Epidemiology of Critically Ill Patients in Intensive Care Units in Dhulikhel Hospital, Nepal: a retrospective observational study

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ABSTRACT

Background

Critical care involves the management of acutely ill patients at risk of organ failure. The burden of critical illness is a major public health concerns, particularly in low and middle income countries like Nepal where access to intensive care services is limited.

Objective

To identify the clinical profile of patients admitted to the Level III Intensive Care Unit at Dhulikhel Hospital.

Method

Data over a period of six months were collected from the ICU registry. Severity and mortality risks were assessed using APACHE II and eTropics scoring systems. Clinical profiles and outcomes were analyzed using SPSS version 25. An independent samples t test was used to compare continuous variables between two independent groups. A p value < 0.05 was considered statistically significant.

Result

A total of 486 patients were included in the study, of whom 57% were male . The median age was 55 years (IQR: 41-69). Most patients were admitted from the emergency room (52.7%). Patients with medical conditions had a higher ICU admission compared to surgical patients. The majority of patients (63.6%) were transferred to the ward followed by discharge to home (16.2%). Non routine discharges included treatment withdrawal in 89 (18.3%) and patient leaving against medical advice 53 patients (11%). The overall mortality rate was 11.3%.

Conclusion

This study shows that most admissions were male, with median age of 55 years and medical cases were more prevalent than surgical cases. The observed mortality rate may underestimate mortality due to high rate of treatment withdrawal discharges.

KEY WORDS

Critically ill patient, Epidemiology, Intensive care unit, Outcome

INTRODUCTION

Intensive Care Units (ICUs) provide a standard of monitoring, intervention, and organ support that cannot be readily delivered in a general ward.[1] In Nepal, ICUs are designated and equipped to administer critical life support measures like inotropes, vasopressors, and mechanical ventilation.[2] The significance of critical care services has dramatically increased since the COVID-19 Pandemic.[3]

Delivering acute care to critically ill patients remains a challenge, especially in low- and middle- income countries, where 8.6 million premature deaths occur annually due to inadequate healthcare. Enhancing the quality and accessibility of critical care in these regions is essential to reduce this burden.[4,5] Even in countries with advanced ICU systems, disparities in ICU bed availability persist.[6] In Nepal, government guidelines recommend that hospitals with ≥ 50 beds allocate 5% of beds to ICUs. However, the current provision of only 2.5 ICU beds per 100,000 population reflects a significant gap in critical care resources.[3] Despite advancements in ICUs over the past decade, data on ICU infrastructure and patient epidemiology in Nepal remain limited. A recent multicentre study conducted across 17 ICUs in Nepal demonstrates the epidemiology of critically ill patients using a standardized and well established ICU registry.[7]

Understanding the epidemiological profile of patients admitted to ICUs is essential for resource allocation, identifying gaps in care quality, improving patient outcomes, supporting surveillance of endemic or emerging diseases, and informing healthcare policies and practices.[8] The study conducted at Dhulikhel Hospital aimed to analyze admission trends and associated outcomes within the ICU.

METHODS

This study was a retrospective, observational study using registry data obtained from Nepal Intensive Care Research Foundation (NICRF). Patients admitted in the ICU of Dhulikhel Hospital from 1st May 2023 to 30th October 2023 were enrolled after obtaining ethical approval from institutional Reviews committee at Research Department of Dhulikhel Hospital, Kathmandu University Hospital (Ref: KUSMS/IRC No. 0224/23; dated November 30, 2023).

Patients aged 18 or older who were admitted to the ICU were enrolled in the study. Patients who remained admitted to the ICU without discharged by the study endpoint and with incomplete data in the registry were excluded.

The clinical and demographic data of patients including age, gender, comorbidities, primary reasons for ICU admission, use of vasopressor, antibiotics, types of admission, notifiable diseases and outcome were collected. Reasons for ICU admission were categorized according to APACHE IV (Acute Physiology and Chronic Health Evaluation) as the electronic case report uses APACHE IV diagnostic categories. APACHE II scoring was used to predict the risk of death and eTroPICS (Tropical Intensive Care Score) was used to predict risk of death.[9] Actual and standardized mortality ratios were calculated using indirect standardization methods. Additional clinical outcomes, including Severity, activity scores, ICU bed days, and organ support-free days were reported using standard methods.

The data was entered in Microsoft excel 2013 and then export to IBM SPSS version 25 for statistical analysis. Descriptive statistics were used to present the case mix, epidemiology, and outcomes. Continuous variables were expressed as mean and standard deviation or median and inter quartile range (IQR) as appropriate while categorical variables were expressed as frequencies and percentages. An independent samples t test was used to compare continuous variable between the independent groups. A p value < 0.05 was considered statistically significant.

RESULTS

A total of 502 patients were admitted to the ICU during the study period were initially screened, of whom 486 met the inclusion criteria and were enrolled in the study. The majority were male (57%, n=277), while females accounted for 43% (n=209). The median age of patients was 55 years (IQR 41-69). Most admissions were non-operative (69.8%, n=339), while 30.2% (n=147) were post-operative patients. Among the post operative admission, 79.6% (n=117) followed elective surgery and 20.4% (n=30) were due to emergency surgical procedure. More than half of patients (52%, n=256) were admitted from the emergency department. The remaining admission were from operating theatre (25.9%, n=126), different hospital wards (16%, n=78), other ICU units within hospital (4.5%, n=22) and other hospitals (0.8%, n=4) as shown in table 1.

The most common comorbidity was hypertension present in 19% (n=95). Type II diabetes was observed in 9.1% (n=44) followed by chronic pulmonary disease 6.8% (n=33), hypothyroidism 2.3% (n=11) and rheumatologic condition in 1% (n=7). Within the first 24 hours of admission, 24.3% (n=118) of patients required mechanical ventilation, of whom 70.8% (n=92) received invasive ventilation and 22.0% (n=26) were managed with non- invasive ventilation. Vasoactive therapy was administered to 67.8% (n=80) of those requiring organ support. Among patients admitted to the ICU, 3.4% (n=4) underwent renal replacement therapy within 24 hours of admission, as summarized in table 1.

During the ICU stay, 43.8% (n=213) of patients required mechanical ventilation. Of these, 73.8% (n=141) received invasive ventilation while 37.7% (n=72) received non-invasive ventilation. Renal replacement therapy was needed in 11.5% (n=22) and tracheotomy was performed in 4.7% (n=9) of patients (Table 1).

Table 1. Socio-demographic and clinical characteristics

Characteristics	Frequency (n)	Percentage (%)
Age (Years) Median IQR	55	41-69
Gender		
Male	277	57
Female	209	43
Types of admissions		
Post - operative	147	30.2
Elective Surgery	117	79.6
Emergency	30	20.4
Non- operative	339	69.8
Source of admission		
ED	256	52.7
OT	126	35.9
Ward	78	16.0
Other ICU units within hospital	22	4.5
Other Hospitals	4	0.8
Top 5 comorbidity during admission		
Hypertension	95	19.5
Type 2 Diabetic Mellitus	44	9.1
Chronic obstructive Pulmonary Disease	33	6.8
Hypothyroidism	11	2.3
Rheumatological conditions	7	1.4
Organ Support within first 24 hrs of admission		
Mechanical Ventilation	118	24.3
Invasive Mechanical Ventilation	92	78.0
Non-Invasive Mechanical Ventilation	26	22.0
Vaso active Therapy	80	67.8
Renal Replacement Therapy	4	3.4
Tracheotomy	2	1.7
Organ Support during ICU stay		
Mechanical Ventilation	213	43.8
Invasive Mechanical Ventilation	141	73.8
Non-Invasive Mechanical Ventilation	72	37.7
Renal Replacement Therapy	22	11.5
Tracheostomy	9	4.7

The primary reason for ICU admission was acute exacerbation of COPD accounting 9.5% (n=46) patients followed by cerebrovascular accident and poisoning, with 8.2% (n=39) and 7.6% (n=37) respectively as shown in figure 1. Typhus was the most common notifiable disease identified in 2.3% (n=11) and acute encephalitis in 1.6% (n=8) (Table 2).

The mean APACHE II score was significantly lower in survivor (11.0 ± 7.44) compared to non survivor (17.65 ± 7.64, $p < 0.001$). Similarly the mean predicted mortality rate based on the APACHE II score was significantly lower in survivors (0.127± 0.14) than non survivor (0.257 ± 0.16, $p < 0.001$) (Table 4). Severity of illness analysis indicated

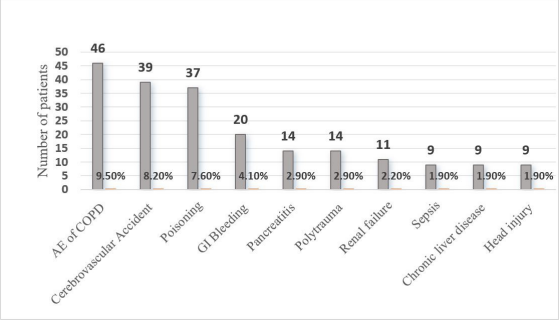

Figure 1. Primary reasons for ICU admission

Table 2. Notifiable diseases from all admission

Notifiable disease	Frequency (n)	Percentage (%)
Typhus	11	2.3
Acute encephalitis	8	1.6
Acute infectious hepatitis	1	0.2
Enteric fever (typhoid or paratyphoid fever)	1	0.2
Acute meningitis	1	0.2

Table 3. Outcome of ICU admitted patients.

Outcome	Frequency (n)	Percentage (%)
Unplanned readmission within 48 hrs of ICU discharge	15	3.5
Elective Discharge from ICU		
Discharged to ward	274	63.6
Discharged home	70	16.2
Discharged to HDU	69	16
Discharged to other ICU	12	2.8
Discharged to other hospital	4	0.9
Non- Routine Discharge		
Treatment withdrawal	89	18.3
Left against medical device	53	11
Discharge upon patient request	10	2.1
ICU Mortality	55	11.3
Use of antibiotics during ICU stay	398	81.9

that the predicted mortality rate based on the APACHE II score was 14.4%. However, the actual observed mortality rate was 11.3%, resulting in an APACHE II Standardized Mortality Ratio (SMR) of 0.785. The predicted mortality rate according to eTropics was 10.2% and the eTropics standardized mortality rate is 1.107. The mean length of ICU stay was 3.36 ± 3.97 days. Among the surviving patients, 64% (274) were discharged to a ward within the hospital, and 16.2% (n=70) were discharged home, 16% (n=69) to high dependency units, 2.8% (n=12) to other ICU and 0.9% (n=4) to other hospitals. Unplanned readmission within 48 hours of ICU discharge accounted for 3.5% (n=15). The treatment withdrawal was reported 18.3% (n=89), while 11% (n=53) left against medical advice (LAMA) and 2.1% (n=10) were discharged upon request (Table 3).

Table 4. Severity of illness

Severity of illness	Survivor	Non-survivor	p value
Mean APACHE II SCORE ± SD	11.0 ± 7.44	17.65 ± 7.64	< 0.001
Mean predicted mortality from APACHE II ± SD	0.127 ± 0.135	0.257 ± 0.162	< 0.001

DISCUSSIONS

In this study of 486 patients, male comprised 57% (n=277) of admissions, while female 43% (n=209) which is similar to the study by Pathak et al. who observed 54.5% male admissions.[10] Similarly, Garland et al. also documented similar male predominance in ICU populations.[6] The higher rate of male admissions may be influenced by gender specific occupational exposures and health behaviour, warranting further investigation. The median age of the patients was 57.5 years, aligning with the typical ICU demographic reported by Vukoja et al.[11]

Our study findings indicate that the majority of patients 52.7% (n=256) were admitted from the emergency department, consistent with the finding of Khanduri et al.[12] However Koirala et al. reported the higher proportion of admission from the emergency operation theatre.[13] This discrepancy reflects institutional variations in patients flow.

Acute exacerbation of chronic obstructive pulmonary disease (COPD) leading to type II respiratory Failure was leading cause of ICU admission, mirroring the finding of Mandal et al.[14] Globally, respiratory disease as COPD remain as major cause critical illness.[15] The high burden of COPD emphasizes the urgent need for targeted public health strategies and improved chronic disease management in Nepal.

Hypertension and Diabetes Mellitus were the most prevalent comorbidities among the ICU patients in our study, reflecting growing burden of non-communicable disease in critically ill patients. A large multicentre study in Nepal reported hypertension in 30% and diabetes in 19% of ICU admission, highlighting the increasing impact of non communicable disease in critically ill patients.[7,16,17] This finding aligns with regional data from South Asia, where non communicable disease increasingly contribute to ICU morbidity and mortality.[18] The high prevalence of these comorbidities focus the need of integrated chronic disease management to potentially reduce ICU admission and improve outcomes.

Around 81.9% (n=398) of patients received antibiotics during their ICU stay, including both empirical antibiotic prescription and culture based antibiotics. A similar trend was observed in a study by Aryal et al. indicating a extensive administration of antibiotics in critical care environment.[19] A recent point prevalence survey found an antibiotics prescription rate as high as 92.85% in different ICU of Nepal, with the majority of prescriptions being empirical rather than guided by culture result.[20] Overuse of broad spectrum antibiotics has been associated with escalating antimicrobial resistance, which poses a serious threat to patient outcomes.[21] Therefore anti-microbial stewardship programmes are essential to optimize antibiotics use, reduce irrational prescriptions, control reisistant pathogens and thereby improve clinical outcome, while preserving antibiotic efficacy for future.[22]

Of the patients admitted, 63.6% (274) were discharged to the ward, comparable to 61% discharge rate as mentioned by Khaduri et al.[12] The mean length of ICU stay was 3.36 ± 3.97 days, similar to finding by Oh et al.[23]

In our study, the observed mortality rate was 11.3% (n=55). The predicted mortality rate based on APACHE II was 14.39%, but the actual mortality rate of 11.3% indicate the high standard of care provided in our ICU. This rate is higher than the 9.4% and 7.4% mortality reported by Gupta et al. and Bajracharya et al. respectively, yet lower than the 31.6% mortality rate reported in study by Pathak et al.[10,24,25] Mortality rates in Nepalese ICUs vary widely from 9.4% to 30%, influenced by factors such as patient severity, availability of ICU resources, staffing models and presence of intensivists.[7,26,27] The relatively low mortality in our ICU may reflect better resources availability, differences in case mix and clinical protocol.

The results of this study show that 60% (n=308) patients were discharged to the ward, which is comparable to the 61% discharge rate reported in a study by Khaduri et al. suggesting effective ICU management and discharge planning.[12] Meanwhile,11% (53) of patients were taken home by their families against medical advice, 2.1% (10) were discharged on request, and treatment was withdrawn 18.3% (89) of cases underscoring the complexity of patient outcome in critical care.

The prevalence of leaving against medical advice (LAMA) observed in our ICU was 11%, posing a significant challenge to accurate outcomes reporting. This finding is consistent with the 13% LAMA rate documented by Koirala et al.[13] The primary reasons for LAMA were identified as financial constraints and existing co-morbid conditions. Patients who leave against medical advice are typically at higher risk for adverse health events, which are not recorded in our data, potentially leading to underestimation of mortality and morbidity. The prevalence of leaving against medical advice in our ICU reflects not only patient and family preferences but also systemic and socioeconomic factors. Addressing these challenges requires multidisciplinary strategies, including enhanced patient family counseling, provision of financial support through organizational programme reinforced by government policies and strengthening relevant protocols. Implementing such strategies will contribute to better patient outcome and more accurate ICU quality assessment.

Our study has several limitations. Firstly, as a single- centre retrospective and observational study, it is subject to potential biases in data recording and patient selection. The epidemiology of the Dhulikhel hospital population may differ significantly from that of other regions in Nepal. A further limitation is the high prevalence of patients leaving against medical advice, which may lead to underestimation of mortality and morbidity outcomes.

CONCLUSION

The lower mortality rate observed may be influenced by the high rate of treatment withdrawal, raising ethical and procedural consideration. It suggests a need for comprehensive guidelines and training regarding end-of-life decisions in the ICU, ensuring that such decisions are made consistently and ethically. Developing standardized protocols for end-of-life care and improving education for patients and families about treatment withdrawal could enhance decision making in critical situations.

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