	15.2
Total	40	184	100	100

Obstetrics management at maternity HDU vs. ICU (n=400)

Among 10 women's who took mechanical ventilators in HDU, 8 and 2 women's were managed by invasive ventilation and noninvasive ventilation respectively.

In contrary to this most maternal case who admitted to ICU were put on mechanical ventilators 108 (54%). Among 108 patients who took mechanical ventilators 98 (49%) were invasive and 10 (5%) were noninvasive. All clients who admitted to ICU took antibiotic but in HDU about 80% (160) were received antibiotic agent.

Mothered outcome at obstetric HDU vs. ICU (n=400)

Total 99% of admitted women were disposed from Maternity HDU and only 2 women were died in HDU since its establishment. 5% of admitted women were transferred to ICU for the indication of multiorgan failure and management of complications.

Cause of death

Of 200 Gyn/Obs women who admitted to maternal HDU, 2(1%) women were died in HDU and the cause of death were multiorgan failure and post partem hemorrhage. In contrary to one percent mortality at HDU, 14% of obstetric women were died in ICU. Among 200 Gyn/Obs women admitted to ICU, 28 (14%) was died in intensive care unit. In intensive care unit cause of death was organ failure 16 (57%), sepsis 8 (28.6%) and postpartum hemorrhage 4 (14.4%).

Fetus outcomes whose mothers admitted to HDU vs. ICU

Total 75% of fetus were alive, 23% and 2% were either experienced Abortion or IUFD and death respectively.

Table 4: Obstetrics management at maternity HDU vs. ICU (n=400).

Category	Response	N		%	
		HDU	ICU	HDU	ICU
Vasopressor	Yes	18	52	6	26
	No	188	148	94	74
Mechanical ventilators	Yes	10	108	5	54
	No	190	92	95	46
Blood transfusion	Yes	104	100	52	50
	No	96	100	48	50
Antibiotic	Yes	160	200	80	100
	No	40	0	20	0.0
Hysterectomy	Yes	4	12	2	6
	No	196	188	98	94
Magnesium Sulphate	Yes	94	74	47	38
	No	106	124	53	62
Anticonvulsant	Yes	16	36	8	18
	No	184	164	92	82
Antihypertensive agent	Yes	52	80	26	40
	No	148	120	74	60
Uterotonic drugs	Yes	48	12	24	6
	No	52	188	76	94
Rate control	Yes	6	12	3	6
	No	94	188	97	94
INO2	Yes	8	76	4	38
	No	192	124	196	62
Dialysis	Yes	0.00	48	0	24
	No	200	152	100	76

Factors associated with maternal mortality

Binary logistic regression: Cross tabulation of each independent variable with outcome variable was done separately. Hence, due to violation of $\chi 2$ assumption, Variables with <5 counts were excluded. Similarly, we could not be able to perform regression for HDU case. But binary and multivariate logistics regression was conducted for maternal ICU case. Variable having p<0.25 with 95% was take to multivariate logistic regression.

Factors associated with maternal mortality in ICU

Model fitness test was conducted by Hosmer and Lemeshow test and p>0.878. Only two independent variables were showing significant association with outcome variables. DIC & HEELP syndrome and use of inotropic agent were found to be independently associated with maternal mortality at 95% confidence level. Obstetrics client who was diagnosed with DIC & HEELP syndrome on admission to intensive care unit were 4.9 times more likely to die (AOR=4.897, CI 1.254-19.113, p<0.022) than who obstetrics clients who were not Diagnosed with DIC & HEELP syndrome keeping other variables constant. Obstetrics woman who was admitted to intensive care Unit and managed by inotropic agents or vasopressor were 33.8 times more likely to die (AOR=33.845, CI 9.547-119.982, p<00) than who did not managed by inotropic agents by keeping all variable constant.

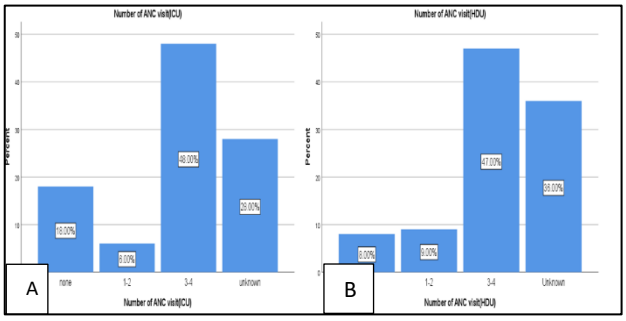

Figure 1: Number of ANC visit among women who admitted to A) ICU vs. B) HDU (n=400).

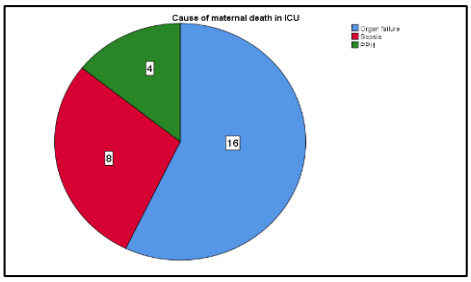

Figure 2: Cause of maternal death at ICU (n=200).

Table 5: Maternal outcome in HDU vs, ICU(n=400).

Maternal Outcome in HDU vs. ICU					
Outcome variable	**Response**	**N**		**%**	
		HDU	**ICU**	**HDU**	**ICU**
Maternal outcome	Improved/discharged.	198	172	99.0	86.0
	Died	2	28	1.0	14.0
	Total	200	200	100.0	100.0

Table 6: Fetal outcome in HDU vs. ICU (n=400).

Fetal outcome					
Variables	**Response**	**N**		**%**	
		HDU	**ICU**	**HDU**	**ICU**
Fetal outcome	Alive	150	92	75	46.0
	Died	46	24	23	12.0
	IUFD/Abortion	4	84	2	42.0
	Total	200	200	100%	100.0%

Table 7: Binary logistic regression candidate variables for multivariate regression (n=200).

Predictor variables		B value	SE	Wald	P value	COR (95% CI)
Duration in ICU		-0.072	0.057	1.561	0.212	0.931 (0.83-1.04)
Age		0.112	0.044	6.522	0.011	1.12 (1.03-1.2)
Parity		-0.381	0.225	2.867	0.090	0.683 (0.440-1.062)
ANC visit	1st Visit	-20.980	11602.711	190.005	0.999	0 (0)
	2nd visit	-2.175	0.499	190.005	0.000	0.114 (0.043-0.302)
	3rd visit	-2.342	0.618	140.366	0.000	0.096 (0.029-0.323)
Pre-eclampsia		1.064	0.564	3.555	0.059	2.897 (0.959-8.750)
DIC&HEELP syndrome		-1.245	0.446	7.791	0.005	0.288 (0.12-0.690)
PPH		-1.112	0.481	5.338	0.021	0.329 (0.128-0.845)
Mechanical ventilation		-1.838	0.561	10.730	0.001	0.159 (0.053-0.478)
Inotropic/vasopressor		-3.429	0.578	35.177	0.000	0.032 (0.010-0.101)
Blood transfusion		-1.983	0.562	12.454	0.000	0.138 (0.046-0.414)
Hysterectomy		-2.821	0.656	18.471	0.000	0.060 (0.016-0.216)
INO2		-1.229	0.650	3.571	0.059	0.293 (0.0821-0.047)

Table 8: multivariate logistic regression by using backward selection method (Wald).

Category		Maternal outcome			
Predictor variable		**Improved N (%)**	**Died N (%)**	**P value**	**AOR (95% CI)**
DIC and HELLP syndrome	No	100 (92.65	8 (7.4)	-	1
	Yes	72 (78.3)	10 (21.7)	0.022*	4.897 (1.254-19.113)
Inotropic vasopressor	No	144 (97.3)	4 (2.7)	-	1
	Yes	28 (53.8)	24 (46.2)	0.00*	33.845 (9.547-119.982)
Hysterectomy	No	4 (33.3)	8 (66.7)	-	1
	Yes	168 (89.4)	20 (10.6))	0.997*	0.618-0.423 (0.000-16.20)
INO2 (1)	No	100 (80.6)	241 (9.4)	-	1
	Yes	72 (94.7)	4 (5.3)	0.088	10.059 (0.711-142.264)
Constant				0.102	19235429.824

*Denotes variable with significance associations

DISCUSSION

Our study uncovers the admission rates to HDU and ICU. The admission rate to HDU was 24 per 1000 deliveries, while the admission rate to ICU was 9.8 per 1000 deliveries. Our ICU admission rate was higher than in other studies.[14-16] However, only one study was comparable to our findings.[17] Similarly, our HDU admission rate was higher compared to other studies.[8,9] Possible reasons for this disagreement may stem from differences in the availability of settings or the sensitivity of case selection for admission to the respective units.

After the establishment of maternity HDU, ICU admission rate was dropped to 1.2 per 1000 deliveries. This finding was consistence with study from China.[11] Of the maternity patients admitted to the HDU, ninety-three (93%) cases were referred from other health institutions, and among the obstetric women admitted to the ICU, 92% were referred from other facilities. The number of ANC visits among women admitted to the ICU and HDU was investigated. Out of 200 clients admitted to the HDU, 8% of them had no prior ANC visit, whereas 18% of women admitted to the ICU had no prior ANC visit. Our findings were inconsistent with a report from another study.[2] One possible justification is that our findings were from a tertiary referral hospital, unlike a rural hospital in India. Therefore, there may be differences in health education and health promotion. The indications leading to HDU and ICU admission were analyzed among the obstetric patients. The most common admission diagnoses to the HDU were pre-eclampsia and DIC & HELLP syndrome, accounting for 28% each, followed by pregnancy-induced complications (18%) and postpartum hemorrhage (15%), which is consistent with reports from India, Mahaveer Jain Hospital, and China.[10,11] On the other hand, a study conducted in India showed that sepsis accounted for the majority of admissions, followed by PPH and severe hypertensive disorders of pregnancy.[8] The most common admission diagnoses to the ICU were eclampsia, followed by DIC & HELLP syndrome. As in other reports, the major cause of admission to the ICU in the present study was hypertensive pregnancy.[11,17-18] Consistent with other studies cardiac diseases and other medical disorders accounted for the majority of non-obstetric indications in our ICU admissions.[11,14-17,19] Obstetric women admitted to the ICU had a high percentage of sepsis (12%) compared to studies conducted in a university hospital in southern India.[17]

All maternity cases admitted to the ICU were given antibiotics, and 80% of HDU cases were treated with antibiotics in addition to other interventions. The next most common intervention was blood transfusion, accounting for 52% and 50% in HDU and ICU, respectively. The transfusion rate was consistent with findings from Care University Hospital in South India.[17] Most maternal cases admitted to the ICU were put on mechanical ventilators, with 108 patients (54%) receiving this treatment. Among the 108 patients on mechanical ventilators, 98 (91%) required invasive ventilation and 10 (9%) required non-invasive ventilation during their stay in the ICU. This percentage was generally higher compared to the report from care university hospital.[17] This difference may be due to the fact that St. Paul is a referral hospital that receives a high proportion of obstetric women with multiorgan failure. Of the total women admitted to the HDU, 18% experienced pregnancy-induced organ failure as a complication, with the highest figure observed in the ICU (90%). Respiratory failure and renal failure were the most common types of complications among maternity cases admitted to the HDU and ICU, respectively. Research conducted in Brazil on factors associated with maternal death in an intensive care unit revealed that the most common complication was acute renal failure, which is similar to our findings.[20] In this study, the maternal mortality rate in the HDU was 1%, while in the ICU it was 14%. The leading cause of mortality in the ICU was organ failure. The mortality rate and cause of death were comparable to a study conducted in West Bengal, India, and the cause of death was similar to a Brazilian report.[9,20] In contrast to this study, the leading cause of mortality in the West Bengal study was dengue and malarial fever, and the maternal mortality rate was lower compared to other studies.[18] The report from Brazil showed that maternal mortality in the ICU was very low compared to our findings.[20] The differences were possibly due to initial cause of admission, different disease characteristic and the presence of specialized services. A study report from central India showed a higher maternal mortality rate compared to our findings.[16] Such differences in mortality rates may be due to a significant gap in leading admission diagnoses, which in our findings were post-partum bleeding and Eclampsia. Fetal outcomes were observed in both units. Among obstetric women admitted to the ICU, 84 women (42%) experienced intrauterine fetal death (IUFD), and 24 women (12%) had early fetal death. The report from central India had much lower numbers than our findings.[16] Possibly the difference was because of the highly organized obstetrics care given by obstetricians and midwives together with critical care nurses, whereas in our setting, primary care was provided by intensivists and critical care nurses. Factors associated with maternal mortality were identified. Obstetric women with DIC and HELLP syndrome, as well as those administered inotropes, were significantly associated with maternal death in the ICU. In contrast to our findings, acute kidney injury, hypotension, and respiratory failure were found to be independent risk factors for maternal death.[20] The difference may arise due to the differences in characteristics of the study population, and these variables were omitted from the regression analysis due to assumptions made in the X2 test.

Limitations

Since there is only one maternity high-dependency unit in Ethiopia, we did not conduct a study in multi-center tertiary referral hospitals. Another limitation of our study was the use of retrospective data.

CONCLUSION

In conclusion the admission rate to our high dependency unit was high. The most common admission diagnosis for the intensive care unit was Eclampsia. Obstetric admissions to the ICU significantly decreased following the establishment of the maternity HDU. There was a substantial difference in maternal mortality rates between the ICU and HDU. In the ICU, obstetric clients diagnosed with disseminated intravascular coagulation and HELLP syndrome, as well as those who received vasopressors as

part of their management, were identified as significant factors contributing to unfavourable maternal outcomes.

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