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The severity of illness of ICU patients – A Single Center Study

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ABSTRACT

Background: The Intensive Care Unit (ICU) is an essential subset of the hospital treatment providing specialized care to patients with most complex diseases, where illness is often life-threatening. Knowledge of illness severity in ICU patients is important to enhance their care and outcomes. The present study intended to investigate the demographic profile, pattern of morbidities and mortality in ICU population of Ad-din Sakina Medical College Hospital, Bangladesh. **Methods & Materials:** This was a prospective descriptive study carried out from January 2023 to December 2023 among 144 patients of the ICU. Patients' demographics (age, sex) and diagnosis, ICU stay and outcome (improved, referred to a higher center, or death) were recorded. Microsoft Excel was used to enter data and analysis was done using Statistical Package for the Social Sciences (SPSS) version 26.0. **Results:** Most ICU patients were more than 60 years of age (41.92 %) and had a slight male preference (50.95%). Common reasons for ICU admission were respiratory, neurological and cardiovascular diseases. Medical diseases were responsible for 90.78% of ICU admissions, and the total mortality was 36%. The lowest survival rate was found in patients with respiratory and cardiovascular comorbidities. Most of deaths fell within the first 3 days after ICU admission thus emphasizing the importance of early ICU management. **Conclusion:** Respiratory and cardiovascular disorders were determined to be the main cause of death in the ICU. The results highlight the significance of early diagnosis, prompt treatment and adequate ICU care, especially in low-income countries, for favorable patient outcome. More investigation is necessary to improve the management of ICU and lower mortality in the critically ill.

Keywords: *ICU, mortality rate, Morbidity rate, Single Center Study, Bangladesh.*

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INTRODUCTION

ICU (Intensive Care Unit) is a specialised ward for patients who need intensive monitoring, treatment and nursing care. It provides advanced life-support systems such as pulmonary and hemodynamic support and is intended for continuous monitoring and intensive care. These units, variously named, Intensive Therapy Units (ITU)/Intensive Treatment Units (ITU)/Critical Care Units (ITU), undertake the control of those patients whose condition is potentially reversible with a view to increasing the chances of survival [1, 2].

ICU admissions are often made up of patients with varying degrees of illness, including respiratory failure, cardiac arrest, and neurologic emergencies. In particular, in the ICU setting the severity of illness plays an important role in the treatment outcome since critically ill patients have challenging medical conditions and are in need of prompt and specialized care [3,4]. ICU outcomes are unpredictable, with mortality rate serving as a key metric for gauging performance in critical care after excluding outliers and adjusting for baseline variables, the mortality rate between 6.4% - 40%, annually fluctuates according to patient population and illness severity [5].

In many high-income countries, ICU beds have become specialized, with ICUs devoted to specific subspecialties (e.g., cardiology, neurology, and trauma). However, in most of the developing country, like Bangladesh, the model of general ICU is prevailing due to resource constraints [6]. ICU in Bangladesh has been growing following the country's first ICU that opened in 1980 with over 78% of ICUs situated in private settings [7]. Mortality in such organizations has been reported to correlate with the patient's age, comorbidity, the time to treatment, and quality of care [8].

The miserable of illness of ICU patients is an important parameter for assessing treatment of the critically ill. ICU admission is a marker of severe morbidity, and the determinants of mortality and morbidity outcomes are important for quality-of-care evaluation [9]. The objective of this study is to find out severity of ill patients admitted in ICU at a tertiary center in Bangladesh. In particular, we will explore mortality rate, morbidity pattern, patient biases, and length of stay in the ICU at the time of death. These characteristics are crucial for understanding the issues of monitoring severely ill patients with limited resources and to implement interventions for a better ICU outcome.

METHODS & MATERIALS

Study Settings and Population

This prospective descriptive study was carried out in Ad-din Sakina Medical College Hospital, Bangladesh, during January 2023 to December 2023. Patients who were admitted to an ICU in this time period. The ICU of the hospital is a modern and well-resourced facility, consisting of 10 beds accommodating critically-ill patients from diverse medical and surgical subspecialties. The ICU was launched on 14th February 2018 and is manned by a dedicated anesthetic team that offers high dependency care to patients requiring high end medical and surgical management.

Study Procedure

This study is based on prospective data of patients who were admitted to the ICU during the study period. Details of age, gender, diagnosis, length of stay in the ICU, and outcome were recorded. Specialists from different subspecialities were involved in the diagnosis, aided by appropriate laboratory work-up. The results were categorized as the discharge of patients and recovered, referred to higher hospital and died away. The information was retrieved from admission and discharge records of ICUs which was a guarantee regarding the accuracy and completeness of patient data.

Data Analysis

Microsoft Excel 2007 was used for primary analysis of data. The statistical analysis was done using the Statistical Package for the Social Sciences (SPSS), software version 26.0. Demographic and clinical characteristics were reported as descriptive statistics, and differences in frequencies were compared using the Chi-square test.

Ethical Considerations

This study received ethical approval from the Ethics Committee of Ad-din Sakina Medical College Hospital (Ad-din Sakina Medical College Hospital). Ethical considerations and confidentiality of information and data Responsible conduct of research pertaining to the ethics involved in the use of this database required that all patients' confidentiality and data be upheld. Written consent was taken from all patients before enrollment.

RESULTS

Table I Demographic data on ICU patients according to age and sex is shown in table 1. Regarding the age, most of the patients are 60 or older (41.92%) with 60 patients. The next largest group is 40 to 59 years, making up 29.74% of the studied group with 43 patients. The 20- to 39-year age group is the largest accounted for (22.95%) in the ICU, 33 patients, meanwhile the patients younger than 20 years is the smallest (5.39%), 8 patients. As for sex ratio, the sex ratio-varied slightly, with 73 male patients (50.95%) and 71 female patients (49.05%) in the ICU, indicating a nearly equal ratio of male-to-female patients in the sample. The findings demonstrate that among ICU admissions, the eldest can be seen, in particular in those aged 60 and over and that ICU population is more or less equally distributed among males and females.

Table I
Demographic Distribution of ICU Patients.

Age (years)	Frequency (n)	Percentage (%)
<20 years	8	5.39
20-39 years	33	22.95
40-59 years	43	29.74
≥60 years	60	41.92
Sex		
Male	73	50.95
Female	71	49.05

Table II outlines the mortality rates based on the primary cause of admission for ICU patients. Among the 144 ICU patients, the majority were admitted due to medical causes, with 130 patients in this category. The mortality rate for medical causes was 36.92%, with 48 patients dying as a result of medical conditions. In contrast, 14 patients were admitted for surgical causes, and the mortality rate in this group was 28.57%, with 4 deaths. Overall, the total mortality rate across all causes of admission was 36.11%, with 52 deaths out of the 144 patients.

Table II
Mortality Rates Based on Primary Cause of Admission in ICU Patients.

Primary Cause	Number of Patient	Number of Death	Mortality Rate
Medical Cause	130	48	36.92
Surgical Cause	14	4	28.57
Total	144	52	36.11

Table III presents the distribution of ICU patients based on their morbidity patterns. The largest group of patients (20.00%) was admitted due to respiratory diseases, with 29 patients. Neurological diseases were the second most common cause, accounting for 16.17% of the total ICU admissions, with 23 patients. Cardiovascular diseases were responsible for 11.13% of ICU admissions, with 16 patients. Renal diseases contributed to 10.43% of the ICU population, with 15 patients. Post-operative complications from surgical causes were observed in 9.22% of patients, totaling 13. Cancer and endocrine diseases each accounted for 6.95% and 6.78% of admissions, respectively, with 10 patients each. Hepatic diseases were responsible for 6.62% of ICU admissions (9 patients), followed by dengue fever at 5.56% (8 patients). GIT problems were noted in 4.18% of cases, with 6 patients. Organophosphorous poisoning and unknown poisoning accounted for smaller proportions, with 3 (1.74%) and 1 (0.87%) patient, respectively. Lastly, a single case of hanging was recorded, representing just 0.35% of ICU admissions.

Table III
Distribution of ICU Patients According to Morbidity Pattern.

Morbidity Pattern	Frequency (n)	Percentage (%)
Respiratory Disease	29	20.00
Neurological Disease	23	16.17
Cardiovascular Disease	16	11.13
Renal Disease	15	10.43
Post operative complication (Surgical Cause)	13	9.22
Cancer	10	6.95
Endocrine Disease	10	6.78
Hepatic Disease	9	6.62
Dengue Fever	8	5.56
GIT Problem	6	4.18
Organophosphorous (OPC) Poisoning	3	1.74
Unknown Poisoning	1	0.87
Hanging	1	0.35
Total	144	100

Table IV presents the mortality rates of ICU patients based on their disease patterns, with a total of 52 patients. Respiratory diseases accounted for the highest mortality rate at 26.90%, with a total of 14 patients in this category, including 8 males and 6 females. Neurological diseases followed with a mortality rate of 21.15%, involving 11 patients, with 6 males and 5 females. Renal diseases had a mortality rate of 17.30%, with 9 patients in total (5 males and 4 females). Cardiovascular diseases showed a mortality rate of 13.4%, with 7 patients (4 males and 3 females). Hepatic diseases contributed to a mortality rate of 11.53%, with 6 patients (4 males and 2 females). Lastly, cancer had the lowest mortality rate at 9.6%, with 5 patients (4 males and 1 female).

Table IV
Mortality of the patients according to disease pattern of ICU admission (*n*=52)

Disease Pattern	Frequency			Mortality Rate
	Male	female	Total	
Respiratory Disease	8	6	14	26.90
Neurological Disease	6	5	11	21.15
Renal Disease	5	4	9	17.30
Cardiovascular Disease	4	3	7	13.4
Hepatic Disease	4	2	6	11.53
Cancer	4	1	5	9.6
Total	31	21	52	

Table V provides the distribution of ICU patients' length of stay before death, with a total of 52 deaths recorded. The majority of deaths occurred within the first 3 days of ICU admission, with 22 patients (42.31%) passing away within 1 to 3 days. A significant portion, 11 patients (21.15%), died within the first 24 hours of their ICU stay. Additionally, 10 patients (19.23%) each passed away after staying between 4 days and 1 week, and another 10 patients (19.23%) died after staying more than 1 week in the ICU.

Table V
Length of stay in ICU before death (*n*=52)

Length of stay	Number of Deaths (n)	Percentage (%)
< 24 hours	11	21.15
1-3 days	22	42.31
4 days to 1 week	10	19.23
> 1 week	10	19.23

Table VI presents the outcomes of ICU patients, with a total of 144 admissions. The majority of patients, 86 (60%), died during their stay in the ICU, highlighting the critical nature of the conditions for which patients are admitted. A smaller proportion of patients, 6 (4%), were referred to other facilities, suggesting that their conditions required specialized care elsewhere. The remaining 52 patients (36%) showed improvement, indicating that a significant number of patients were able to recover or stabilize during their ICU treatment.

Table VI
Outcome of admitted patients in ICU (*n*=144).

Outcome	Number of Deaths (n)	Percentage (%)
Death	86	60
Referred	6	4
Improved	52	36

DISCUSSION

The illness severity and mortality in patients in the Intensive Care Unit (ICU) are determined by several patient-related and ICU-related factors. These are age, sex, disease severity, comorbidities, time to medical treatment, goodness of ICU nurses, and ICU quality. ICU admissions generally consist of critically unwell patients who are deemed 'rescueable' with organ support, including mechanical ventilation and invasive monitoring. There was a slight male preponderance in ICU admissions in the present cohort (73 males (50.95%) and 71 females (49.05%), nearly equal sex ratio). This male predominance could be due to cultural reasons in male-dominated societies, where male members of the family are given preference for health-related issues [10].

The age of the patients in this cohort study ranged from 18 to 85 years of age, implying that there is no age group that is spared from severe or life-threatening disease requiring ICU admission. Patients 60 years and older formed the majority of ICU admissions, accounting for 41.92% of the study population. This contrasts with the previous studies in which younger and middle-aged men were frequently represented in the ICU admissions [11]. Findings of this study showed that older population especially people aged 60 years and older were the most common ICU admissions, which confirms greater susceptibly of the elderly to more severe illness.

The most frequent reason for ICU admission was for medical cases compared to surgical cases, with 130 (90.78%) medical and 14 (9.22%) surgical patients. But medical patients' death rate was significantly higher 36.92% as compared to 28.57% in surgical patients. This is in line with others showing that medical patients are more severely ill and more comorbid, and have higher death rates overall [12]. Respiratory, neurology, and cardiovascular diseases were the predominant reasons for which ICU patients

were admitted, and respiratory diseases especially were highly prevalent considering the high air pollution and smoking rates. Respiratory and cardiovascular diseases were also the leading cause of mortality in our study as well as in other literature [13].

In this series, the general ICU mortality was 36%, and it is analogous to other series we obtained from underdeveloped countries. For instance, research done in large public hospital of Bangladesh has declared 57.23% mortality rate [11]. African ICU studies have reported ICU mortality rates from 34%-43% [14, 15] whereas developed countries, including France and the USA, have reported mean ICU mortality rates ranging between 8%-18% [16, 17]. The higher mortalities in low-resource countries are often attributed to patients presenting late, lack of trained staff, and lack of life-support equipment, characteristics which are echoed in many low-resource settings around the world.

The analysis also showed higher mortality rates in males and elderly patients which were similar to the other studies by Dongre et al. (2016) and Alam et al. (2017) [4, 5]. Mortality was greatest in the first 1-3 days of ICU stay, demonstrating the sensors perform best in the ICU as the first 72 hours are essential for patient outcomes [18]. A short mean duration of admission for non-survivors is indicative of the pattern that patient with a grave condition dies rather quickly and survivors are stabilized over a longer period before being referred to ward for further management.

Comparing the aforementioned clinical parameter with the mortality rate in ICU of this study, the patients with severe medical conditions, older ages and male sex have the mortality higher, fact also supported by a previous study showing a mortality rate closely associated with these characteristics. This emphasises the need for early detection of clinical predictors for timely medical therapies as well as for ameliorating ICU-level care with a goal of reduction of mortality rates, especially in resource-poor region.

CONCLUSION

This work underscores the outcome of ICU patients, which are older adults (age 60+ yrs) and often affected by respiratory and heart diseases. There was a lower mortality among males than females, being medical cases more lethal than surgical ones. More than half the deaths occurred within 72 hours of admission highlighting the importance of early diagnosis and improved ICU care, particularly in resource-poor regions. Enhanced ICU management and guidelines are essential in the reduction of mortality" especially in vulnerable populations and in the developing world.

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