ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

A comparison of clinical profile and outcomes among different age groups of critically ill elderly patients in a tertiary level hospital in Nepal: A retrospective study

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Submission: 27-12-2022 Revision: 28-02-2023 Publication: 01-04-2023

ABSTRACT

Background: Ageing population has increased the rate of hospitalizations and demand for critical care services. The data on the clinical profile and outcomes of different groups of elderly admitted to the intensive care units (ICU) are however sparse. **Aims and Objectives:** The aim of this study was to evaluate and compare the clinical profile and outcomes among different age groups of critically ill elderly patients admitted to the ICU of a tertiary level hospital. **Materials and Methods:** This retrospective and observational study reviewed all the elderly patients aged 60 years and above, admitted to the ICU of a tertiary hospital over a period of 1 year. The patients were divided into three groups, 60–69 years, 70–79 years, and 80 years and above. Non-probability sampling was done. Kruskal–Wallis H test was performed to compare the median values of the variables between the three groups. **Results:** Among 173 patients analyzed, the three groups did not differ in clinical characteristics, requirement of renal replacement therapy and cardiovascular support, length of stay (LOS) in ICU, LOS in mechanical ventilator, and patients who improved and transferred out of ICU. Acute physiology and chronic health evaluation II (APACHE) II score was significantly higher in 70–79 years compared to the other two groups (P = 0.01) as was the in-hospital mortality (P = 0.03). **Conclusion:** APACHE II score rather than age is a good predictor of adverse outcomes in ICU. Age should not be used to preclude the utilization of resources in ICU.

Key words: Acute physiology and chronic health evaluation II score; Clinical characteristics; Elderly; Intensive care unit; Outcomes

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v14i4.50716

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Ageing population is a global phenomenon, to which Nepal is no exception. Preliminary census report of 2021 shows total fertility rate of Nepal to be below 2, infant mortality rate of 23.4, crude death rate of 6.3 and life expectancy increased to 71 years.[1] Thus, a decline in the birth rate and mortality rate and an increase in the life expectancy has resulted in an increase in elderly population, defined as adults 60 years of age and above as per the Nepali Senior Citizens Act.[2] Elderly population has increased from 1.5 million in 2001 to 2.2 million in 2011 and is projected to reach 4.3 million in 2031, if the current annual growth rate of elderly population of 3.5% persists.[3]

As chronic illness and functional impairment are more prevalent in the elderly, the rate of hospitalizations for acute illness and demand for critical care services is increasing and is projected to rise dramatically in the next decade.[4] However, the data on the clinical profile and outcomes of elderly admitted to the intensive care units (ICU) are sparse. Similarly, virtually, no data exist comparing the different

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groups of elderly admitted to our ICUs, which may impact the decisions on allocation of health resources in terms of triage, decision-making, expansion of ICU capacity, and advanced care planning.

Thus, this study is done to find out and compare the clinical profile and outcomes of different age groups of elderly patients admitted to our ICU.

Aims and objectives

The aim of the study was to evaluate and compare the clinical profile and outcomes among different age groups of critically ill elderly patients 60 years of age and above admitted to ICU of a tertiary level hospital.

MATERIALS AND METHODS

Study design and participants

This retrospective and observational study reviewed all the elderly patients aged 60 years and above, admitted to the ICU of Tribhuvan University Teaching Hospital, Kathmandu, Nepal, over a period of 1 year, from April 2020 to April 2021 (Baisakh 2077 to Chaitra 2077). Non-probability sampling was done.

The ICU admission and discharge book, data maintained within the ICU registry at Nepal intensive care research foundation, and patient charts were reviewed and required data were extracted from it.

The patients were divided into three broad groups, the young old, which included those between 60 and 69 years of age, the old, which included those between 70 and 79 years of age and the very old, which included those above 80 years of age and above as was done by Thangam and Deepa[5] in their study. The patients clinical and demographic data collected included age, gender, diagnosis at the time of admission and comorbidities. The outcomes looked were LOS in mechanical ventilator (LOS MV), LOS in ICU (LOS ICU), need for renal replacement therapy (RRT), need for cardiovascular (CV) support, death, and transfer out of ICU or leave against medical advice (LAMA).

Statistical analysis

The data of the present study were recorded using Microsoft Excel and analyzed using the IBM SPSS® version 17.0 for windows. Frequency analysis was done for the nominal and ordinal scale variables and descriptive analysis was done for scale variables. On normality testing (by Shapiro–Wilk test), LOS in ICU and LOS in MV and acute physiology and chronic health evaluation II (APACHE II) score were found to have non-parametric distribution. Therefore, Kruskal–Wallis H test was performed to compare the median values of these variables. The difference in proportions of categorical variables was calculated using Fisher's exact test.

Ethics approval

Ethical approval was obtained from the Institutional Review Committee of the Institute of Medicine, Tribhuvan University Teaching Hospital [Ref no: 548(6-11)E2 dated July 6, 2022].

RESULTS

A total of 633 patients were admitted in the ICU during the study period, of which 186 (29.38%) patients were elderly (age ≥60 years). After excluding the patients with incomplete and missing data, 173 patients were included in the study. The median (IQR) age of the patients (n=173) was 68 years (62–73 years). The age histogram of the patients is shown in Figure 1.

Just over half (96, 55.5%) of the patients were males. There were almost equal proportion of medical and surgical patients (49.1% vs. 50.9%). The most common source of admission of the patients was from the emergency room (82, 47.4%), followed by the operation theater (44, 25.4%).

At least one comorbidity was present in 117 (67.6%) patients, out of which 47 (27.2%) patients had multiple comorbidities (two or more comorbidities). Hypertension (HTN) was the most frequent comorbidity (82, 47.4%), followed by type two diabetes mellitus (35, 20.2%). Based on the pre-defined criteria of age, more than half (96, 55.5%) of the patients were between 60 and 69 years. Only 18 (10.4%) were of ≥80 years.

Among the admitted patient, 54.9% of patients improved and were transferred out of ICU, 35.2% of patients had

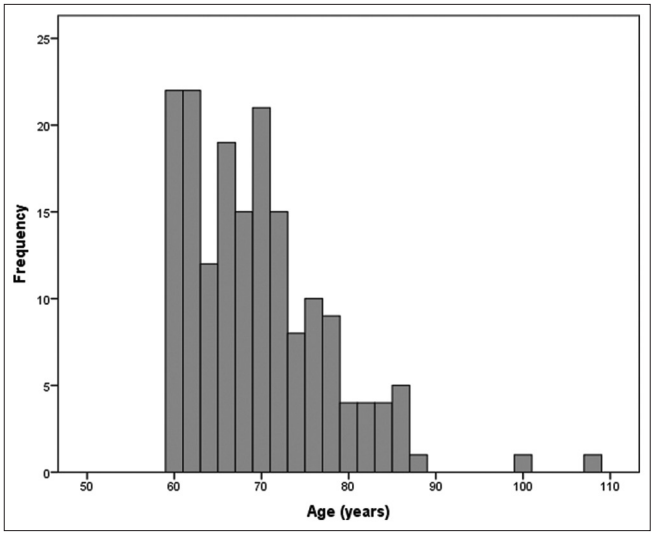

Figure 1: Age histogram of critically ill elderly patients (n=173)

ICU mortality, 9.8% of patients left the hospital against medical advice (LAMA), and 8.6% had withdrawal of active life support (Table 1).

There were no significant differences in the distribution of gender, comorbidities, patient admission category, and patients intubated at admission between the three age categories. Similarly, the three groups did not significantly differ in terms of outcomes such as RRT and CV support requirement, LOS ICU, LOS MV, and patients who improved and were transferred out of ICU. APACHE II score was significantly higher in 70–79 years compared to the other two groups (P=0.01). Furthermore, the in-hospital mortality was also significantly higher in the same group (P=0.03). Withdrawal of life support and LAMA rates was similar in all age categories (Table 2).

DISCUSSION

There has been an increase in the number of elderly patients being admitted to ICUs across the globe.[4,6] Our data showed that 29.38% of the total admitted patients were 60 years and above. However, this was lower than the admission rate of 48% of elderly patients 65 years and above in a tertiary referral teaching hospital of Seoul, South Korea,[6] but better than 12.6% of admissions seen in a tertiary hospital in a Sub-Saharan African country.[7] This shows that as the per capita income and elderly population rises, the need for critical care services is also expected to increase in the coming years in Nepal.

Table 1: Sociodemographic and clinical characteristics of the study population (n=173)

Characteristics	Summary statistic
Age (years), median (IQR)	68 (62–73)
Age category	
60–69 years	96 (55.5)
70–79 years	59 (34.1)
≥80 years	18 (10.4)
Gender, n (%)	
Male	96 (55.5)
Female	77 (44.5)
Comorbidity present, n (%)	117 (67.6)
Comorbidity, n (%)	
Hypertension	82 (47.4)
T2DM	35 (20.2)
COPD	18 (10.4)
CAD	15 (8.7)
CKD	6 (3.5)
Multiple comorbidities present, n (%)	47 (27.2)
Patient admission category, n (%)	
Medical	85 (49.1)
Surgical	88 (50.9)
Admission source, n (%)	
Emergency room (ER)	82 (47.4)
Operation theater (OT)	44 (25.4)
Inpatient ward	34 (19.7)
COVID ICU	7 (4.0)
SICU	4 (2.3)
Other ICUs	2 (1.2)
Outcomes, n (%)	
Improved and transferred out	95 (54.9)
ICU Mortality	61 (35.2)
LAMA	17 (9.8)
Withdrawal of life support	15 (8.6)

T2DM: Type 2 diabetes mellitus, COPD: Chronic obstructive pulmonary disease, CAD: Coronary artery disease, CKD: Chronic kidney disease, ICU: Intensive care unit, SICU: Surgical ICU

Consistent with the census report of 2021, which found the average life expectancy of 71 years,[1] most of the ICU patients belonged to 60–69 years age followed by 70–79 years and with the least number in ≥80 years. The predominance of male gender (55.5%) follows the similar trend observed by Acharya et al.,[8] and Paudel et al.,[9] in their study of patients admitted in ICUs in Nepal. This shows the pattern of males seeking more health-care services than females in Nepal.

Similar to the observations of Oh et al.,[6] who found comorbidities in 72.9% of patients, and increased prevalence of comorbidities with age, 67.6% of our patients had comorbidities, with patients ≥80 years having the highest number of comorbidities. Our elderly patients had higher prevalence of HTN followed by T2DM and COPD which was similar to the study by Oh et al.,[6] in South Korea and by Lankoande et al.,[10] in Burkina Faso.

Most of our patients were received intubated at ICU from ER or OT with slight surgical preponderance. This may be due to the tendency of extubating the post-operative elderly patients in the ICU. On evaluating the mortality rate, the mortality rate among elderly in our ICU was 35.2% which was lower than in the study of elderly done by Upparakadiyala et al.,[11] in Tirupati, India, but higher than Thangam and Deepa[5] in Chennai and Oh et al.,[6] in South Korea. This shows that the care of our elderly is comparable to other developing nations. However, timely referral and early aggressive intervention may help to reduce the mortality rate further.

The extent to which different groups of elderly patients differ from one another has been a subject of significant interest. On comparison of the three groups in our study, we found no significant differences in the distribution of gender, comorbidity, and patient admission category. Although comorbidities increased with age, as found in different studies,[6,12] it was not statistically significant, which shows that most of our elderly had acquired the chronic conditions before 60 years of age. Thus, any national surveillance for detecting comorbid conditions should focus on younger population before 60 years for early detection and better symptom control.

Table 2: Comparison of clinical characteristics and outcomes in different age categories of the study population (n=173)

Characteristics	Age category			P-value
	60–69 years (n=96)	70–79 years (n=59)	≥80 years (n=18)	
Male gender, n (%)	50 (52.1)	35 (59.3)	11 (61.1)	0.64
Comorbidity present, n (%)	58 (60.4)	45 (76.3)	14 (77.8)	0.08
Multiple comorbidities present, n (%)	21 (21.9)	22 (37.3)	4 (22.2)	0.11
Patient admission category, n (%)				
Medical	44 (45.8)	31 (52.5)	10 (55.6)	0.63
Surgical	52 (54.2)	28 (47.5)	8 (44.4)	
Intubated at admission, n (%)	52 (54.2)	31 (52.5)	6 (33.3)	0.42
RRT requirement, n (%)	14 (14.6)	5 (8.5)	1 (5.6)	0.43
CV support requirement, n (%)	59 (61.5)	35 (59.3)	6 (33.3)	0.09
APACHE II score, median (IQR)	14 (9–21)	18 (13–25)	16 (13–21.25)	0.01*
LOS ICU (days), median (IQR)	3.5 (2–6)	3 (1–8)	2 (1–3)	0.10
LOS MV (days), median (IQR)	3 (1–5)	4 (1–7.75)	2 (1–5)	0.44
LAMA rate, n (%)	10 (10.4)	6 (10.2)	1 (5.6)	0.32
Improved and transferred out, n (%)	59 (61.5)	25 (42.4)	11 (61.1)	0.14
Mortality rate, n (%)				
ICU	27 (28.1)	28 (47.5)	6 (33.3)	0.05
In-hospital	31 (32.3)	32 (54.2)	7 (38.9)	0.03*
Post-ICU discharge mortality	4 (4.2)	4 (6.8)	1 (5.5)	0.56
Withdrawal of life support, n (%)	6 (6.2)	7 (11.9)	2 (11.1)	0.42

RRT: Renal replacement therapy, CV: Cardiovascular, APACHE II: Acute physiology and chronic health evaluation II, LOS ICU: Length of stay in intensive care unit, LOS MV: Length of stay in mechanical ventilation, LAMA: Leave against medical advice

In their review, Guidet et al.,[12] found higher rates of treatment limitation in aged patients compared with their younger counterparts. We also noticed a trend toward decreased use of RRT, MV, and CV support as the age increased. This may be due to the reluctance of family members as well as treating physicians to subject the elderly to intensive treatment modality due to their age.

The APACHE II score of 70–79 years was significantly higher than patients in other groups. This suggests that there were sicker patients in that age group which correlated with the higher in hospital mortality seen in that age group. This finding was similar to the findings of other studies which asserts APACHE II score and not the age is a predictor of mortality.[13,14] The higher post-ICU discharge mortality seen in this age group also may be due to higher APACHE II score, though statistical significance was not reached when different groups of elderly were compared, which may be due to small number of patients for comparison.

The ICU LOS and LOS MV were also similar in all three groups in our study. Lee et al.,[15] also found similar ICU LOS on comparison of three different elderly groups in their study. Interestingly, though Ma et al.,[16] found increased ICU LOS on elderly above 80 years of age, they did not find statistically significant difference in the hospital LOS and duration of mechanical ventilation among the two groups of elderly in their study. Bruno et al.,[17] found shorter LOS in ICU while Oh et al.,[6] found increased LOS in ICU with age. The reason for shorter length of ICU stay in the former studies may be due to lower illness severity and selection bias in selecting elderly patients in relatively good health to ICU. The patients in our ICU on the other hand were sicker with less selection bias as evidenced by the higher APACHE II scores. Our result also shows that ICU LOS and LOS of mechanical ventilation are independent of age.

Perhaps, the most worrisome finding in our study was the high prevalence of LAMA of 9.8%, which may have skewed the actual mortality and morbidity data. This was very high as compared 3.5% in the study by Thangam and Deepa[5] in India and 2.5% in the study by Lankoande et al.,[10] in Sub-Saharan Africa. Acharya et al.,[8] had pointed out inability to afford medications and high financial burden on the family members as the prime reasons for high prevalence of LAMA in Nepal.

The prevalence of withdrawal of active life support in our study was 8.6%, which was lower than that found by Ma et al.,[16] in their Chinese multi-centric retrospective study and by Guidet et al.,[18] in a prospective study in 21 European countries. Bajracharya et al.,[19] had concluded either poor prognosis or financial constraints or both as the reason for withdrawal of active life support in Nepal. An important aspect/way forward may be to conduct a well-designed cost-effectiveness analysis in this group of critically ill patients. This can be the way to convince authorities (both local and national) to focus care of this group of critically ill patients.

Limitations of the study

Our study has several limitations. First, our study was a retrospective and observational study performed in a

single center, so the results may not be generalizable to other health-care systems. Second, we have no information about pre-ICU triage decisions and frailty of the admitted patients which might have affected the utilization of ICU resources and outcomes of the study. Third, we did not perform quality-of-life assessment post-ICU admission as being discharged alive from the ICU may not necessarily be the main priority of the admitted patients or their families. We also did not access the costs related to ICU and hospital stay as several previous studies had pointed it to be the main reasons for high LAMA and withdrawal of active life support in our ICUs.

CONCLUSION

The population of elderly admitted to the ICU is growing and will continue to do in the future. Our result has shown that age is not a predictor of adverse outcomes in ICU such as mortality, LOS in ICU, and LOS in MV and age should not be used to preclude the utilization of resources in ICU. Finally, to better predict and improve the clinical outcomes for elderly requiring ICUs and to better prepare for the anticipated demand on our ICUs, additional prospective investigations are needed.

ACKNOWLEDGMENT

We would like to acknowledge all the medical officers and nursing staff in IOM, TUTH ICU, who during their regular clinical duties, contributed significantly in data recording process.

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SB- Concept and design of the study, literature review, data acquisition, data analysis, data interpretation, first draft of manuscript writing, manuscript editing, and manuscript finalization; **SPA-** Design of the study, data interpretation, manuscript writing, manuscript editing, and manuscript finalization; **GSS-** Design of the study, data interpretation, manuscript writing, manuscript editing, and manuscript finalization; **PSS-** Design of the study, data interpretation, manuscript writing, manuscript editing, and manuscript finalization; **HRP-** Design of the study, data interpretation, manuscript writing, manuscript editing, and manuscript finalization.

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Source of Support: Nil, **Conflicts of Interest:** None declared.