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# A Two-Year Retrospective Study of ICU Patient Trends and Outcomes at Jazan General Hospital (2023-2024)

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**Abstract**
Background: ICU treatment requires an understanding of patient demographics and outcomes; moreover, the course of an illness is influenced by comorbidities, severity, and functional status. This study examined ICU trends and outcomes at Jazan General Hospital between 2023 and 2024, with an emphasis on the effects of comorbidities, length of stay, age, and admission source.

Methods: : 998 ICU patient records from Jazan General Hospital were reviewed retrospectively in 2023 and 2024. A primary focus of this study was to examine ICU outcomes and relationships among demographics, comorbidities, admission source, and length of ICU stay, using chi-square analysis.

Results: Most patients were aged ≤ 30 (26.75%), and men comprised 54.81%. Emergency department admissions accounted for 64.03%. The highest mortality rate (48.08%) was observed in patients aged 71–90, and prolonged ICU stays (>10 days) had a 50.74% mortality. Significant correlations were observed between outcomes and age, ICU length, and admission source ($p < 0.01$). Admissions peaked in December, with respiratory illnesses (23.45%) and cardiac issues (11.82%) as the most frequent causes.

Conclusion: Age, duration of ICU stays, and the reason for admission all worsen the prognosis. The predominant conditions were cardiovascular and respiratory; specific interventions are required.

**Keywords:** : ICU dynamics, Patient characteristics, Clinical outcomes, retrospective analysis.



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## 1. Introduction:

Although the efficiency and effectiveness of intensive care units (ICUs) have improved, the global mortality rate remains high, ranging from 16.2% to 46.8% (Abate et al., 2021). End-of-life care (EoLC) in ICUs is common, with more than 70% of deaths occurring immediately after life-sustaining treatment is reduced or stopped (Korsah & Schmollgruber, 2023). Adequate financial and human resource allocation should be central to holistic support systems. Existing research points to the high cost of life-sustaining treatments, the lack of hospice wards for EoLC patients, and staff shortages (Rawas, 2019). Therefore, securing additional financial investment to develop ICUs' capacities and expand staff must be a key priority for hospital management.

As a long-term plan to meet future societal demands, the Saudi government has proposed Vision 2030. As part of the healthcare system's reorganization, the current 13 administrative healthcare regions were divided into five business units (BUs). The regions of Jazan, Najran, Aseer, and Bisha make up the Southern BU. Through a variety of strategies, the new Model of Care (MoC) aims to close gaps in primary care access, quality, prevention, workforce training, technology, accessibility, and efficiency for all Saudi citizens, regardless of where they reside (A. A. Alharbi et al., 2022). Health care institutions constantly scrutinize efficiency and costs. ICUs provide specialized, intensive, and expensive medical care to patients with severe or life-threatening conditions within modern healthcare systems (Ervin et al., 2018).

The majority of research on demographics, comorbidities, and intensive care unit length of stay (LOS) was conducted during the coronavirus pandemic or in pediatric populations (Al-Otaiby et al., 2022; Alqahtani et al., 2025; Alshaikh et al., 2022; Alsofayan et al., 2020; Mobarki et al., 2021). One study in Saudi Arabia, which examined data from more than 42,000 patients, identified factors affecting LOS in adult intensive care units. LOS was significantly influenced by age, gender, nationality, source of admission, and clinical history. These findings underscore the complexity of factors influencing LOS and the role of patient demographics and healthcare delivery systems in critical care (K. K. Alharbi et al., 2023).

In particular, there is limited data from Saudi Arabia on factors influencing ICU trends and outcomes, especially in the Southern BU. Accordingly, this study describes factors influencing ICU outcomes, along with demographic data, comorbidities, admission source, length of ICU stay, and outcomes. Improving clinical outcomes in critical care settings requires an understanding of these dynamics. Additionally, identifying these factors will help develop targeted research to reduce the ICU's burden and improve clinical practice. It will add to the variety of data in the literature, thereby making future meta-analyses and predictive models more generalizable.

## 2. Methods:

### 2.1 Setting:

This study was conducted at Jazan General Hospital in the Kingdom of Saudi Arabia, which provides specialized care to the entire region. According to the 2022 census, the hospital's catchment area had a population of 1,404,997.

### 2.2 Study design:

The study examined registry data on adult intensive care unit patients from January 1, 2023, to December 31, 2024, in a retrospective, cross-sectional manner.

### 2.3 Study Population and Criteria:

- Inclusion and Exclusion Criteria:

The primary exposure of interest was the total number of adult patients admitted to the intensive care unit during the study period. Patients admitted for observation were not studied, and non-ICU patients, incomplete data, and missing data were excluded. To ensure data quality and consistency, double data checking and the SOPA protocol were used to ensure consistent data entry.

### 2.4 Data Collection

In this study, data were extracted from Vida, the hospital's electronic health record system. The database included age, sex, ICD-10 (International Classification of Diseases, 10th Revision) diagnoses, discharge summaries, routinely collected administrative data, and patient records, all extracted into a pre-structured format. Repeated admissions were treated separately to ensure accurate tracking of ICU outcomes; only the first ICU admission was analysed for patients with multiple admissions. A trend analysis was also conducted using individual patient identifiers.

### 2.5 The variables collected include:

The main exposure of interest was the total number of adult patients admitted to the intensive care unit (ICU) during the designated timeframe, along with demographics (gender, age), admission diagnosis and comorbidities, major interventions (mechanical ventilations, inotropic support), length of stay in the ICU, and clinical outcomes (survivor, death, transfer, and discharge against medical advice). The SOFA score was used to describe organ dysfunction. However, comparing survivors to non-survivors was not one of the study's primary objectives.

### 2.6 Sample:

A total of 998 Adult critically ill patients admitted to the ICU during the study period from January 2023 to December 2024 were studied. The various variables, including admission source and the date of admission before the day of discharge, were compared using cross-validation, which yielded classifications that matched the anticipated classifications. Double-checking the data collection sheet for any inconsistencies or missing information was followed. The following exclusions were made: non-ICU patients with admission to the

general ward, patients with incomplete data, and patients admitted for observation.

### 2.7 Data Analysis

Descriptive statistics were used to summarize patient characteristics, admission patterns, interventions, and outcomes. Outcomes were stratified by age, sex, admission diagnosis, interventions received, and length of stay. All descriptive analyses were performed using the Statistical Package for the Social Sciences (Version 27.0, SPSS Inc., Chicago, IL, USA). The chi-square test was used, and $p < 0.05$ was considered significant. The qualitative variables were presented as percentages and counts.

### 2.8 Ethical Considerations

The hospital's Institutional Review Board (IRB) and Ethics Committee approved the study (No. 2510). These data were used for a secondary analysis of ICU patients. Patient confidentiality was maintained at all times. The study closely followed the Helsinki Declaration of Scientific Research Ethics on Human Subjects. Because it was a retrospective study, direct patient consent might not have been necessary.

### 2.9 Results:

A total of 998 patients were studied, with the majority aged ≤ 30 (26.75%) and 51-70 (26.65%). Those aged 90 and older were the least prevalent age group (2.91%). Males accounted for 547 (54.81% of the group), and females for 451 (45.19%). The percentage of married patients was 54.11%. A significant age-gender difference may inform targeted clinical interventions (Table 1).

**Table 1. Frequency and Percentage of Socio-demographic Variables (N =998)**

| Variable | Options | Frequency | Percentage |
|---|---|---|---|
| Age | ≤ 30 years | 267 | 26.75% |
| | 31-50 years | 221 | 22.14% |
| | 51-70 years | 266 | 26.65% |
| | 71-90 years | 215 | 21.54% |
| | Over 90 | 29 | 2.91% |
| Gender | Male | 547 | 54.81% |
| | Female | 451 | 45.19% |
| Marital Status | Single | 276 | 27.66% |
| | Married | 540 | 54.11% |
| | Divorced | 64 | 6.41% |
| | Widowed | 118 | 11.82% |

As shown in Table 2, ER admissions accounted for 64.03% of all admissions, followed by referrals from other hospitals (17.64%), with orthopaedics accounting for 1.1%. Nearly half of patients stayed 3–5 days (41.78%), while 27.05% stayed ≤ 2 days. Of patients, 62.32% were transferred out, 24.25% died, and 8.42% were referred to other hospitals. These trends highlight the importance of transition planning in ICU care.

**Table 2. Frequency and Percentage of Selected ICU Variables (N =998)**

| Variable | Options | Frequency (n) | Percentage % |
|---|---|---|---|
| Admission Source | Emergency Department | 639 | 64.03% |
| | Medical department | 93 | 9.32% |
| | Surgical department | 46 | 4.61% |
| | Orthopaedics department | 11 | 1.1% |
| | Obstetrical and Gynecological Department | 33 | 3.31% |
| | Referral from other hospitals | 176 | 17.64% |
| Duration of ICU Admission | ≤ 2 days | 270 | 27.05% |
| | 3 – 5 days | 417 | 41.78% |
| | 6 - 8 days | 129 | 12.93% |
| | 8- 10 days | 44 | 4.41% |
| | More than 10 days | 138 | 13.83% |
| Outcomes of Cases Admitted to the ICU | Transfer out of the ICU | 622 | 62.32% |
| | Referral to another hospital | 84 | 8.42% |
| | Discharge home upon patient request | 4 | 0.4% |
| | Discharge against medical advice | 42 | 4.21% |
| | Death | 242 | 24.25% |
| | | 4 | 0.4% |

*** ICU: Intensive Care Unit**

Regarding age, the distribution of outcomes varied significantly: younger adult patients (≤ 30 years) had the highest transfer rate (84.71%) and the lowest mortality (6.61%), whereas patients aged 71–90 years had the highest mortality (48.08%) and the lowest transfer rate (47.60%). For patients over 90, transfers and deaths were nearly equal (48.28% each), with a significant correlation ($p < 0.001$). Results were also influenced by ICU length of stay; transfers were highest (65.34%) and mortality lowest (19.92%) during stays of ≤ 2 days, whereas transfers were lowest (38.97%) and mortality highest (50.74%) during 10-day stays ($p < 0.01$). The source of admission was another factor; transfers through various hospitals had the highest mortality (43.86%), whereas those from the departments of gynecology and obstetrics had the lowest mortality (3.03%) and the highest transfer rate (93.94%). The most important source, the ED, yielded a balanced result with a statistically significant ($p < 0.01$) mortality rate of 19.77%. (Table 3).

**Table 3. Cross-tabs of Age, Duration of ICU (all sources), and Admission Source (excl.Orthopaedics) vs Outcome (N =998)**

| Variable | Variable Option | Transfer out of the ICU | Referral to other hospital | Death | Chi square | P value |
|---|---|---|---|---|---|---|
| Age | ≤ 30 years | 205 (84.71%) | 21 (8.68%) | 16 (6.61%) | 139.558 | <0.001 |
| | 31-50 years | 159 (76.08%) | 22 (10.53%) | 28 (13.40%) | | |
| | 51-70 years | 145 (55.77%) | 31 (11.92%) | 84 (32.31%) | | |
| | 71-90 years | 99 (47.60%) | 9 (4.33%) | 100 (48.08%) | | |
| | Over 90 | 14 (48.28%) | 1 (3.45%) | 14 (48.28%) | | |
| Duration of ICU Admission | ≤ 2 days | 164 (65.34%) | 37 (14.74%) | 50 (19.92%) | 81.574 | <0.01 |
| | 3 – 5 days | 297 (74.81%) | 20 (5.04%) | 80 (20.15%) | | |
| | 6 - 8 days | 83 (66.94%) | 12 (9.68%) | 29 (23.39%) | | |
| | 8- 10 days | 25 (62.50%) | 1 (2.50%) | 14 (35.00%) | | |
| | More than 10 days | 53 (38.97%) | 14 (10.29%) | 69 (50.74%) | | |
| Admission Source | Emergency Department | 416 (69.68%) | 63 (10.55%) | 118 (19.77%) | 66.483 | <0.01 |
| | Medical department | 45 (50.00%) | 8 (8.89%) | 37 (41.11%) | | |
| | Surgical department | 33 (71.74%) | 2 (4.35%) | 11 (23.91%) | | |
| | Obstetrical and gynecological department | 31 (93.94%) | 1 (3.03%) | 1 (3.03%) | | |
| | F. Referral from other hospital | 87 (50.88%) | 9 (5.26%) | 75 (43.86%) | | |

*** ICU: Intensive Care Unit**

Table 4 presents key trends in ICU outcomes across different systems. The majority of hospitalizations were due to respiratory and endocrine conditions (23.45% and 21.04%, respectively), with respiratory diseases alone accounting for the greatest case load and mortality burden (39.74%). Genitourinary cases had a 37.5% mortality rate. Infectious and communicable diseases (36.84%), gastroenterology and liver disorders (36.59%), and neurological cases (34.57%) are also associated with high mortality. Cardiovascular and nephrology cases also represented significant proportions of ICU mortality, at 22.88% and 24.24%, respectively. In contrast, despite their high incidence, endocrine disorders have a low mortality rate of 8.10%, indicating effective acute management. Self-harm cases (3.57%) and gynaecology and obstetrics (5.26%) also show low mortality, indicating effective emergency response systems. Dermatological cases also had a significant mortality rate (50%), despite having the fewest ICU admissions.

**Table 4. System involvement: total cases and mortality (N =998)**

| System.Involvement | Total Cases | % | Mortality | % |
|---|---|---|---|---|
| Cardiovascular | 118 | 11.82% | 27 | 22.88% |
| Respiratory | 234 | 23.45% | 93 | 39.74% |
| Gastroenterology and liver disease | 41 | 4.11% | 15 | 36.59% |

| System.Involvement | Total Cases | % | Mortality | % |
|---|---|---|---|---|
| Nephrology | 33 | 3.31% | 8 | 24.24% |
| Endocrinology | 210 | 21.04% | 17 | 8.10% |
| Neurology | 81 | 8.12% | 28 | 34.57% |
| Infectious and communicable diseases | 38 | 3.81% | 14 | 36.84% |
| Cases of genitourinary | 16 | 1.60% | 6 | 37.5% |
| Cases from obstetrics and gynecology | 38 | 3.81% | 2 | 5.26% |
| Self–harm | 28 | 2.81% | 1 | 3.57% |
| Orthopaedics | 46 | 4.61% | 7 | 15.22% |
| Surgery | 72 | 7.21% | 17 | 23.61% |
| Dermatology | 2 | 0.20% | 1 | 50% |
| Others | 41 | 4.11% | 6 | 14.63% |

Monthly admissions are shown in Figure 1, peaking at 60 in January and falling to 41 in March. There is a slight decrease in May (96) after a significant rise in April (105), with stability from June to August (70–72). Admissions peak at 120 in September, fall to 65 in November, and then remain high at 118 in October. December records the highest peak, at 136. The data indicate that admissions peak in April and September–October, suggesting that seasonal or operational factors may influence admission trends.

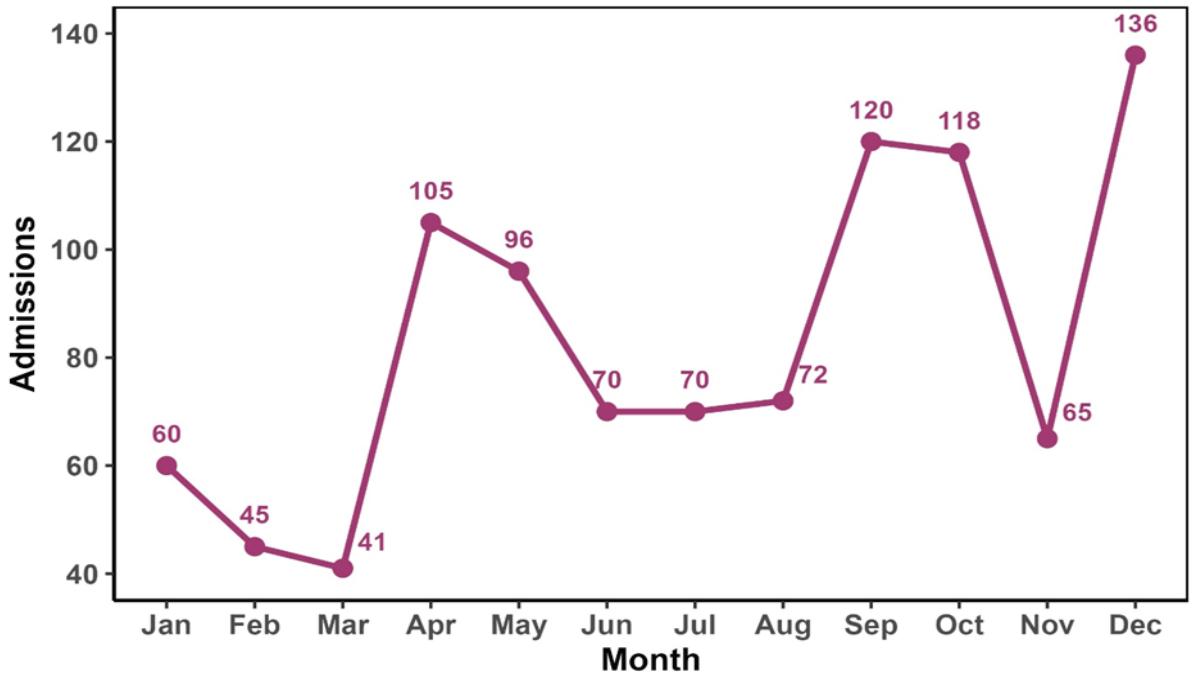


**Figure 1 illustrates the monthly admissions trends for two consecutive years (2023, 2024). December shows the highest admissions trend, and March shows the lowest.**

## 3. Discussion:

The results of this two-year study provide an extensive overview of the sociodemographic characteristics, reasons for admission, lengths of stay in the intensive care unit (ICU), patient outcomes, and the prevalence of various medical conditions among ICU patients at Jazan General Hospital. Among the 998 patients examined, the most common age group was young adults aged ≤ 30 years, comprising 26.75% of the total population, followed closely by the 51–70 years age group (26.65%). This distribution indicates that younger adults are more likely to be admitted to the ICU than older adults, consistent with earlier studies showing that a large number of ICU admissions in these age groups are due to non-communicable diseases, injuries, or other acute conditions. According to the literature, the variety of young adults' medical conditions determines the percentage of young adults in intensive care units. Age and lifestyle are recognized as important factors in determining disease risk, raising the question of whether lifestyle changes are needed in this community (Eya et al., 2022; Khamis et al., 2021; Knapik et al., 2019).

Regarding gender, the patient population was predominantly male (54.81%), consistent with global patterns in ICU admissions, where males are more likely to be admitted, particularly for conditions linked to trauma or cardiovascular events (Cruz-Garcinuño et al., 2025; Lat et al., 2021). Disparities in disease prevalence, treatment approaches, and physiological responses to life-threatening conditions may underlie sex-based differences in ICU length of stay (LOS). This finding aligns with comparable research conducted in Saudi Arabia.

Age-related variation in intensive care unit (ICU) outcomes is a key finding of this research. Younger patients (10-30 years) had the lowest mortality rate (6.61%) and the highest ICU transfer rate (84.71%), suggesting that interventions for this age group are particularly effective. In contrast, patients aged 71 to 90 years had the highest ICU mortality rate (48.08%), underscoring their heightened vulnerability. These findings corroborate other studies identifying age as an important determinant of ICU outcomes (K. K. Alharbi et al., 2023; Amado et al., 2025; Ranucci et al., 2022; Vallet et al., 2023). Age-related disparities in outcomes are statistically significant ($p < 0.001$), underscoring the need for personalized treatment strategies.

Patient outcomes also strongly depend on ICU length of stay. Patients with ≤ 2 days in the ICU had the best transfer rate (65.34%) and the lowest mortality rate (19.92%). Hence, short ICU stays are associated with better outcomes; it is also possible that these patients seek early medical advice, which may be related to social, familial, and community support networks in Saudi Arabia that have been found to increase healthcare utilization (K. K. Alharbi et al., 2023). Meanwhile, those who stayed longer than 10 days had the lowest transfer rate (38.97%) and the highest death rate (50.74%). This conclusion is supported by the literature, which indicates that longer stays in the intensive care unit are often linked to increased risks of complications, including organ failure, infection, and death. Additionally, significant risk factors associated with a poorer prognosis and longer hospital and intensive care unit stays included advanced age and comorbid conditions such as diabetes, cardiovascular disease, and chronic kidney disease. Furthermore, a lengthy ICU stay has been linked to a high death rate and a low quality of life among survivors (Ala-Kokko et al., 2025; Al-Otaiby et al., 2022; Budianu et al., 2024; Damien et al., 2024; Kodati et al., 2022; Koowattanatianchai et al., 2025). The strong association between ICU length of stay and outcomes was statistically significant ($p < 0.01$), underscoring the need for early interventions and discharge planning.

According to the study, which also looked at how the source of admission affected ICU outcomes, patients admitted from the obstetrical and gynecological department had the lowest mortality rate (3.33%) and the highest transfer rate (93.94%). This result might suggest that the acuity of cases in this department is generally lower than that in other sources, such as the Emergency Department (ED) (Rocha et al., 2024; Rudakemwa et al., 2021). A more evenly distributed distribution of outcomes was shown by the ED, which had a mortality rate of (19.77%) and was responsible for the majority of ICU admissions (64.03%). Given the sensitivity of this indicator, hospital resources must be carefully allocated in this crucial area. However, the greatest mortality rate (43.86%) was seen in patients who were transferred from other hospitals, indicating that these patients might have been more seriously ill when they arrived. ICU outcomes are largely impacted by the observed disparities, which were statistically significant ($p < 0.01$). This research demonstrates the need for hospital collaboration to enhance the transfer process. Patients must be stable before admission to the intensive care unit. Setting clear criteria and improving communication between intensive care units and referring facilities are crucial for achieving the best patient outcomes, according to this finding.

Respiratory conditions accounted for 23.45% of intensive care unit admissions, with endocrine disorders second at 21.04% and cardiovascular disorders at 11.82%. Chronic respiratory and cardiovascular conditions are known to be leading causes of intensive care unit admissions worldwide (Shayganfar et al., 2021), underscoring the substantial burden they pose. These results align with a study in Saudi Arabia examining mortality among intensive care unit readmissions, which found that

respiratory failure was the most common cause. This highlights the frequent occurrence of respiratory disorders in critical care settings. Notably, the mortality rate for respiratory disorders was 39.84%, higher than that for cardiovascular diseases (22.88%). The severity and acute nature of respiratory disorders, such as pneumonia, acute respiratory distress syndrome, and exacerbations of chronic obstructive pulmonary disease (COPD), may explain this disparity. These conditions can cause rapid deterioration and increased mortality in intensive care units (Akbaş & Güneş, 2023; Chae et al., 2025; Mady et al., 2023).

As shown in Figure 1, the monthly admissions trends indicate a peak in ICU admissions in December and a clear dip in March. Uncommon are seasonal changes in ICU admissions, driven by factors such as respiratory infections, flu seasons, or variations in the frequency of accidents or trauma (Akbaş & Güneş, 2023).

Knowing these trends will help with resource allocation and ICU staffing to ensure the hospital is ready for periods of increased demand. Implementing targeted protocols for high-mortality diagnostic groups, scheduling staffing and resources for December peaks, and developing inter-hospital transfer triage criteria are doable suggestions and recommendations.

There were several restrictions on this study. First off, the findings might not be as widely relevant as they could be, since it was a retrospective observational study conducted at a single center. Additionally, there are no post-ICU outcomes, no illness severity scores, and a dependence on unadjusted, crude associations.

Therefore, a multicenter prospective study would help to support the validity of the results. Such a study may include a larger, more diverse patient base, thereby enhancing the validity and generalizability of the findings across multiple medical settings.

## 4. Conclusion:

This study identifies key trends in patient demographics, admission sources, and ICU outcomes. Treatment plans may work well for younger patients, which could explain their lower death rates and higher transfer rates. In contrast, older patients had the highest death rates, reflecting their greater vulnerability in critical care settings. The data also revealed that ICU length of stay significantly affected outcomes. Shorter stays were associated with more transfers and lower mortality rates. The source of admission was another critical factor. To meet the diverse needs of ICU patients and improve their management, these findings emphasize the need for targeted treatments that enhance ICU outcomes. Given seasonal trends, especially in December, healthcare facilities should plan resources and staffing to handle increased patient volumes during this period. This may involve expanding ICU capacity and ensuring adequate staffing. To improve patient management, these protocols should include teamwork, better monitoring, and standardized treatment plans. The healthcare system can effectively tackle the challenges highlighted in this study, which showcases the distinctive features of this group's findings for potential regional research.

### 4.1 Funding:

There was no outside funding for this study.

1. Data Availability Statement:

- Upon reasonable request, the author will provide the data supporting the study's conclusions.

2. Conflicts of Interest:

- No conflicts of interest have been disclosed.

## 5. References:

*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. https://doi.org/10.1016/j.amsu.2021.102318*

*Akbaş, T., & Güneş, H. (2023). Characteristics and outcomes of patients with chronic obstructive pulmonary disease admitted to the intensive care unit due to acute hypercapnic respiratory failure. Acute and Critical Care, 38(1), 49–56. https://doi.org/10.4266/acc.2022.01011*

*Ala-Kokko, T. I., Karhu, J. M., Lehto, P., Sälkiö, S., Ohtonen, P., & Syrjälä, H. (2025). Long-term outcomes of ICU-acquired infections with a focus on bloodstream infections: A single-center retrospective registry study. Infection, 53(6), 2727–2738. https://doi.org/10.1007/s15010-025-02621-w*

*Alharbi, A. A., Alqumaizi, K. I., Bin Hussain, I., AlHarbi, N. S., Alqahtani, A., Alzawad, W., Suhail, H. M., Alamir, M. I., Alharbi, M. A., & Alzamanan, H. (2022). Hospital Length of Stay and Related Factors for COVID-19 Inpatients Among the Four Southern Regions Under the Proposed Southern Business Unit of Saudi Arabia. Journal of Multidisciplinary Healthcare, 15, 825–836. https://doi.org/10.2147/JMDH.S362625*

*Alharbi, K. K., Arbaein, T. J., Alzhrani, A. A., Alzahrani, A. M., Monshi, S. S., Alotaibi, A. F. M., Aljasser, A. I., Alruhaimi, K. T., Alotaibi, S. D. K., Alsultan, A. K., Arafat, M. S., Aldhabib, A., & Abd-Ellatif, E. E. (2023). Factors Affecting the Length of Stay in the Intensive Care Unit among Adults in Saudi Arabia: A Cross-Sectional Study.*

*Journal of Clinical Medicine, 12(21), 6787. https://doi.org/10.3390/jcm12216787*

*Al-Otaiby, M., Almutairi, K. M., Vinluan, J. M., Al Seraihi, A., Alonazi, W. B., Qahtani, M. H., Aljeri, T., Alhumud, M. A., Alobaidi, N., & Alhurishi, S. A. (2022). Demographic Characteristics, Comorbidities, and Length of Stay of COVID-19 Patients Admitted Into Intensive Care Units in Saudi Arabia: A Nationwide Retrospective Study. Frontiers in Medicine, 9, 893954. https://doi.org/10.3389/fmed.2022.893954*

*Alqahtani, S. A., Alshammari, T. M., Alzahrani, E. M., Alaohali, A. A., Alqahtani, J. S., Alzahrani, Y. A., Alrawashdeh, A. A., Williams, B., Aljumaan, M. A., Alsulaibikh, A. H., Alghamdi, M. A., Almulhim, M. A., Alqahtani, S. Y., Al-Ahmadi, S., & Alshahrani, M. S. (2025). Outcomes of COVID-19 During the First Wave in Saudi Arabia: An Observational Study of ICU Cases from a Single Hospital. Journal of Clinical Medicine, 14(6), 1915. https://doi.org/10.3390/jcm14061915*

*Alshaikh, R., AlKhalifah, A., Fayed, A., & AlYousef, S. (2022). Factors influencing the length of stay among patients admitted to a tertiary pediatric intensive care unit in Saudi Arabia. Frontiers in Pediatrics, 10, 1093160. https://doi.org/10.3389/fped.2022.1093160*

*Alsofayan, Y. M., Althunayyan, S. M., Khan, A. A., Hakawi, A. M., & Assiri, A. M. (2020). Clinical characteristics of COVID-19 in Saudi Arabia: A national retrospective study. Journal of Infection and Public Health, 13(7), 920–925. https://doi.org/10.1016/j.jiph.2020.05.026*

*Amado, F. S., Moura, E. C. R., Oliveira, C. M. B., Dibai-Filho, A. V., Neto, J. N., & da Cunha Leal, P. (2025). Clinical characteristics and outcomes of critically ill elderly patients aged 90 years and older. Scientific Reports, 15(1), 20486. https://doi.org/10.1038/s41598-025-05343-z*

*Budianu, M.-A., Moraru, L., Roiban, A. L., Budianu, B.-M., Kovacs, J., Mitranovici, M.-I., & Voidăzan, S. (2024). The Risk of Death among Patients with Healthcare-associated Infections and Cardiovascular Diseases Admitted to the Intensive Care Unit in Romania. Journal of Cardiovascular Emergencies, 10(2), 71–77. https://doi.org/10.2478/jce-2024-0001*

*Chae, H., Jun, K., & Lee, J.-Y. (2025). Incidence, risk factors, and outcomes of respiratory related hospitalizations in older patients with COPD, asthma, and bronchiectasis. Scientific Reports, 15(1), 22580. https://doi.org/10.1038/s41598-025-07197-x*

*Cruz-Garcinuño, M., Juárez-Vela, R., Chover-Sierra, E., Navas-Echazarreta, N., Czapla, M., Ballestar-Tarín, M. L., Martínez-Pascual, R.-M., Nanwani-Nanwani, K., Serrano-Lazaro, A., Del Val-Rey, I., Quintana-Díaz, M., & Martinez-Sabater, A. (2025). Sex differences and gender-oriented characteristics in intensive care unit admissions for patients with traumatic brain injury in Spain. Frontiers in Medicine, 12, 1622422. https://doi.org/10.3389/fmed.2025.1622422*

*Damien, C., Yuan, F., Legros, B., & Gaspard, N. (2024). Complications during and after ICU stay are associated with increased mortality after status epilepticus. Clinical Neurology and Neurosurgery, 246, 108554. https://doi.org/10.1016/j.clineuro.2024.108554*

*Ervin, J. N., Kahn, J. M., Cohen, T. R., & Weingart, L. R. (2018). Teamwork in the intensive care unit. The American Psychologist, 73(4), 468–477. https://doi.org/10.1037/amp0000247*

*Eya, J., Ejikem, M., & Ogamba, C. (2022). Admission and Mortality Patterns in Intensive Care Delivery at Enugu State University of Science and Technology Teaching Hospital: A Three-Year Retrospective Study. Cureus, 14(7), e27195. https://doi.org/10.7759/cureus.27195*

*Khamis, F., Memish, Z., Bahrani, M. A., Dowaiki, S. A., Pandak, N., Bolushi, Z. A., Salmi, I. A., & Al-Zakwani, I. (2021). Prevalence and predictors of in-hospital mortality of patients hospitalized with COVID-19 infection. Journal of Infection and Public Health, 14(6), 759–765. https://doi.org/10.1016/j.jiph.2021.03.016*

*Knapik, P., Trejnowska, E., Knapik, M., Kręt, M., Cieśla, D., Krzych, Ł. J., & Kucewicz-Czech, E. (2019). Young Adults Among Patients Admitted to Polish Intensive Care Units in the Silesian ICU Registry. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 25, 5727–5737. https://doi.org/10.12659/MSM.913852*

*Kodati, R., Muthu, V., Agarwal, R., Dhooria, S., Aggarwal, A. N., Prasad, K. T., Behera, D., & Sehgal, I. S. (2022). Long-term Survival and Quality of Life among Survivors Discharged from a Respiratory ICU in North India: A Prospective Study. Indian Journal of Critical Care Medicine: Peer-Reviewed, Official Publication of Indian Society of Critical Care Medicine, 26(10), 1078–1085. https://doi.org/10.5005/jp-journals-10071-24321*

*Koowattanatianchai, S., Kochaiyapatana, P., Eungsuwat, N., Rangsrisaeneepitak, V., Thammakumpee, K., & Kaladee, K. (2025).*

*Significance of Right Ventricular Dysfunction in Predicting Short-Term Survival Among Patients With Sepsis and Septic Shock: A Prognostic Analysis. Critical Care Research and Practice, 2025, 5511135. https://doi.org/10.1155/ccrp/5511135*

*Korsah, E. K., & Schmollgruber, S. (2023). Barriers and facilitators to end-of-life care in the adult intensive care unit: A scoping review. International Journal of Africa Nursing Sciences, 19, 100636. https://doi.org/10.1016/j.ijans.2023.100636*

*Lat, T. I., McGraw, M. K., & White, H. D. (2021). Gender Differences in Critical Illness and Critical Care Research. Clinics in Chest Medicine, 42(3), 543–555. https://doi.org/10.1016/j.ccm.2021.04.012*

*Mady, A. F., Al-Odat, M. A., Alshaya, R., Hussien, S., Aletreby, A., Hamido, H. M., & Aletreby, W. T. (2023). Mortality Rates in Early versus Late Intensive Care Unit Readmission. Saudi Journal of Medicine & Medical Sciences, 11(2), 143–149. https://doi.org/10.4103/sjmms.sjmms_634_22*

*Mobarki, A. A., Dobie, G., Saboor, M., Madkhali, A. M., Akhter, M. S., Hakamy, A., Humran, A., Hamali, Y., Jackson, D. E., & Hamali, H. A. (2021). MPR and NLR as Prognostic Markers in ICU-Admitted Patients with COVID-19 in Jazan, Saudi Arabia. Infection and Drug Resistance, 14, 4859–4864. https://doi.org/10.2147/IDR.S342259*

*Ranucci, M., Parati, G., Di Dedda, U., Bussotti, M., Agricola, E., Menicanti, L., Bombace, S., De Martino, F., Giovinazzo, S., Zambon, A., Menè, R., & La Rovere, M. T. (2022). When Outcomes Diverge: Age and Cardiovascular Risk as Determinants of Mortality and ICU Admission in COVID-19. Journal of Clinical Medicine, 11(14), 4099. https://doi.org/10.3390/jcm11144099*

*Rawas, H. (2019). Moral Distress in Critical Care Nurses: A Qualitative Study. International Journal of Studies in Nursing, 4(4), 35. https://doi.org/10.20849/ijsn.v4i4.659*

*Rocha, F. R., Gonçalves, T. N., Xavier-Ferreira, M. I., Laranjeira, F., Magalhães, G. M., Lopes, M. I., Sousa, M., Pestana, D., Fernandes, É., Chung, A., Berdeja, A., Santos, G. C., Marto, N., Messias, A., & Lima, J. (2024). Obstetric Intensive Care Admissions and Neonatal Outcomes: 15 Years of Experience from a Single Center. Medicina, 60(12), 1937. https://doi.org/10.3390/medicina60121937*

*Rudakemwa, A., Cassidy, A. L., & Twagirumugabe, T. (2021). High mortality rate of obstetric critically ill women in Rwanda and its predictability. BMC Pregnancy and Childbirth, 21(1), 401. https://doi.org/10.1186/s12884-021-03882-7*

*Shayganfar, A., Sami, R., Sadeghi, S., Dehghan, M., Khademi, N., Rikhtehgaran, R., Basiratnia, R., Ferdosi, F., & Hajiahmadi, S. (2021). Risk factors associated with intensive care unit (ICU) admission and in-hospital death among adults hospitalized with COVID-19: A two-center retrospective observational study in tertiary care hospitals. Emergency Radiology, 28(4), 691–697. https://doi.org/10.1007/s10140-021-01903-8*

*Vallet, H., Guidet, B., Boumendil, A., De Lange, D. W., Leaver, S., Szczeklik, W., Jung, C., Sviri, S., Beil, M., & Flaatten, H. (2023). The impact of age-related syndromes on ICU process and outcomes in very old patients. Annals of Intensive Care, 13(1), 68. https://doi.org/10.1186/s13613-023-01160-7*

*Kodati, R., Muthu, V., Agarwal, R., Dhooria, S., Aggarwal, A. N., Prasad, K. T., Behera, D., & Sehgal, I. S. (2022). Long-term Survival and Quality of Life among Survivors Discharged from a Respiratory ICU in North India: A Prospective Study. Indian Journal of Critical Care Medicine: Peer-Reviewed, Official Publication of Indian Society of Critical Care Medicine, 26(10), 1078–1085. https://doi.org/10.5005/jp-journals-10071-24321*

*Koowattanatianchai, S., Kochaiyapatana, P., Eungsuwat, N., Rangsrisaeneepitak, V., Thammakumpee, K., & Kaladee, K. (2025). Significance of Right Ventricular Dysfunction in Predicting Short-Term Survival Among Patients With Sepsis and Septic Shock: A Prognostic Analysis. Critical Care Research and Practice, 2025, 5511135. https://doi.org/10.1155/ccrp/5511135*

*Korsah, E. K., & Schmollgruber, S. (2023). Barriers and facilitators to end-of-life care in the adult intensive care unit: A scoping review. International Journal of Africa Nursing Sciences, 19, 100636. https://doi.org/10.1016/j.ijans.2023.100636*

*Lat, T. I., McGraw, M. K., & White, H. D. (2021). Gender Differences in Critical Illness and Critical Care Research. Clinics in Chest Medicine, 42(3), 543–555. https://doi.org/10.1016/j.ccm.2021.04.012*

*Mady, A. F., Al-Odat, M. A., Alshaya, R., Hussien, S., Aletreby, A., Hamido, H. M., & Aletreby, W. T. (2023). Mortality Rates in Early versus Late*

*Intensive Care Unit Readmission. Saudi Journal of Medicine & Medical Sciences, 11(2), 143–149. https://doi.org/10.4103/sjmms.sjmms_634_22*

*Mobarki, A. A., Dobie, G., Saboor, M., Madkhali, A. M., Akhter, M. S., Hakamy, A., Humran, A., Hamali, Y., Jackson, D. E., & Hamali, H. A. (2021). MPR and NLR as Prognostic Markers in ICU-Admitted Patients with COVID-19 in Jazan, Saudi Arabia. Infection and Drug Resistance, 14, 4859–4864. https://doi.org/10.2147/IDR.S342259*

*Ranucci, M., Parati, G., Di Dedda, U., Bussotti, M., Agricola, E., Menicanti, L., Bombace, S., De Martino, F., Giovinazzo, S., Zambon, A., Menè, R., & La Rovere, M. T. (2022). When Outcomes Diverge: Age and Cardiovascular Risk as Determinants of Mortality and ICU Admission in COVID-19. Journal of Clinical Medicine, 11(14), 4099. https://doi.org/10.3390/jcm11144099*

*Rawas, H. (2019). Moral Distress in Critical Care Nurses: A Qualitative Study. International Journal of Studies in Nursing, 4(4), 35. https://doi.org/10.20849/ijsn.v4i4.659*

*Rocha, F. R., Gonçalves, T. N., Xavier-Ferreira, M. I., Laranjeira, F., Magalhães, G. M., Lopes, M. I., Sousa, M., Pestana, D., Fernandes, É., Chung, A., Berdeja, A., Santos, G. C., Marto, N., Messias, A., & Lima, J. (2024). Obstetric Intensive Care Admissions and Neonatal Outcomes: 15 Years of Experience from a Single Center. Medicina, 60(12), 1937. https://doi.org/10.3390/medicina60121937*

*Rudakemwa, A., Cassidy, A. L., & Twagirumugabe, T. (2021). High mortality rate of obstetric critically ill women in Rwanda and its predictability. BMC Pregnancy and Childbirth, 21(1), 401. https://doi.org/10.1186/s12884-021-03882-7*

*Shayganfar, A., Sami, R., Sadeghi, S., Dehghan, M., Khademi, N., Rikhtehgaran, R., Basiratnia, R., Ferdosi, F., & Hajiahmadi, S. (2021). Risk factors associated with intensive care unit (ICU) admission and in-hospital death among adults hospitalized with COVID-19: A two-center retrospective observational study in tertiary care hospitals. Emergency Radiology, 28(4), 691–697. https://doi.org/10.1007/s10140-021-01903-8*

*Vallet, H., Guidet, B., Boumendil, A., De Lange, D. W., Leaver, S., Szczeklik, W., Jung, C., Sviri, S., Beil, M., & Flaatten, H. (2023). The impact of age-related syndromes on ICU process and outcomes in very old patients. Annals of Intensive Care, 13(1), 68. https://doi.org/10.1186/s13613-023-01160-7*