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Survival and Determinants of Mortality among Adult Intensive Care Unit Patients in Ethiopia: A Multicenter Retrospective Cohort Study

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Abstract

Background: Despite high mortality in intensive care units in Ethiopia, there is limited evidence on the time to death and its predictors among critically ill adult patients.

Methods: A secondary data analysis of a previously published dataset was employed. Kaplan-Meier survival estimates and a log-rank test were used to compare survival time among variables. Cox proportional hazards regression analysis was performed to identify predictors of time to death. In the multivariable analysis statistical significance was declared at a P-value < 0.05, reported with an adjusted hazard ratio with a 95% confidence interval.

Results: Out of 409 patients, approximately 151 (36.9%) died. The median time to death was 15 days (IQR: 6-38). Sepsis (AHR = 2.45, 95% CI: 1.5–3.8; P = 0.0001), chronic lung disease comorbidity (AHR = 2.1, 95% CI: 1.08–4.3; P = 0.028), hypotension at admission (AHR = 2.2, 95% CI: 1.4–3.5; P = 0.0001), hyponatremia (AHR = 1.5, 95% CI: 1.03–2.1; P = 0.034), vasopressor requirement (AHR = 1.8, 95% CI: 1.2–2.7; P = 0.002), tracheostomy (AHR = 0.38, 95% CI: 0.22-0.68; P = 0.001), and acute kidney injury (AHR = 1.7, 95% CI: 1.06–2.6; P = 0.026).

Conclusion: Nearly four of ten critically ill patients died with a median time to death of 15 days. Sepsis, chronic lung disease comorbidity, hypotension at admission, hyponatremia, vasopressor requirement, tracheostomy, and acute kidney injury. Strengthening early recognition and timely management improve survival in resource-limited ICUs.

Keywords: Intensive Care Unit, Time to death, ICU mortality, Survival analysis, Predictors of mortality, Ethiopia

Introduction

Critical illness continues to be an important public health problem and a major global source of morbidity and mortality. The intensive care unit (ICU) is a specialized hospital unit intended to provide life-saving interventions, organ support and comprehensive monitoring to critically ill patients who require ongoing care from highly trained multidisciplinary teams[1, 2].

Despite advancements in low- and middle-income countries (LMICs), access to high-quality critical care which is jeopardized by inadequate infrastructure, a lack of trained healthcare professionals, a scarcity of necessary medical supplies, and delayed access to intensive care remains limited[1–4].

These structural problems contributed to a disproportionately higher death rate than in high-income nations. Evidence from sub-Saharan Africa revealed that the death rate ranged from 21.6% to 59.4%[5–10], whereas it was less than the 20% commonly reported in high-income nations[11], indicating ongoing disparities in critical care capacity and service provision. Similarly, studies conducted in Ethiopia revealed considerable variation in the ICU mortality rate across hospitals and study participants due to significant differences in case severity, resource availability and quality of care[2, 3].

Previously conducted studies have identified several factors associated with mortality, including age, the presence of complications in the ICU, antibiotic usage, infections, the need for mechanical ventilation, the need for vasopressors or inotropes, hypoxia, a Glasgow Coma Scale (GCS) score of less than 8, the length of ICU stay, and delayed ICU admission[2, 3, 12–14].

Although ICU mortality is widely reported in Africa including Ethiopia, most studies have assessed mortality as a binary discharge outcome, usually classified as survival or death at discharge. Such approaches provide limited insight into the time-based dynamics of mortality and disparity of risk during the ICU stay. Time to death analysis provides a comprehensive approach for characterizing mortality patterns and identifying prognostic factors in critically ill patients. Studies on the time to death in the general ICU population in

developing countries are limited but most existing studies have focused on specific disease conditions. Understanding the time to death and predictors among ICU patients is essential for early risk stratification, improving clinical decision-making, and optimizing resource allocation in developing countries. Therefore, this multicenter retrospective survival analysis aimed to estimate the time to death and identify predictors among adult ICU patients admitted to selected public hospitals in Addis Ababa.

Methodology

Study area, study design and period

A multicenter retrospective institutional-based cohort study was conducted using secondary data obtained from a previously published study entitled "Outcomes and factors associated with prolonged stays among patients admitted to adult intensive care unit in a resource-limited setting: a multicenter chart review"[15].

The present study reanalyzed the same dataset to investigate time to death and its predictors among patients admitted to adult intensive care units (ICUs) in resource-limited settings. The study was carried out between March 28 and April 28, 2023, across four public hospitals in Addis Ababa: Tikur Anbessa Specialized Hospital, Zewditu Memorial Hospital, Menelik II Referral Hospital, and Yekatit 12 Hospital Medical College.

Source and study population

The source population comprised all patients admitted to and managed in the ICUs of selected public hospitals in Addis Ababa between January 1 and December 31, 2022, from which the study population was sampled.

Inclusion and exclusion criteria

Patients admitted to the ICUs of four selected public hospitals in Addis Ababa between January 1 and December 31, 2022, with complete medical records from admission to discharge were included in the study.

Study variables

Dependent variables: time to death of adult ICU patients

Independent variables: included chronic lung disease comorbidity, sepsis diagnosis at admission, systolic blood pressure at admission, respiratory rate at admission, serum sodium level at admission, platelet level at admission, serum creatinine at admission, inotropes/vasopressors, tracheostomy, and acute kidney injury complication.

Sampling size determination

For this study no formal sample size calculation was performed due to the use of secondary data analysis of a previously published dataset. The adequacy of the sample size was checked by events-per-variable assumptions recommended for Cox proportional hazards regression. According to the dataset, 409 patients were included; approximately 151 patients (36.9%) died, and 10 independent variables were entered into the multivariable model[15], resulting in an event-per-variable ratio of 15.1, exceeding the recommended minimum threshold of ten[16, 17]. Therefore, a 409-sample size was adequate to support reliable and stable regression estimates.

Sampling procedure

In this study, no additional sampling procedure was used. All eligible patient records included in the original multicenter dataset were considered for secondary analysis. Out of the 12 public hospitals in Addis Ababa, four hospitals were selected via simple random sampling. The number of study participants allocated to each hospital was determined proportionally on the basis of the total number of ICU admissions during the study period. Between January and December 2022, the total numbers of patients admitted to the ICUs of Tikur Anbessa Specialized Hospital, Zewditu Memorial Hospital, Yekatit 12 Hospital Medical College, and Menelik II Comprehensive Specialized Hospital were 600, 194, 276, and 240, respectively. Accordingly, 193, 62, 89, and 77 participants were selected from each hospital, respectively, via simple random sampling.

Operational definition

Event: Adult ICU patients who died during their stay in the intensive care unit.

Censored: Adult ICU patients who were transferred to an inpatient ward, discharged home, referred to another healthcare facility, or left the hospital against medical advice before death occurred during their ICU stay.

Time to event: the time between ICU admission and death or censoring (in days)

Data collection tools and procedures

In the previous study, the data retrieval tool was pretested, structured, and developed from different related literature. The data were collected via the KoboToolbox mobile application.

Data quality assurance

In the previous study, the quality of the dataset was assured by conducting a pretest, training data collectors, providing onsite supervision, and checking the completeness of the dataset. In this study, dataset completeness and suitability were checked for survival analysis and incomplete data were removed.

Data management and analysis

The data were exported from the original database, coded and exported to STATA version 17 for further analysis. Categorical data are presented as frequencies and percentages. Descriptive statistics are presented as means, medians, standard deviations and interquartile ranges as were Kaplan Meier plots and median survival times. The Kaplan Meier approach was utilized to evaluate the survival time of different variables via survival curves. The Log rank test was used to determine whether there was a significant variation in the median survival time between various groups.

Cox proportional hazards regression analysis was performed to identify predictors of time to death. In the bivariable analysis used to calculate the unadjusted hazard ratio and screen out variables for multivariable Cox regression a p-value less than 0.25 was used. A log minus log plot of survival and a global residual test were used to check the Cox proportional hazard assumption. Model adequacy was checked by the Cox-Snell residual test. In the

multivariable Cox regression analysis, variables with a p-value less than or equal to 0.05 were considered to have a significant association between time to death and the predictors, and the adjusted hazard ratio with confidence interval was reported. Multicollinearity was checked by using the variance inflation factor (VIF), which ranged from 1.03 to 1.2 and showed no significant correlation between predictor variables.

Ethical considerations

Ethical approval

Ethical approval for this study was obtained through the original study from which this secondary analysis was derived. Ethical clearance for the original study was obtained from the Addis Ababa University College of Health Sciences, Department of Emergency Medicine (Reference No.: EM/SM/877/2015), and the Addis Ababa City Administration Health Bureau Ethical Committee (Reference No.: A/A/11193/227). Authorization letters were submitted to the participating hospitals, and permission was granted by hospital managers, research officers, and health information system focal persons to access patient medical records for data collection. The study was conducted in strict accordance with institutional and national ethical standards, as well as the principles of the Declaration of Helsinki.

Informed consent

The original data were collected through a review of patient medical records, with no direct interaction between patients and data collectors. Therefore, the requirement for informed consent was waived by the Addis Ababa University College of Health Sciences, Department of Emergency Medicine, and the Addis Ababa City Administration Health Bureau Ethical Committee.

Confidentiality and data protection

All patient information was handled confidentially. Medical record numbers were used only for data extraction and management purposes, and no personal identifiers were collected or used.

Results

A total of 409 ICU patients were included in the original study. The age of the patients was not normally distributed; the median age was 38 years, with an interquartile range of 27-55 years, with the majority of patients aged above 45 years (149, 36.4%), followed by 18-30 years (145, 35.5%). The majority of patients were male (225, 55%) and the male-to-female ratio was 1.22:1. Approximately 187(45.7%) patients were admitted to the ICU from the Emergency Department. (Table 1)

Incidence of mortality among patients admitted to the adult ICU

A total of 409 adult patients admitted to the ICU were followed for periods ranging from three hours to 73 days, with a median follow-up duration of 5 days (IQR: 3-9 days). During the follow-up period, 151 patients (36.9%) died. The median time of death among adult ICU patients was 15 days (IQR: 6-38). The overall observation time contributed by the cohort was 3,373.9 person-days, yielding a mortality incidence rate of 4.5 deaths per 100 person-days of observation (95% CI: 3.8–5.2). With respect to patient outcomes, 243 (59.4%) patients were transferred to inpatient wards, 8 (1.95%) were discharged home, 4 (0.97%) were left against medical advice, and 3 (0.73%) were referred to other healthcare facilities (Figure 1).

Seven deaths (4.6%) occurred within the first 24 hours of ICU admission, 75 deaths (49.7%) occurred between 1 and 7 days, 39 deaths (25.8%) occurred between 7 and 14 days, and 30 deaths (19.9%) occurred after 14 days of follow-up. Overall, more than half of the deaths (82, 54.3%) occurred within the first seven days of the ICU stay. Kaplan–Meier survival analysis demonstrated a gradual decline in cumulative survival probability over time among the study participants (Figure 2). The cumulative survival probabilities at the end of days 1, 7, 14, 21, 30, 45, and 60 were 98.3%, 67.45%, 50.46%, 41.2%, 30.8%, 15.8%, and 5.3%, respectively (Table 2).

Comparison of mortality among explanatory predictors

Differences in mortality between the categorical variables were evaluated via Kaplan–Meier failure curves and the log-rank test. We found significant differences in mortality time at sepsis diagnosis at admission (P-value= 0.0001), comorbidity of chronic lung disease (P-

value= 0.0079), SBP at admission (P-value= 0.0001), sodium level at admission (P-value= 0.0326), serum creatinine at admission (P-value= 0.0035), vasopressor (P-value= 0.0001), tracheostomy (P-value= 0.0001), and AKI complication (P-value= 0.04). For example, the median time to mortality among adult ICU patients diagnosed with sepsis was 6 days (95% CI= 4-7) whereas that among nonseptic patients was 17 days (95% CI= 12-23). The median time of mortality among those who presented with SBP<90 mmHg was 5 days (95% CI=2-7) but that among those with SBP ≥90 mmHg was 17 days (95% CI=12-23) (Figure 3). The median time of mortality among those who used vasopressors was 6 days (95% CI=5-8) but that among those who did not use vasopressors was 22 days (95% CI=15-34). (Figure 4) Variables such as the platelet level, and respiratory rate at admission did not significantly affect the median mortality time.

Proportional hazard assumption test

The Cox proportional hazards assumption was assessed both statistically using a global test and graphically via log-minus-log plots. All covariates met the proportional hazards assumption, and the overall Schoenfeld global test (global test: χ^2 = 16.80, df = 12, p = 0.1574). A Cox-Snell residual plot was used to assess the overall model adequacy; the plot revealed an acceptable fit of the final Cox proportional hazards model (Figure 5).

Predictors of ICU mortality

Variables such as sepsis at admission, chronic lung disease comorbidity, systolic blood pressure (SBP) at admission, respiratory rate at admission, platelet level at admission, sodium level at admission, serum creatinine at admission, vasopressor use, tracheostomy status, and acute kidney injury (AKI) were associated with mortality according to bivariable Cox regression with p-values < 0.25.

However, after adjustment for confounders in the multivariable Cox regression model, sepsis at admission, chronic lung disease, low SBP, hyponatremia, vasopressor use, absence of tracheostomy, and AKI remained significant predictors of mortality among adult ICU patients at a p-value < 0.05.

Patients admitted with sepsis had a 2.45-fold greater hazard of mortality than did those without sepsis (AHR = 2.45, 95% CI: 1.5–3.8; P = 0.0001). Similarly, patients with chronic lung disease comorbidity had more than twice the hazard of mortality than did those without chronic lung disease (AHR = 2.1, 95% CI: 1.08–4.3; P = 0.028). The hazard of ICU mortality among patients who presented with SBP <90 mmHg was 2.2-fold greater than that among those with SBP ≥90 mmHg (AHR = 2.2, 95% CI: 1.4–3.5; P = 0.0001).

In terms of laboratory findings, patients with serum sodium levels <135 mEq/L had a 50% greater risk of mortality than did those with normal sodium levels (AHR = 1.5, 95% CI: 1.03–2.1; P = 0.034). Patients who used vasopressor support had a significantly greater hazard of mortality than did those who did not use vasopressor support (AHR = 1.8, 95% CI: 1.2–2.7; P = 0.002).

In addition, patients who underwent tracheostomy had a 62% lower hazard of death than their counterparts did (AHR = 0.38, 95% CI: 0.22-0.68; P = 0.001). Furthermore, the hazard of ICU mortality among patients who developed AKI was 1.7-fold greater than that among patients without AKI (AHR = 1.7, 95% CI: 1.06–2.6; P = 0.026). (Table 3)

Discussion

This study employed secondary analysis of previously published data as it aimed to assess the time to death and its predictors among adult patients admitted to ICUs in selected public hospitals in Addis Ababa. This study revealed a high burden of ICU mortality, with more than one-third of patients dying during follow-up, and the median time of death was 15 days. In the multivariable Cox proportional hazards analysis, predictors such as sepsis at admission, comorbidity with chronic lung disease, systolic blood pressure at admission, sodium level at admission, vasopressor use, tracheostomy, and acute kidney injury were significant predictors of mortality among adult ICU patients.

The median time of death among adult ICU patients was 15 days (IQR: 6-38). This finding was consistent with a study conducted in Gondar, in which the median time to death was 11 days[18], and that of Addis Ababa was 8 days[19].

The overall mortality rate was 36.9% (95% CI= 32.2-41.8). This finding was consistent with many reports from Brazil[20], Nigeria[21], Tanzania[22], western Ethiopia[23], Addis Ababa[24, 25], and Gondar[26], whose mortality rates ranged from 32.9-41.4%. This finding was higher than those of two studies conducted in Addis Ababa[27, 28] 30.2% and 30.3% respectively, while this finding was also lower than those of studies conducted in southern Ethiopia[29] 46.8%, Addis Ababa[19] 44.97%, Addis Ababa[30] 46.3%, Hosanna[31] 46.42%, Kenya[32] 53.6%, southern Nigeria[9] 49.2%, Nigeria[33] 48.5%. The possible reasons for this discrepancy include differences in admission case, illness severity, study participants, availability of ICU resources and staffing, presence of comorbidities, ICU complications and methodological differences.

Patients admitted with sepsis had a 2.45-fold greater hazard of mortality than did those without sepsis (P = 0.0001). This association is consistent with that reported in Brazil[20], two systematic reviews and meta-analyses conducted in Ethiopia[34, 35], Northwest Amhara[36]. A possible explanation for this association is that sepsis has an increased risk of mortality due to several factors; for example, the complex pathophysiology of the disease causes sepsis-induced coagulopathy, severe tissue hypoperfusion due to mismatched oxygen delivery vs demand, and immune paralysis with T-cell exhaustion, which increases the risk of

nosocomial infection[37]. In addition to these factors, there is a delay in the identification and management of sepsis due to delays in its presentation to the hospital; source control, diagnosis and pathogen identification; and limited invasive and advanced monitoring[23, 38, 39]. These cumulative effects contribute to multiorgan failure and increased in ICU mortality.

Patients with chronic lung disease comorbidity had more than twice the hazard of mortality than did those without chronic lung disease (P = 0.028). A possible explanation for this association is that patients who have comorbidities of chronic lung diseases such as asthma and COPD are prone to developing complications such as pneumothorax and hemodynamic instability, which increases their cardiopulmonary arrest in addition to prolonged durations of MV and ICU stay and increases the incidence of ICU complications which potentiate death.

The hazard of ICU mortality among patients who presented with SBP <90 mmHg was 2.2-fold greater than with those with SBP ≥90 mmHg (P = 0.0001). This finding was comparable with reports from Northwest Ethiopia trauma[40], septic shock[41], Northwest Amhara[42] and the USA[43]. A possible explanation for the presence of hypotension is systemic cardiovascular failure for autoregulation to restore the mean arterial pressure if not identified in a timely manner identified and managed; it impairs vital organ perfusion and leads to multiorgan dysfunction and death.

Patients with serum sodium levels <135 mEq/L had a 50% greater risk of mortality than did those with normal sodium levels (P = 0.034). This finding was supported by a systematic review[44] and retrospective cohort study conducted on COVID-19 patients[45] , which revealed that hyponatremia is an independent risk factor for mortality, but some studies reported that there was no significant association with mortality[46], and other studies reported that patients died due to underlying disease rather than the severity of hyponatremia[47]. Overall, the inconsistency between the above studies may be due to variations in study participants, disease severity, ICU settings, classification and assessment time of serum sodium.

Patients who required vasopressor support had a significantly greater hazard of mortality than did those who did not receive vasopressors (P = 0.002). This finding is supported by a

systematic review and meta-analysis conducted in Ethiopia[34] and Addis Ababa[48]. A possible explanation is that patients who require vasopressor do not respond to fluid resuscitation which reflects the severity of circulatory failure, persistent hypotension and inadequate tissue perfusion which are associated with vital organ dysfunction and death.

Compared with their counterparts, patients who underwent tracheostomy had a 62% lower hazard of death. This finding is comparable with a study conducted in West Amhara[49], but a study conducted in Dessie revealed that patients receiving tracheostomy had a 72.4% lower rate of recovery[50]. There are discrepancies in the literature regarding tracheostomy based on the timing of the tracheostomy procedure. Most studies have reported that early tracheostomy (≤ 5 days) is associated with a shorter length of stay on mechanical ventilation and in the ICU and a lower the risk of developing ventilators associated with pneumonia than late tracheostomy (>10 days) or prolonged intubation (> 14 days)[51–53]. Overall, these findings highlight that timely tracheostomy increases the survival of critically ill patients.

The hazard of ICU mortality among patients who developed AKI was 1.7-fold increase greater than that among patients without AKI (P = 0.026). Similar findings have been reported in Hawassa[54], southern Ethiopia[55], the Democratic Republic of the Congo[56], and China[57]. This finding highlights that the development of AKI in the ICU is a significant predictor of poor outcomes. This association can be explained by the fact that AKI in the ICU is caused by multiple factors, such as hypovolemia, sepsis, medications, hemodynamic instability, vasopressor usage and renal hypoperfusion[58–60]. AKI can result in fluid overload, electrolyte abnormalities, metabolic acidosis and the accumulation of toxic substances which increase the risk of multiorgan failure and death[61].

Since the analysis was derived from secondary data in previously published multicenter retrospective charts, the study data were restricted to variables available in the original dataset. The dataset lacked important variables such as mechanical ventilator parameters, nutritional status, stage of AKI, and timing of tracheostomy. Future researchers should consider prospective multicenter cohort designs that include illness severity scores such as APACHE II or SOFA scores, ICU resource availability, staffing patterns, infection prevention strategies, and the investigation of barriers to timely critical care delivery.

Conclusion

This study revealed that almost four out of ten patients admitted to the ICU died, and the median time to death was 15 days. Sepsis, chronic lung disease, systolic blood pressure <90 mmHg, hyponatremia, vasopressor use, and acute kidney injury were independent predictors of time to death. This study emphasizes the importance of early identification of high-risk patients and timely management of critically ill patients to improve their survival in ICUs in resource-limited countries.

Consent for Publication: Not applicable

Data availability: The datasets will be available upon reasonable request from the corresponding author.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions

TGB contributed to the conceptualization, study design, analysis, interpretation, reporting, and drafting of the manuscript. AWM, ASA, GGB, and LFA were involved in data analysis, interpretation, and the critical review of the study design, as well as the review of written reports and the drafting of the manuscript. All authors have read and approved the final version of the manuscript.

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Table 1: Sociodemographic of patients admitted to adult intensive care units at selected public hospitals in Addis Ababa from January 1, 2022, to December 31, 2022 (n = 409).

Variables	Category	Survival	Total N%

		Death N%	Censored N%	
Sex	Male	87(21.3)	138(33.7)	225(55.0)
	Female	64(15.6)	120(29.3)	184(45.0)
Age (in years)	18-30	42(10.3)	103(25.2)	145(35.5)
	31-45	48(11.7)	67(16.4)	115(28.1)
	> 45	61(14.9)	88(21.5)	149(36.4)
Place of residence	Addis Ababa	93(22.7)	145(35.5)	238(58.2)
	Out Addis Ababa	58(14.2)	113(27.6)	171(41.8)

Table 2: Cumulative survival probability of patients admitted to adult intensive care units at selected public hospitals in Addis Ababa from January 1, 2022, to December 31, 2022 (n = 409).

Time interval (days)	Beginning total	Event	Censored	Cumulative survival probability	95% CI
0-1	409	7	1	0.983	0.964-0.992
7-8	152	12	15	0.674	0.613-0.728
10-11	96	4	3	0.579	0.511-0.642
14-15	69	0	5	0.505	0.432-0.573
20-21	41	1	3	0.412	0.333-0.488
30-31	20	0	1	0.308	0.227-0.391
45-46	6	1	0	0.131	0.057-0.236
73-74	1	0	1	0.053	0.01-0.148

Table 3: Bivariable and multivariable Cox-proportional hazard regression analyses of predictors of time to death among patients admitted to adult intensive care units at selected public hospitals in Addis Ababa from January 1, 2022, to December 31, 2022 (n = 409).

Variable	**Category**	**Survival**		**CHR 95% CI**	**AHR 95% CI**	**P-value**
		Death	**Censored**			
Sepsis	Yes	30(7.33)	15(3.67)	3.4(2.3-5.1)	2.45(1.5-3.8)	**0.0001**
	No	121(29.58)	243(59.41)	1	1	
Chronic lung disease	Yes	10(2.44)	5(1.22)	2.3(1.2-4.4)	2.1(1.08-4.3)	**0.028**
	No	141(34.47)	253(61.86)	1	1	
Systolic blood pressure (mmHg)	<90	35(8.56)	13(3.18)	3.7(2.5-5.4)	2.2(1.4-3.5)	**0.0001**
	≥90	116(28.36)	245(59.9)	1	1	
Respiratory rate (Breaths/min)	≤24	72(17.6)	175(42.79)	1	1	
	>24	79(19.32)	83(20.29)	1.26(0.91-1.74)	0.98(0.69-1.39)	0.929
Platelet level (× 10^9/L)	<150	54(13.2)	66(16.14)	1.4(1.005-1.98)	1.2(0.84-1.7)	0.327
	>450	11(2.69)	13(3.18)	1.21(0.65-2.3)	1.3(0.69-2.6)	0.390
	150-450	86(21.03)	179(43.77)	1	1	
Sodium level (mEq/l)	<135	55(13.45)	66(16.14)	1.5(1.09-2.2)	1.5(1.03-2.1)	**0.034**
	>145	19(4.65)	20(4.89)	1.4(0.86-2.38)	1.06(0.63-1.8)	0.819
	135-145	77(18.83)	172(42.05)	1	1	
Serum creatinine (mg/dl)	≤1.2	101(24.69)	205(50.12)	1	1	
	>1.2	50(12.22)	53(12.96)	1.6(1.2-2.3)	1.3(0.93-1.94)	0.114
Vasopressor	Yes	60(14.67)	21(5.13)	3.1(2.2-4.3)	1.8(1.2-2.7)	**0.002**
	No	91(22.25)	237(57.95)	1	1	
Tracheostomy	Yes	16(3.91)	18(4.4)	0.29(0.16-0.51)	0.38(0.22-0.68)	**0.001**
	No	135(33.01)	240(58.68)	1	1	
Acute kidney injury	Yes	26(6.36)	5(1.22)	1.5(1.007-2.4)	1.7(1.06-2.6)	**0.026**
	No	125(30.56)	253(61.86)	1	1	

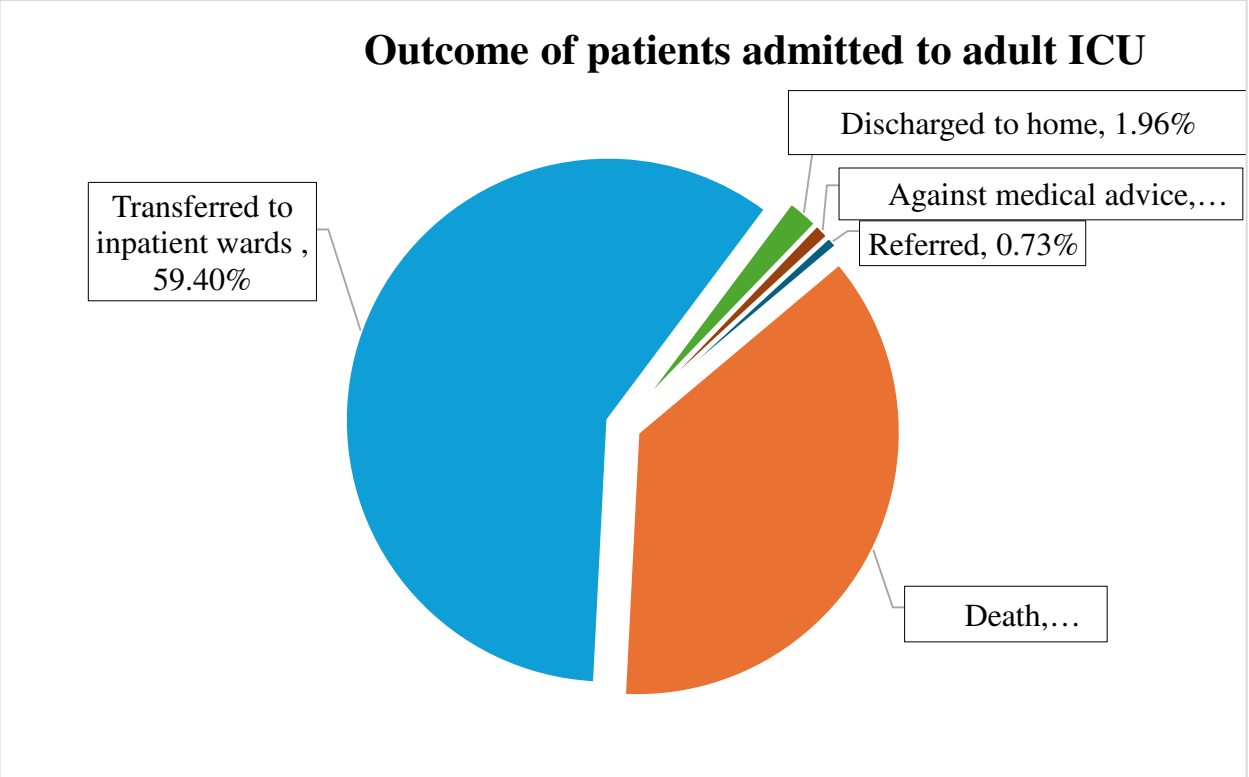


Figure 1: Outcome of patients admitted to adult intensive care units at selected public hospitals in Addis Ababa from January 1, 2022, to December 31, 2022 (n = 409).

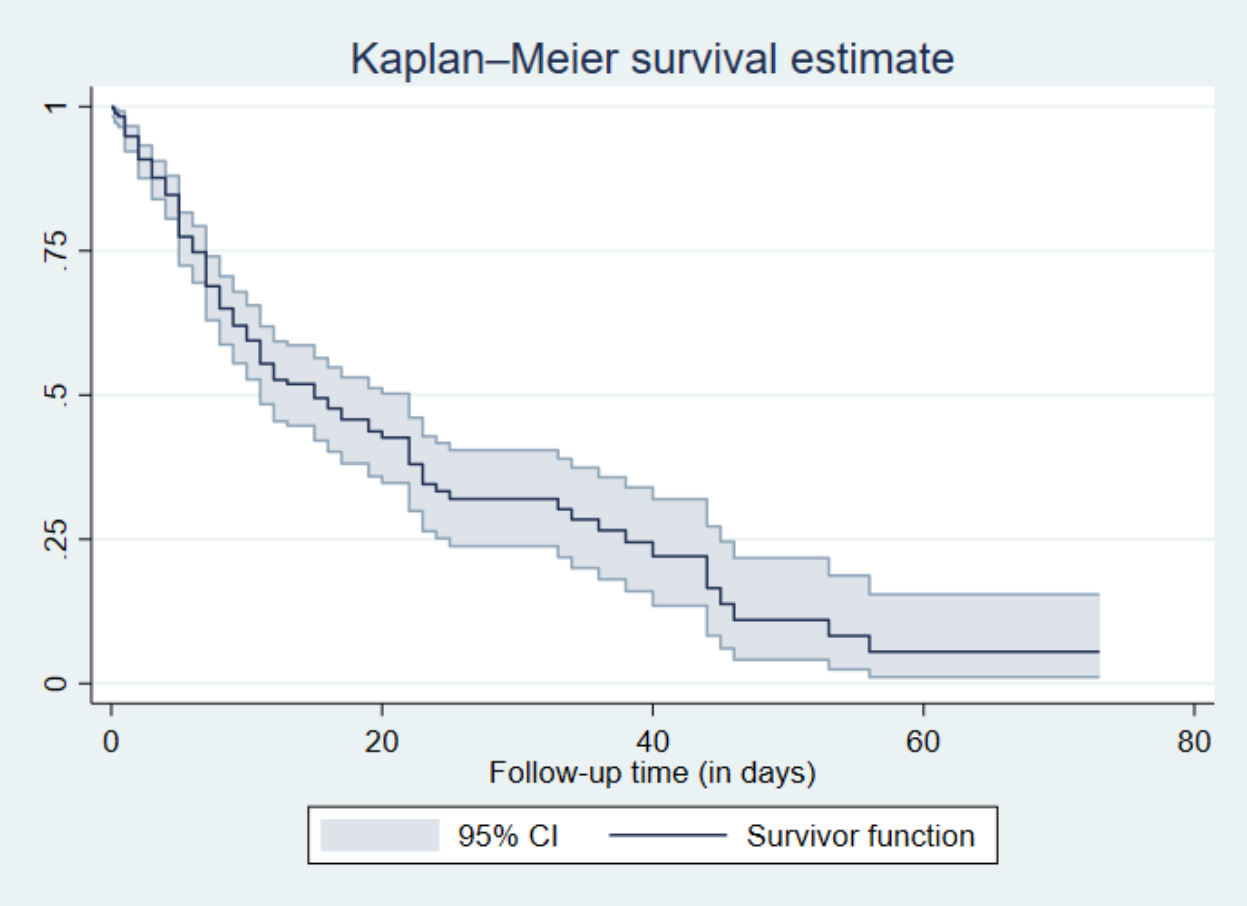


Figure 2: Kaplan-Meier Survival estimate of cumulative Survival status of patients admitted to adult ICU of selected public hospitals in Addis Ababa, Ethiopia, 2023.

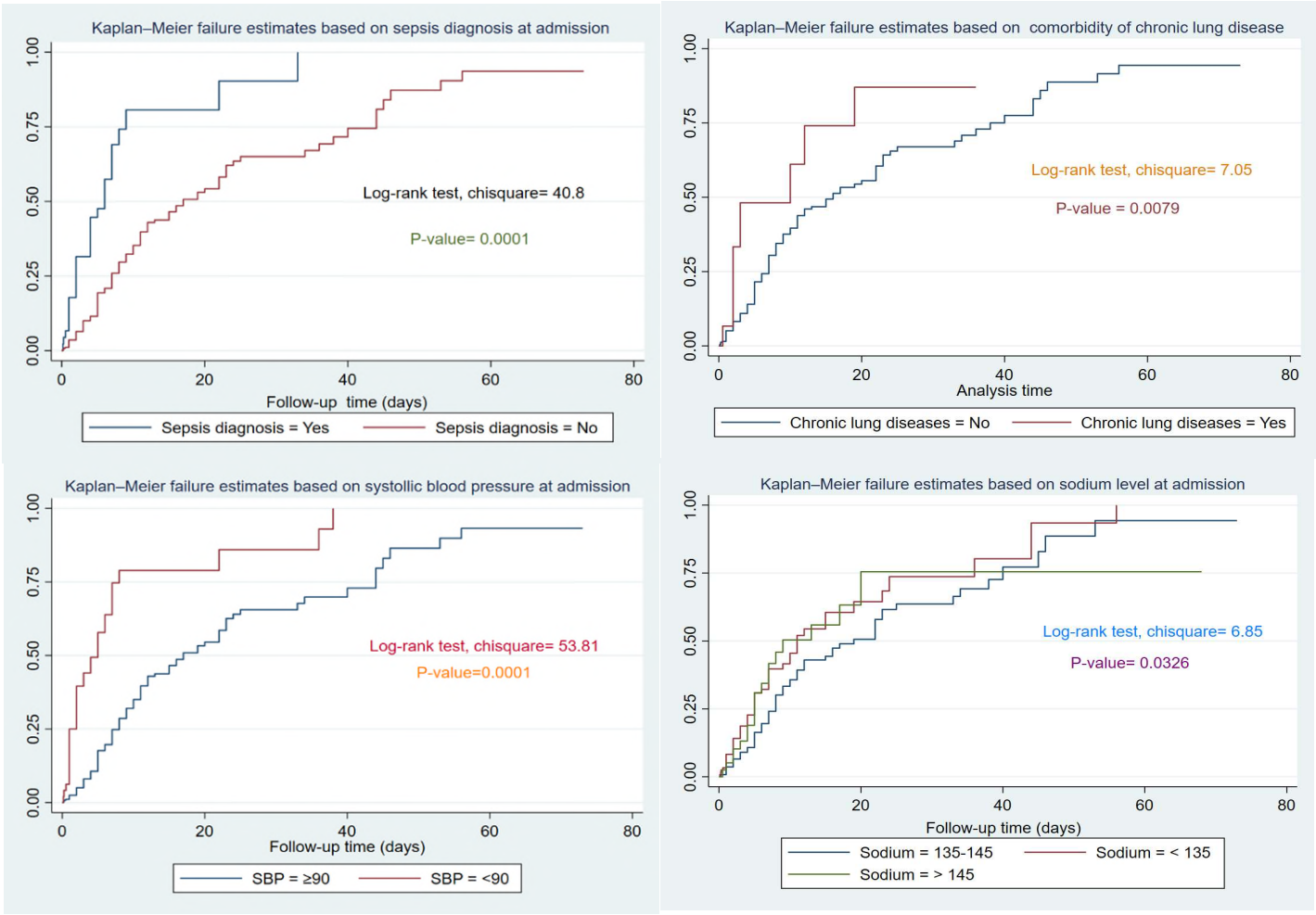


Figure 3: Kaplan-Meier failure curve for sepsis, chronic lung disease, SBP, serum sodium level of patients admitted to adult intensive care units at selected public hospitals in Addis Ababa from January 1, 2022, to December 31, 2022 (n = 409).

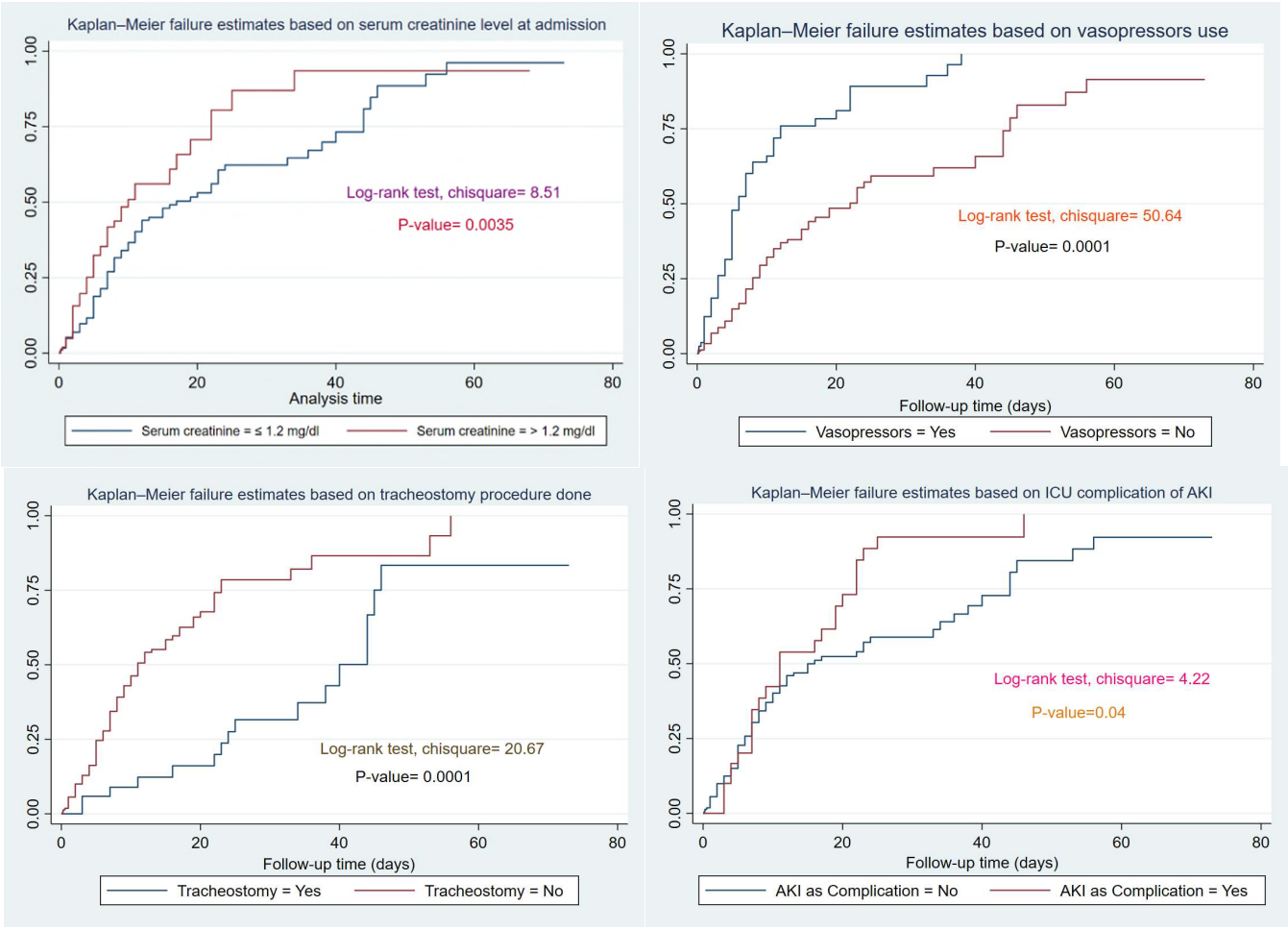


Figure 4: Kaplan-Meier failure curve for serum Creatinine, vasopressor, tracheostomy, AKI of patients admitted to adult intensive care units at selected public hospitals in Addis Ababa from January 1, 2022, to December 31, 2022 (n = 409).