Disease pattern and mortality rate among patients admitted to the Intensive Care Unit in Arbaminch General Hospital, Southern Ethiopia

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Research Article

Keywords: mechanical ventilator, comorbidity, acute abdomen, cardiac disease

Posted Date: March 13th, 2024

DOI: https://doi.org/10.21203/rs.3.rs-4042442/v1

Additional Declarations: No competing interests reported.

Abstract

Background: Disease patterns in intensive care Unit is differ from place to place. Cardiac disease, septic shock, trauma, and acute abdomen are the common causes of admission. The mortality rate in the Intensive Care Unit (ICU) was higher than that in the other hospital units. Our aim was to assess the common admission diagnosis and mortality rate among Intensive Care Unit (ICU) patients in the Arbaminch General Hospital.

Methods: A retrospective cross-sectional study was conducted based on a review of the records and charts of patients admitted from January 1, 2019, to January 1, 2021. Descriptive statistics were also calculated. An independent variable effect on the mortality rate was observed.

Result: The most common admission diagnoses were cardiac and other medical diseases, septic shock and ARDS followed by acute abdomen and other surgical diseases. The overall mortality rate was 40.7%. On multivariate logistic regression analysis, no significant mortality rate affecting factors were identified.

Conclusion: Cardiac and other medical diseases were the most common admissions diagnoses, with an overall mortality rate of 40.7%. No significant association was found between the mortality rate and independent variables in the multivariate logistic regression.

Introduction

Background

The ICU admission diagnosis pattern differs across different parts of the world. Sepsis is frequent Intensive Care Unit admission diagnosis in western countries however Cardiovascular and respiratory diseases are the most common causes of Intensive Care Unit admission in middle income countries (1, 2). However, in low-income countries, the most common causes of intensive care unit admission are trauma and surgery (2). Neurosurgery accounts for 78.4% of trauma admissions (3). Abate et al. reported that acute respiratory distress syndrome is the most frequent admission diagnosis, and the second most common cause of intensive care unit admission is post-operative complications (4). One report from Tanzania, showed esophageal varices followed by diabetic keto acidosis (5). To address specific disease patterns in Intensive Care Unit, it is important to understand the distribution of diagnostic patterns in specific hospitals (1–6). Intensive Care Unit mortality rates vary across countries. In the United States, it ranges from 9.3–18.7% which is significantly lower than that reported for other developing countries (5). The overall intensive care mortality rate in Japan is higher than USA (1, 5). The mortality rates in Nigeria, Tanzania, Egypt, Sudan, and Ethiopia are 3 to 7 times higher than those in developed countries. This is probably due to less qualified human power, poorly functioning hospital systems, and inadequate equipment. The mortality rate is associated with different factors in different setups, such as length on mechanical ventilator, complications developed, increased hospital stay, concomitant comorbidity, and level of consciousness on admission (3–5, 7–11). At our hospital, the disease patterns and mortality rates among intensive care unit admitted patients are unknown. Therefore, this study was designed to assess disease patterns and treatment outcomes among patients admitted to the intensive care unit of the Arba Minch General Hospital.

Materials and methods

This hospital-based retrospective cross-sectional study was performed at Arbaminch General Hospital. Ethical approval was obtained from the Arbaminch University College of Medicine and Health Science Institutional Review Board (IRB/1161/2021). Data were collected from the Arbaminch General Hospital Intensive Care Unit record book and patient charts, using a checklist.

Study Setting and the period

This study was conducted at the Arba Minch General Hospital in Southern Ethiopia. It is a public hospital located in Arba Minch, Southern Ethiopia. The hospital has a bed capacity of 350 and is organized into different units (Surgical, Medical, Pediatrics, GYN/OBS, Burn, Orthopedics, and ICU). The ICU was established on January 1, 2019 with two trained nurses, one anesthetist, and one mechanical ventilator. The ICU was general and served all the departments together. Data were collected from patients admitted to the ICU between January 1, 2019, and January 1, 2021from patients admitted to the intensive care unit.

Study populations

All patients were admitted to the intensive care unit between January 1, 2019, and January 1, 2021, at the Arba Minch General Hospital in, southern Ethiopia. Incomplete data were excluded from the analysis.

Inclusion criteria

All complete data containing patient records was included.

Exclusion criteria

All incomplete data was excluded from the study.

Data collection procedure

Data were retrospectively collected from the ICU logbooks and patient charts by preparing a checklist in English. Data collectors were trained and supervised by both the principal and co-authors.

Sample size

All patients admitted to the ICU during the study period, with complete charts, were included.

Data compilation and analysis

Data were entered, cleaned, checked for completeness, compiled, and analyzed using SPSS version 25. Descriptive statistics were performed for frequencies and percentiles. Bivariate and multivariate logistic regression analyses were performed to determine the effect of the independent variables on the mortality rate.

Results

Characteristics of the study participants and their outcomes

A total of 344 patients were admitted to the intensive care unit, of which54.1% (186/344) were males. The majority of patients (47.1%, 162/344) were 20–40 years old, and more than half were from towns (52.9%, 182/344) (Table 1). The three common causes of admission were cardiac and other medical diseases (32.8%), septic shock and ARDS (28.2%), and acute abdomen and other surgical diseases (18.6%). Of the admitted patients, 48.3% had known comorbidities and 51.7% were free of chronic illnesses (Table 2). Of the admitted patients, 40.7% died, 59.3% improved, and they were discharged from the intensive care unit. Among the patients admitted to the intensive care unit, more than half developed shock and organ failure, and 17.2% developed hospital-acquired infections. More than half of the admitted patients needed intubation, and 80.5% stayed in the hospital for no more than five days. The ward was the most common source of admission, and the majority was from the internal medicine department. Almost all admissions occur on an emergency basis, accounting for 94.8% of admissions (326/344). Of the 344 patients, 182 (52.9%) were unconscious, and 162 (47.1%) were conscious. Among patients requiring mechanical ventilation (56.7%), 0.5% was not intubated, probably because of a shortage of mechanical ventilation machines.

Table 1
Age range, residency, and sex for the study done in Arbaminch General Hospital.

Variable	Component	Frequency	Percent (%)
Age of patient in years	< 20	80	23.3
	20_40	162	47.1
	41_60	76	22.1
	> 60	26	7.6
The gender of the patient	Male	186	54.1
	Female	158	45.9
Residency	Urban	182	52.9
	Rural	162	47.1

Intensive care unit outcomes (death and discharge)

Outcomes were defined as those discharged from the intensive care unit or those who died in the intensive care unit and were sent to a morgue. In the present study, the mortality rate was 40.7%. On two variable checks for the effect of the independent variable on the dependent variable, a significant effect on the intensive care unit outcomes was observed. When it was checked for multivariate analysis, there was no association between loss of consciousness, the need for mechanical ventilation, development of complications in the intensive care unit, and the time patients remained intubated because the p-value on adjusted values was more than 0.05, for all variables (Table 3).

Table 2
Variable components and outcomes for the study done in Arbaminch Hospital ICU

Variable	Component	Frequency	Percent (%)
Diagnosis at admission	Septic shock and ARDS	97	28.2
	Severe traumatic brain injury	31	9
	Acute abdomen and other surgical disease	64	18.6
	Uterine rupture and other GYN/OBS disease	23	6.7
	Cardiac disease and other medical disease	113	32.8
	Bleeding and hypovolemic shock	16	4.7
Comorbid illness	Present	166	48.3
	Absent	178	51.7
Outcome	Discharged	204	59.3
	Died	140	40.7
Type of complication developed	Shock and organ failure	231	67.2
	Electrolyte abnormality	36	10.5
	Hospital-acquired infection	59	17.2
	Other	18	5.2
Need mechanical ventilation	Yes	195	56.7
	No	149	43.3
Length of time on mechanical ventilation	< 24 h	87	25.3
	24_72 h	80	23.3
	> 72 h	26	7.6
	Not intubated	151	43.9
Hospital stay	1_5 days	277	80.5
	6_10 days	57	16.6
	11_15 days	8	2.3
	> 15	2	0.6
Admission source	Ward	188	54.7
	OR/PACU	69	20.1
	Emergency room	80	23.3
	Other	7	2
Admitting department	Surgery	125	36.3
	Internal medicine	152	44.2
	GYN/OBS	35	10.2
	Child and pediatric health	28	8.1
	Other	4	1.2
Admission Type	Emergency	326	94.8
	Elective	18	5.2
Level of consciousness	Conscious	162	47.1
	Unconscious	182	52.9

Table 3
Outcome and associated factors among intensive care units in Arbaminch Hospital

Independent variables	Category	Number (%)	Univariate analysis		Multivariate analysis	
			COR (95% CI)	P-value	AOR (95% CI)	P-value
Type of complication developed	Shock and organ failure	231(67.1)	3.127 (0.999 9.786)	0.050	3.161 (0.918 10.889)	0.068
	Electrolyte abnormality	36 (10.5)	1.750 (0.472 6.483)	0.402	1.709 (0.411 7.101)	0.461
	Hospital-acquired infection	59 (17.2)	1.193 (0.340 4.191)	0.783	.698 (0.175 2.788)	0.611
	Other	18 (5.2)	1		1	
Need mechanical ventilation	Yes	195(56.7)	4.274 (2.648 6.898)	0.000	.378 (0.023 6.326)	0.489
	No	149(43.3)	1		1	
Length of time on mechanical ventilation	< 24 h	87 (25.3)	4.65(2.626 8.234)	0.000	1.670 (0.099 28.217)	0.722
	24_72 h	80 (23.3)	3.273(1.83 5.854)	0.000	1.431 (0.084 24.414)	0.804
	> 72 h	26 (7.6)	6.50(2.660 15.886)	0.000	4.112 (0.215 78.550)	0.347
	Not intubated	151(43.9)	1		1	
Level of consciousness	Conscious	162(47.1)	2.191(1.408 3.410)	0.001	1.548 (0.943 2.541)	0.084
	Unconscious	182(52.9)	1		1	

Discussions

This study aimed to determine the pattern of diseases and, treatment outcomes among patients admitted to the intensive care unit of Arbaminch General Hospital. Intensive care units can be general or specific based on their capacity to serve all departments or specialize in serving special groups of patients by fulfilling specialized setups for specific types of patients. A general ICU is a setup in which the availability of equipment and skilled human power is too low to serve sophisticated conditions (2, 3). Our intensive care unit is general, accommodating all pediatric and adult patients from all working units of the hospital and referred patients.

The socio-demographic data showed that, majority were in the age range of 20–40 years (47.1%), and more than half were male, which is similar to findings from Western Kenya (12). In addition, our findings regarding age and sex distribution were consistent with those reported by Abdi et al. (5). Our patient's age range matches that reported by Semagn et al. (1). Most patients (52.9%) came from towns, which is similar to a report from Sudan Khartoum but contradicts a study conducted in Egypt and Misgan et al's report (7–9).

Cardiac and other medical diseases were the most common causes of ICU admissions (32.8%). A report by Bati et al. from Hawassa, Ethiopia showed similar findings, as cardiovascular disorders were the primary cause of ICU admission (13). Smith et al. reported similar findings (14). Unlike our findings, Mohammed et al. reported that acute abdomen, specifically small bowel obstruction, was the most common cause of ICU admission (15). The others were septic shock and ARDS (28.2%), acute abdomen and other surgical diseases (18.6%), and severe traumatic brain injury (9%). A possible explanation for the lower rate of trauma admissions to the hospital ICU might be that nearby hospitals have a better setup and profile, in which critical patients might be referred before visiting the study hospital directly. Among admitted patients, 48.3% (166) had associated comorbidities, which is contrary to the 67% reported by Abe et al., probably due to westernization (2). Unlike our findings, a report by Semagn Mekonnen et al. reported that 78.7% of patients had concomitant comorbidities (1). In another study in Ethiopia, only 9.58% of ICU admissions had comorbidities, as reported by Misgan et al. in Ethiopia (8). Based on our findings, the most common sources of admission were wards from the respective departments (54.7%), followed by the emergency room (23.3%). This is contrary to a report by Nahom et al., in which emergency rooms accounted for 60.4% (16). The top three ICU bed-occupying departments were internal medicine, surgery, and GYN/OBS, as reported by Mekonnen et al., where common admissions come from internal medicine followed by surgery (4). The child and pediatric health department admission rate was 8.1%, probably because of the absence of a

pediatric set. Among ICU admissions, 94.8% were emergency-based admissions and only 5.2% were elective base admissions for some observed ships. Of the ICU-admitted patients, 43.9% (151) were not intubated, probably indicating a shortage of mechanical ventilation, and the majority were extubated within 72 h, which is similar to other resource-limited setups (6, 13–18). Among the ICU-admitted patients, 52.9% (182) were unconscious and 47.1% (162) were conscious. Of the 182 unconscious patients, 55 were not intubated, likely because of a shortage of mechanical ventilator machines.

Among the intubated patients, only 7.6% (n = 26) required more than 72 h on mechanical ventilators. This is in contrast to Phillipo et al. and Hansa et al., where the average machine occupancy was seven days, but the maximum number of days was extended from 30 to 34days (17, 18). Of the admitted patients, 56.7% (195) required mechanical ventilation and 43.3% (149) did not require mechanical ventilation.

According to our study, the three common complications developed in ICU patients were shock and organ failure (67.2%), electrolyte abnormality (10.5%), and hospital-acquired infection (17.2%), respectively. The total hospital stay for most patients was only 1–5 days (80.5%), and only 0.6% (2) of patients stayed for more than 15 days.

Our study revealed a 40.7% (140) overall mortality rate. This rate was higher than that reported by Abe et al. (23.4%) (2). Additionally, our findings were worse than those reported by Khartoum and, Sudan (24%) (9). Another study by Hailemariam et al. reported that 38.87% of the patients were from the northwest (11). In contrast, our findings are better than those of Hussain et al. (53.6%), Abate et al. (49%), Debebe et al. (60.7%), Abate et al. (46.8%), Abdi et al. (45.8%), and Smith et al. (50.4%) (12, 4, 19, 1, 5, 14). Dendir et al. reported similar findings (40.7%) however, all patients were pediatric, unlike our patients (10).

No associated factors were identified in this study. Bivariate logistic regression showed that the type of complication requiring mechanical ventilation, length of time on mechanical ventilation, and loss of consciousness significantly affected patient outcomes. When these variables were evaluated using multivariate analysis, none showed a significant effect on patient outcomes.

Conclusion

The overall mortality rate in our ICU study was 40.7%, with cardiac and other medical diseases being the most common cause of admission. As the mortality rate is significantly high, it is better to identify problems with machines, skilled human power, and supportive staff.

Declarations

Ethical clearance

Ethical approval was obtained from the Arbaminch University College of Medicine and Health Sciences Institutional Review Board. The Arbaminch University College of Medicine and Health Sciences Institutional Review Board exempted the primary investigator from obtain informed consents from the study participants, because the study design did not affect the rights and welfare of the patients. Reference: IRB/1161/2021.

Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Author contributions

All authors made a significant contribution to the study reported, whether in the conception, study design, execution, acquisition of data, analysis, and interpretation, or all these areas: took part in drafting, revising, or critically reviewing the article: gave final approval of the version to be published agreed on the journal to which the article has been submitted and agreed to be accountable for all aspects of the study.

Competing interest

No competing interest.

Funding

Not funded.

Acknowledgements

We thank Arbaminch University for providing the opportunity to conduct this study.

We also want to express our gratitude to the Arbaminch General Hospital for their support during data collection.

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