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Predictive Factors of Mortality in a Surgical Intensive Care Unit: A Retrospective Study about 100 Cases

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Abstract **Original Research Article**

Despite major advances that were made in intensive care unit, mortality rate remains high. The objective of our study was to analyze the incidence and predictive factors of mortality in a surgical intensive care unit, in order to apprehend these factors for an optimal management. We have conducted a retrospective study about 100 consecutive cases of patients admitted to the surgical intensive care unit of Ibn Sina University Hospital in Rabat, during a 3-month period (02/01/2021-02/04/2021). Nearly 20 parameters were collected, analyzed and compared between the group of survivors and the group of deceased. The results shows that the mean age of the patients was 56.86 years, and the sex ratio of men to women was 1,56. Medical comorbidities were dominated by hypertensive and/or ischemic heart disease (38%), diabetes (22%), smoking (27%), neoplasia (17%). 61% of patients were admitted for a surgical pathology, 30% for a medical pathology, and 9% for a traumatic reason. The average APACHE II score at admission was 14,61. On the therapeutic level: 39% of the patients had recourse to vasoactive drugs, 49% had recourse to mechanical ventilation, 6% benefited from extra-renal purification, and 46% from a transfusion of blood derivatives. The average length of stay was 6,46 days. Multivariate analysis using binary logistic regression identified the following factors as independent mortality factors: the existence of neoplastic comorbidities, admission for a medical reason, the elevated APACHE II score, the need for vasoactive drugs, the prolonged mechanic ventilation, the need for transfusion, and the elevated length of stay, all of them were significant. Knowing the predictive factors of mortality will allow us to improve the quality of the care provided, and to target an eventual preventive action to improve the prognosis and to decrease mortality in intensive care unit.

Keywords: Surgical, Intensive care, Mortality, Predictive factors, APACH II score, vasoactive drugs, mechanic ventilation, transfusion.

INTRODUCTION

Intensive care units represent a strategic location in any healthcare facility, where patients at risk of acute organ failure are hospitalized. Despite major advances in patient care, ICU mortality remains high, reaching 40 to 50% [1-3].

Predictive factors of mortality in intensive care units vary widely, depending on comorbidities and the severity of the condition leading to the admission to the unit.

In this study, we aimed to evaluate mortality in a surgical intensive care unit, and identify prognostic factors.

The objective of the study was to analyze the incidence and predictive factors of mortality, with the aim of improving care and prognosis of patients admitted to intensive care units.

MATERIAL AND METHODS

1- Study type

This is a retrospective, descriptive and analytical study conducted over a period of 3 months (January 01, 2021 – April 01, 2021), involving 100 consecutive patients hospitalized in the surgical intensive care unit of Avicenne Hospital.

2- Inclusion and exclusion criteria

100 consecutive patients admitted to surgical intensive care were included in the study.

Patients under the age of 18, patients hospitalized for covid or its sequelae and patients with unusable medical records were excluded from the study.

3- Data collection

For each patient included in the study, we collected the following parameters: demographic data (age, gender); comorbidities; reason for admission to intensive care unit; origin department; assessment of severity and visceral failures; aspects of management; evolution and possible occurrence of death, with analysis of causes of death; and length of stay in intensive care unit.

The type of admission was analyzed according to whether it was for a scheduled or emergency surgery, management of a serious surgical pathology that was not operated on, or management of a medical or traumatic emergency.

The reason for admission was the main element that justified hospitalization in the intensive care unit. If necessary, it was specified retrospectively after collecting all the data related to the patients.

For the original services, it could have been surgical services (in the case of a scheduled surgery or a postoperative medical or surgical complication), emergency service (in the case of a medical or surgical condition) or medical services.

It should be noted that the surgical intensive care at Avicenne hospital is intended to care of patients hospitalized in surgical services, in the event of complications or in the aftermath of scheduled surgery.

The assessment of the severity of patients, included in the study, and of the organ failures was based on the analysis of the APACHE II (Acute Physiology and Chronic Health Evaluation II) and the SOFA (Sepsis-related Organ Failure Assessment) scores.

Aspects of patient management were identified mainly in relation to the implementation of the following elements: use of vasoactive drugs (norepinephrine, dobutamine, epinephrine, etc.); use of conventional mechanical ventilation; use of renal replacement therapy; transfusion of blood products.

4- Analysis of results

All recorded variables were expressed as a percentage for qualitative variables and as means +/- standard deviation for quantitative variables.

For statistical analysis, we used SPSS software, Windows11.

First, we analyzed all the data collected and evaluated the mortality rate among the 100 patients included in the study.

Secondly, we evaluated the predictive factors of morality in univariate and multivariate analysis. The significance threshold was considered reached for a value of $p < 0.05$.

RESULTS

1. Descriptive study

The average age of the patients was 56.86 +/- 18.28 years, ranging from 18 to 98 years old. The male-to-female sex ratio was 1.56, with 61% male and 39% female patients.

The main comorbidities found in our patients were tobacco intoxication of more than 20 pack-years (27%), hypertension (24%), and diabetes (22%). 17% of the patients had neoplastic diseases and 14% were followed for ischemic heart disease.

It should be noted that five patients had an ischemic stroke, and three patients were followed for end-stage chronic renal failure.

The majority of patients included in the study (61%) were admitted after a scheduled surgical intervention or for urgent surgery. 30% of patients were hospitalized in surgical intensive care for medical pathology and 9% for traumatic pathology (Fig 1).

Among the 61 patients hospitalized for surgical reasons: 11 patients were admitted for postoperative hemorrhagic shock, including one case of ruptured abdominal aortic aneurysm and one case of bleeding following a liver biopsy; 12 patients were hospitalized for peritonitis, including six cases of community-acquired peritonitis and six cases of postoperative peritonitis; four patients were hospitalized for hemorrhagic stroke; three patients were hospitalized for severe cholangitis and one patient for tumor-related spinal cord compression (Table 1).

The distribution of patients according to the nature of the medical pathologies that required surgical intensive care hospitalization is shown in Table 2.

Regarding traumatic pathology, there were three cases of isolated head trauma, one case of isolated thoracic trauma, and five cases of polytrauma.

71% of patients admitted to surgical intensive care came from surgical departments. 24% were hospitalized directly through the emergency department, and 5% of patients came from medical departments.

The distribution of patients according to their origin from different surgical departments is shown in Figure 2.

The mean APACHE II score at admission was 14.61 +/- 5.49. The value of this score varied according to the departments of origin. For patients coming from

the emergency department and surgical departments, the mean APACHE II score was 18.5 and 14.32, respectively. For patients coming from medical departments, the mean APACHE II score was 7.8.

Various types of visceral failures were observed in our study. The main failures observed were cardiovascular (32%), renal (24%), and respiratory (13%). Hematological and neurological failures were observed in 12% and 11% of cases, respectively.

The mean SOFA score of patients at admission was 9.75, with extremes ranging from 03 to 18.

The aspects of management were defined mainly in relation to the use of vasoactive drugs, the use of mechanical ventilation, the use of renal replacement therapy, and transfusion of blood products.

39% of patients included in the study required the use of vasoactive drugs, including norepinephrine, epinephrine, or dobutamine. 49 patients required conventional mechanical ventilation during their stay in the ICU. The use of renal replacement therapy was deemed necessary in six cases, represented by three cases of acute renal failure with severe acidosis and hyperkalemia, and three cases of end-stage chronic renal failure, who were already on dialysis before hospitalization. The transfusion of blood products was deemed necessary in 46 cases (Table 3).

We regret 36 deaths, representing a mortality rate of 36%. 64 patients evolved favorably and have been transferred, for the most part, to their original services for further care.

Among the 36 deceased patients, 13 patients (36%) died from an infectious origin, 10 patients (28%) died from a cardiovascular complication, and five patients (14%) died from a metabolic cause. Two patients died suddenly without an obvious cause.

The different causes of death observed in our study are shown in Table 4. In our study, the average length of stay in the intensive care unit was 6.46 +/- 9.85 days, with extremes ranging from one day to 86 days.

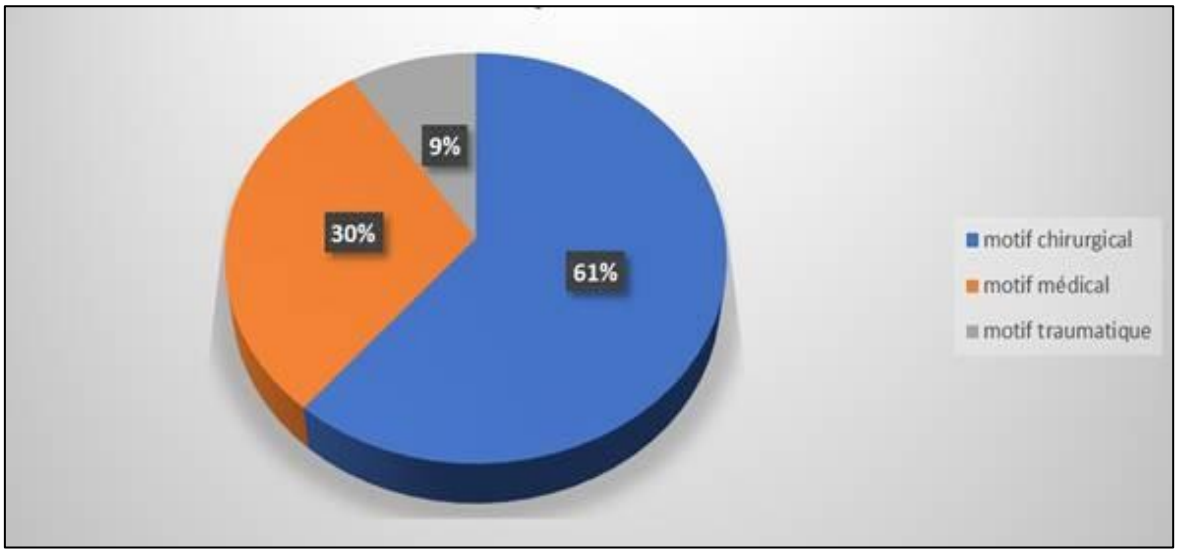

Figure 1: Distribution of patients by admission reasons

Table 1: Surgical motive of admission

Diagnosis at admission	Number (%)
Postoperative period of an elective surgery	30 (30%)
Postoperative Hemorrhagic Shock	11 (11%)
Community peritonitis	6 (6%)
Postoperative peritonitis	6 (6%)
hemorrhagic stroke	4 (4%)
Acute cholangitis	3 (3%)

Table 2: Medical motive of admission

Diagnosis at admission	Number (%)
Pneumonia	8 (8%)
Urinary tract infection Neuromeningeal infection	5 (5%) 3 (3%)
Metabolic causes coma	4 (4%)
Severe acute pancreatitis	3 (3%)
Pulmonary edema	3 (3%)
pulmonary embolism	2 (2%)
ischemic stroke	1 (1%)
Severe burns	1 (1%)
TOTAL	30 (30%)

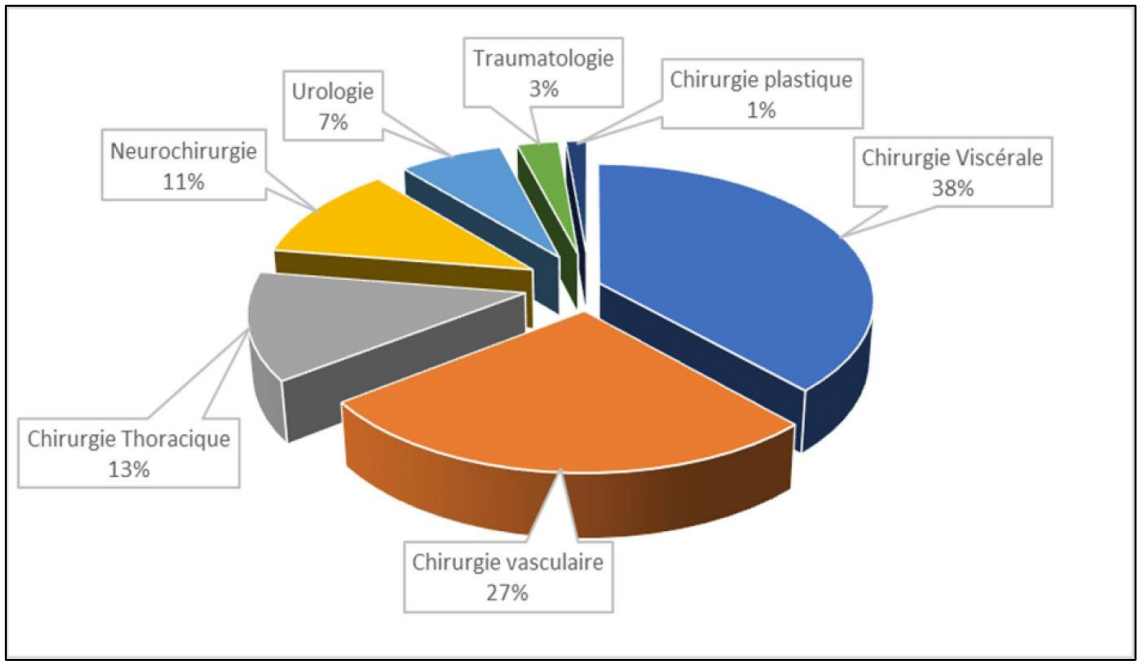

Figure 2: Distribution of patients by department of origin

Table 3: Aspects of treatment

Aspects of treatment	Number (%)
Vasoactive drugs	39 (39%)
Mechanical ventilation	49 (49%)
Renal replacement therapy	6 (6%)
Blood transfusion	46 (46%)

Table 4: Causes of death

Causes of death	Number (%)
infectious causes	13 (36)
Cadiovascular causes	10 (28)
- Hemorrhagic shock	7 (19,5)
- Cardiogenic shock	3 (8,5)
Respiratory causes (pulmonary embolism)	2 (5,5)
Neurological causes (Cerebral engagement)	4 (11)
Metabolic causes (acute kidney injury and electrolyte disorders)	5 (14)
Unexpected death	2 (5,5)

2. Analytical Study

The mortality observed in our study was 36%. Various prognostic factors were analyzed. Tables 5 and 6 show, respectively, the results of the univariate and multivariate analysis in terms of predictive factors of mortality.

Table 5: Univariate analysis of predictive factors for mortality

Variables	Group of deceased n (%)	Survivors group n (%)	P value
Age **Age (mean in years)** **Age ≥ 65**	 57,33 +/- 13,45 15 (41,66%)	 54,94 +/- 18,58 25 (39,06%)	 NSNS
Gender **Male** **Female**	 21(58,33%) 15(41,66%)	 40(62,5%) 24(37,5%)	 NSNS
Comorbidities **Smoking intoxication**	 05 (13,88%)	 22 (34,37%)	 0,026
high blood pressure	10 (27,78%)	14 (21,87%)	NS
Ischemic heart disease	05 (13,88%)	09 (14,06%)	NS
diabetes	07 (19,44%)	15 (23,43%)	NS
neoplasia	11 (30,55%)	06 (9,3%)	<0,001
ischemic stroke	03 (8,33%)	02 (3,12%)	NS
chronic kidney disease	01 (2,77%)	02 (3,12%)	NS
Motive of admission **surgical** **medical** **traumatic**	 16(44,44%) 21(58,33%) 03 (8,33%)	 45(70,31%) 09(14,06%) 06 (9,37%)	 0,01 <0,001 NS
Surgical department	24 (66,66%)	47 (73,44%)	NS
Emergency	11 (30,55%)	13 (20,31%)	NS
Medical department	02 (5,55%)	03 (4,68%)	NS
Severity scores and multivisceral failures **APACHEII score** **SOFA score**	 18,67 +/-7,32 10,68 +/-2,68	 11,34 +/- 4,47 7,31 +/-1,16	 <0,001 NS
Aspects of treatment **Vasoactive drugs**	 28 (77,77%)	 11 (17,18%)	 <0,001
Mechanical ventilation	29 (80,55%)	20 (31,25%)	<0,001
Renal dialysis	03 (8,33%)	03 (4,68%)	NS
Blood transfusion	22 (61,11%)	24(37,5%)	0,02
Length of stay in UCI **Mean +/- standard deviation**	 9,52 +/- 15,04	 4,71+/- 5,25	 0,008

Table 6: Multivariate analysis of predictive factors for mortality

Variables	Odds Ratio	[confidence interval 95%]	P value
Tabagic intoxication	0,30	0,07 - 0,20	0,026
Neoplasia	4,29	0,21 - 0,39	<0,001
Surgical motive of admission	0,33	0,34 - 0,54	0,01
Medical motive of admission	8,55	0,48 - 0,67	<0,001
APACHE II score	_	17,23 - 20,10	<0,001
Vasoactive drugs	16,86	0,69 - 0.85	<0,001
Mechanical ventilation	9,14	0,72 - 0,88	<0,001
Blood transfusion	2,61	0,51 - 0,70	0,02
Length of stay in ICU	_	6,57 - 12,47	0,008

DISCUSSION

The mortality rate found in our study was 36%. This figure appears to be similar to that found generally in emerging or developing countries, but remains higher than that found in developed countries.

In the African continent, the mortality rate in intensive care remains above 30% [4-7]. In Europe, the mortality rates in intensive care seem lower compared to that reported in our study. Studies generally report a mortality rate ranging from 6.7% to 17.8% in Europe [1, 3]. The same observation can be made about other

countries. The mortality rates reported in the USA, Australia and New Zealand were 11.3% and 7%, respectively [8, 9]. In China and Brazil, the reported mortality rate in intensive care was 16.3% and 9.6%, respectively [10, 11].

The causes and characteristics of death in intensive care are very polymorphic. They generally depend on various parameters, including the characteristics of the intensive care unit and the targeted population.

Schematically, the main causes of death can be infectious, cardiocirculatory, respiratory, neurological or metabolic. There are cases where the causes of death are not specified. Furthermore, the different causes of death can be intertwined.

Finally, it should be noted that in most studies, the causes of death are classified according to whether they are expected or not, and according to the organ failure causing the death.

In our study, we analyzed the causes of death in relation to the origin of visceral failures that directly led to death.

The main causes of death found in our study were infectious (36%), cardiovascular (28%), metabolic (14%), neurological (11%), and respiratory (5.5%). In two cases, the deaths were unpredictable.

Various predictive factors of mortality in intensive care units have been described in the literature. These factors may be related to the patient's condition, type of admission, severity scores, aspects of care, etc.

In our study, the predictive factors of mortality in the ICU were represented by the existence of a neoplastic disease, admission for a medical reason, the APACHE II score, the use of vasoactive drugs, the use of mechanical ventilation, blood transfusion, and length of stay in the ICU.

Overall, these are risk factors consistent with those reported in the literature. In a prospective study of 401 patients admitted to the ICU, Oliveira et al., [12] analyzed the predictive factors of mortality. The authors found a mortality rate of 13.5%. Factors associated with a significant increase in mortality were represented by an APACHE II score >11, the need for tracheotomy, and the need for tracheal re intubation.

In a multicenter Polish study, Weigl et al., [1] analyzed the predictors factors of survival in the ICU. The study involved 48,282 patients hospitalized in different ICU units. The authors found a mortality rate of about 42%. The independent predictors associated with patient survival were represented by hospitalization in a tertiary ICU unit, a high annual volume of ICU hospitalizations, young age, female sex, and reduced comorbidities.

Pinheiro et al., [13] conducted a study of 316 patients hospitalized in two ICUs in Brazil. The authors assessed the risk of mortality by analyzing several variables. The authors found a mortality rate of 21%. Predictors of mortality in multivariate analysis were represented by advanced age, hospitalization from the emergency department, the presence of glycemic alterations, dehydration, enteral feeding, anti-epileptics, mechanical ventilation, and a high Charlson score.

A recently published Ethiopian study focused on 310 patients hospitalized in a polyvalent ICU [14]. The observed mortality rate in this study was 45.8%. Independent risk factors of mortality were represented by inhalation pneumonia, renal failure, mechanical ventilation, hospital-acquired infections, and a reduced length of stay in intensive care.

Finally, a multicenter study was conducted in Egypt by El Ashry et al., [15] involving 1,132 ICU patients. It was a descriptive and analytical study aimed to analyze the mortality rate and prognostic factors. The authors found a mortality rate of 24%. They also found a significant association between mortality and the following factors: advanced age of over 60 years, urban areas, reduced length of stay in the ICU, and a high Charlson comorbidity index.

Comparing the results of our study with those reported in the studies cited above, it can be noted that they are mostly consistent. We indeed found, in univariate and multivariate analysis, seven predictive factors of mortality. These factors were represented by the presence of a neoplastic condition, admission for a medical reason, a high APACHE II score, the use of vasoactive drugs, the use of mechanical ventilation, blood transfusion, and length of stay in the ICU.

Among the seven factors mentioned above, the APACHE II score, the use of vasoactive drugs, the use of mechanical ventilation, and prolonged length of stay in the ICU are reported in most studies [14, 16-18].

In our study, blood transfusion stood out as an independent predictor of mortality in the ICU (OR 2.61, 95% CI 0.51-0.70, p=0.02). This factor was not reported in the various studies cited earlier. Several studies that analyzed blood transfusion and its impact on the survival of patients admitted to the ICU found that it significantly increased mortality. This was the case in the study by Akbas on 169 ICU patients, which aimed to analyze the impact of blood transfusion on patient prognosis [19]. The authors found that blood transfusion was associated with a significant increase in mortality and length of stay in the ICU.

The existence of a neoplastic disease did not also represent a predictive factor of mortality in the various studies cited above. Nevertheless, it seems obvious to us that the immunosuppression associated with the neoplastic disease is likely to significantly increase mortality in intensive care. On the other hand, knowing that the neoplastic disease is part of the criteria of the Charlson comorbidity index, often described as an independent predictor of mortality in intensive care, it is not surprising to find the neoplastic condition as a prognostic factor in our study.

Some risk factors often reported in the literature were not found in our study. This is particularly the case of advanced age and visceral failures. It is important to note that in our study, the average age observed in the group of deceased exceeded that observed in the group of survivors (57.33 versus 54.94 years). However, the difference was not significant. Similarly, the average SOFA score was relatively higher in the deceased group, although the difference was not significant (10.68 versus 7.31, p=0.06).

Regarding the limits of our study, they essentially boil down to its retrospective and monocentric character. On the other hand, the objective of our study was to evaluate mortality and its prognostic factors in a surgical intensive care unit. The analysis of the data, revealed the heterogeneous and versatile nature of the patients included in our study, with a medical type admission rate of around 30%.

CONCLUSION

Evaluating predictive factors of mortality could help to improve the prognosis of patients admitted to the ICU. In our study, we found a mortality rate of around 36%. We identified seven independent factors of mortality, which were the presence of a neoplastic disease, admission for a medical reason, the APACHE II score, the use of vasoactive drugs, the use of mechanical ventilation, blood transfusion, and length of stay in the ICU.

REFERENCES

1. Weigl, W., Adamski, J., Gorynski, P., Kanski, A., & Hultström, M. (2018). ICU mortality and variables associated with ICU survival in Poland: a nationwide database study. *European Journal of Anaesthesiology| EJA*, *35*(12), 949-954.
2. Knapik, P., Krzych, Ł. J., Weigl, W., Adamski, J., & Hultstöm, M. (2017). Mortality rate in Polish intensive care units is lower than predicted according to the APACHE II scoring system. *Intensive Care Medicine*, *43*, 1745-1746.
3. Weigl, W., Adamski, J., Goryński, P., Kański, A., & Hultström, M. (2017). Mortality rate is higher in Polish intensive care units than in other European countries. *Intensive care medicine*, *43*, 1430-1432.
4. Wade, K. A., Diallo, A., Beye, S. A., Niang, E. H. M., Diop, M., & Diatta, B. (2011). Evaluation of the use of severity scores in the Resuscitation department of the main army instructions hospital in Dakar, Rev Afr Anesth Med Urg, 16, 7-11.
5. Tchoua, R., Vemba A., Taty Koumba, C., & Ngaka Nsafu, D. (1999). Severity of intensive care patients at the Jeanne Ebori Foundation in Libreville. Black Afr Med, 46, 495-499.
6. Bonkoungou, P., Traoré, I., Bako, Y. P., Sanou, J., & Ouédraogo, N. (2014, September). La mortalité en réanimation polyvalente du centre hospitalier universitaire Yalgado Ouédraogo de Ouagadougou au Burkina–Faso. In *Annales Françaises d'Anesthésie et de Réanimation* (Vol. 33, p. A310). Elsevier Masson.
7. Essola, L., Ngondé Monsu, L. O., Soami, V., Ngomas, J. F., & Sima, Z. (2017). Mortality in the Intensive Care Unit of the Libreville University Hospital Center: causes and risk factors. RAMUR, 22(1).
8. Zimmerman, J. E., Kramer, A. A., & Knaus, W. A. (2013). Changes in hospital mortality for United States intensive care unit admissions from 1988 to 2012. *Critical care*, *17*, 1-9.
9. Moran, J. L., Solomon, P. J., & ANZICS Centre for Outcome and Resource Evaluation (CORE) of the Australian and New Zealand Intensive Care Society (ANZICS). (2014). Fixed effects modelling for provider mortality outcomes: analysis of the Australia and New Zealand Intensive Care Society (ANZICS) adult patient data-base. *PloS one*, *9*(7), e102297.
10. Du, B., An, Y., Kang, Y., Yu, X., Zhao, M., Ma, X., ... & China Critical Care Clinical Trial Group. (2013). Characteristics of critically ill patients in ICUs in mainland China. *Critical care medicine*, *41*(1), 84-92. doi:10.1097/CCM.0b013e31826a4082. PMID: 23222268.
11. Soares, M., Bozza, F. A., Angus, D. C., Japiassú, A. M., Viana, W. N., Costa, R., ... & Salluh, J. I. (2015). Organizational characteristics, outcomes, and resource use in 78 Brazilian intensive care units: the ORCHESTRA study. *Intensive care medicine*, *41*, 2149-2160. doi: 10.1007/s00134-015-4076-7. PMID: 26499477.
12. Oliveira, A. B. F. D., Dias, O. M., Mello, M. M., Araújo, S., Dragosavac, D., Nucci, A., & Falcão, A. L. E. (2010). Factors associated with increased mortality and prolonged length of stay in an adult intensive care unit. *Revista Brasileira de terapia intensiva*, *22*, 250-256.
13. Soares Pinheiro, F. G. D. M., Santana Santos, E., Barreto, Í. D. D. C., Weiss, C., Vaez, A. C., Oliveira, J. C., ... & Silva, F. A. (2020). Mortality predictors and associated factors in patients in the

intensive care unit: a cross-sectional study. *Critical Care Research and Practice*, *2020*.

14. Wotiye, A. B., Shimber, E. T., & Ayele, B. A. (2022). Factors Associated with ICU Mortality at Hawassa University Comprehensive Specialized Hospital (HUCSH). *Ethiopian Journal of Health Sciences*, *32*(3), 505.
15. El-Adawy, A. E. A., Khafagy, M. A., El Adawi, N. M., Bahgat, M., & El-Gilany, A. H. (2022). Intensive Care Morbidity and Mortality and Their Associated Factors: A National Study in Egypt. *Benha Medical Journal*, *39*(Special issue (Academic)), 52-62.
16. Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. (1987). A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of chronic diseases*, *40*(5), 373-383.
17. Abate, S. M., Assen, S., Yinges, M., & Basu, B. (2021). Survival and predictors of mortality among patients admitted to the intensive care units in southern Ethiopia: A multi-center cohort study. *Annals of Medicine and Surgery*, *65*, 102318.
18. Bekele, Z., Jisha, H., & Haile, M. (2022). Outcomes and associated factors among adult patients admitted to adult intensive care unit, retrospective cohort study. *International Journal of Surgery: Oncology*, *7*(1), 20-29.
19. Akbaş, T. (2019). Long length of stay in the ICU associates with a high erythrocyte transfusion rate in critically ill patients. *Journal of International Medical Research*, *47*(5), 1948-1957.
20. Otero, M. L., Menezes, R. C., Ferreira, I. B., Issa, F. L., Agareno, G., Carmo, T. A., ... & Andrade, B. B. (2020). Factors associated with mortality in critically ill patients diagnosed with hospital acquired infections. *Infection and Drug Resistance*, 2811-2817.
21. El-Adawy, A. E. A., Khafagy, M. A., El Adawi, N. M., Bahgat, M., & El-Gilany, A. H. (2022). Intensive Care Morbidity and Mortality and Their Associated Factors: A National Study in Egypt. *Benha Medical Journal*, *39*(Special issue (Academic)), 52-62.