Original Article

DOI: 10.7860/JCDR/2025/80353.21407

Association of Nutritional Status with Outcome among Elderly Patients Admitted with Respiratory Diseases in a Critical Care Unit: A Cross-sectional Study

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ABSTRACT

Introduction: Elderly population (>60 years) is fast growing segment of the population globally, leading to healthcare challenges for all the countries. Admissions to Intensive Care Unit (ICU) due to exacerbation of respiratory diseases together with co-morbidities and under nutrition result in prolong hospital stay and are usually associated with increased mortality.

Aim: To assess clinicodemographic profile, disease pattern, and clinical outcome in elderly patients with respiratory diseases admitted in the ICU and to associate these parameters with their nutritional status.

Materials and Methods: The present cross-sectional study was conducted at Shri BM Patil Medical College, Hospital and Research Center, a Tertiary Care Hospital's ICU at Vijayapura, Karnataka, India, between September 2022 to August 2023. Total 100 elderly patients of either gender with respiratory emergencies admitted in ICU during the study period of one year were included in the study after obtaining the informed consent. Mini Nutritional Assessment short form (MNA-SF®) was used to assess nutritional status of the admitted patients and graded according to its scale. The Chi-square test was applied to test the association between the selected risk factors and mortality.

Results: The mean age of 100 elderly patients admitted in ICU with respiratory diseases was found to be 69.11±7.82 years. There were 53% males and 47% females. Majority (74%) of patients fell in the age group of 60-74 years (young-old), 65% were on mixed diet with 52% elderly patients reported a normal appetite. Among the study population, 17% of the patients were under nourished and 40% were at the risk of under nutrition. Based upon MNA-SF® score, 71% of patients in malnourished group, 35% of patients at risk of malnutrition and 14% with normal nutritional status required mechanical ventilation (p-0.0018). Considering patient's outcome, 35% of patients died in malnourished group whereas mortality was 2% in well-nourished group (p<0.0001).

Conclusion: Under nourished elderly patients face heightened risks of mortality and morbidity, because malnutrition can exacerbate existing conditions like chronic lung diseases, lung cancers, sepsis, trauma, and cardio-respiratory dysfunction. Assessing malnutrition through systematic nutritional screening is crucial as it allows healthcare providers to identify patients at risk.

Keywords: Anthropometry, Critical care, Malnutrition, Older people, Pulmonary diseases

INTRODUCTION

On one hand, population ageing is a cause for celebrations, representing a triumph of medical, social and economic advancements over disease and death, while on the other hand, booming elderly population presents tremendous challenges for the functioning of the most institutions of the society including the practice of medicine [1]. Hospital associated malnutrition and its importance were first identified by Charles Butterworth in 1974, underlining the importance of malnutrition which is usually ignored, underdiagnosed, overlooked, and as a result is under-treated in day-to-day medical practice [2]. Adequate nutrition is a fundamental aspect of patient care, and addressing the nutritional needs of elderly patient in ICU is essential from an ethical stand point [3].

The respiratory system undergoes various anatomical, physiological and immunological changes with age. Reduced lung elasticity, weakened immune response, altered function of respiratory muscles, impaired gas exchange, inflammaging, co-morbidities, occupational hazards, cigarette smoking, and life time exposure to environmental and occupational pollutants contribute to chronic respiratory diseases in older adults [4]. Chronic Obstructive Pulmonary Disease (COPD) is the most prevalent respiratory disease followed by Bronchial Asthma (BA) and Pulmonary Tuberculosis (PTB) in elderly age group requiring urgent care [5].

Older hospitalised patients are more medically complex than younger ones with large number of co-morbidities and higher risk of poly-pharmacy [6]. The hospitals care of elderly from admission to discharge includes not only an approach towards the management of the admission problem but also, an approach that recognises common complications and attends to the special needs of elderly population [7].

Earlier research conducted by American Society for Parenteral and Enteral Nutrition (ASPEN) found that malnutrition was associated with longer ICU stay and increased in-hospital mortality. A study by ASPEN focused on the association of malnutrition in elderly patients with respiratory diseases admitted in ICU and found that their association existed [8]. Hence, research in this area can contribute to the development of evidence-based guidelines and policies aimed at ensuring equitable access to nutrition support for all patients, regardless of age or health status. Overall, research in this domain is vital for optimising clinical outcomes, enhancing quality of care, and promoting the well-being of this vulnerable yet precious part of our population and society.

With this background present study was conducted to assess clinicodemographic profile, disease pattern, and clinical outcome in elderly patients with respiratory diseases admitted in the ICU and to correlate these parameters with their nutritional status.

MATERIALS AND METHODS

The present cross-sectional study was conducted at Shri BM Patil Medical College, Hospital and Research Center, a Tertiary Care Hospital's ICU at Vijayapura, Karnataka, India, over a period of one year from September 2022 to August 2023. Ethical clearance was obtained from the Institutional Ethics Committee (IEC) before the commencement of the study (IEC approval No. BLDE (DU)/IEC/690/2022-23 dated 30.08.2022).

Inclusion criteria: All admitted ICU patients in elderly age group (60+) with various respiratory diseases were included in the study.

Exclusion criteria: Patients or their attendants who refused to give informed consent were excluded from this study.

Same size selection: There were no re-admissions during the study period. The sample size of 100 subjects was taken by purposive sampling for this particular study.

Study Procedure

Data collection: The demographic details like age, sex, occupation and health related data like symptoms, co-morbidity were recorded in the study proforma. MNA-SF® is an ideal tool for the evaluation of older adults with high specificity of 100%, sensitivity of 98%, diagnostic accuracy of 99% for predicting under nutrition with high validity [9]. It allows evaluators to replace Body Mass Index (BMI) value with calf circumference, considering the fact that it is usual for elderly to have age related spine changes with shortening of height, wherein BMI will not be the true representation of nutritional status.

As MNA-SF® can be used in nutritional research without prior approval from Nestlé, the original developer of the tool, it was used for the evaluation of nutritional status in the present study. A low MNA-SF® score (0-7) represents malnutrition; a high score (12-14) represents normal nutrition status and an intermediate score (8-11) represents risk of malnutrition [9].

STATISTICAL ANALYSIS

The data was finally entered into the Microsoft Excel® sheets and was analysed using Statistical Package for Social Sciences (SPSS) trial version 28.0, IBM Corporation, Armonk, NY, USA. Categorical characters were described as frequency and percentages; continuous variables were described as mean and standard deviation. The Chi-square test was applied to test the association between the selected risk factors and mortality. The p-value of less than 0.05 was considered statistically significant.

RESULTS

The mean age of 100 elderly patients admitted to ICU with various respiratory diseases was found to be 69.11±7.82 years. There were 53% males and 47% females. Majority (74%) of patients fall in the age group of 60-74 years (young-old) and 65% were on mixed diet with 52% elderly patients reported a normal (not reduced) appetite. In the present study, 17% of the elderly subjects had MNA-SF® score between 0 to 7, which represent-malnourished status, 40% had a score in the range of 8 to 11, representing at risk of malnourishment status and 43% of the elderly subjects of this study had score between 12 to 14, representing normal nutritional status [Table/Fig-1].

The study population of the present study showed diverse diagnosis of various respiratory pathologies. Patients with lower respiratory tract infection were found to be largely malnourished and also were at risk of malnutrition; maximum percent of patient with the diagnosis of acute exacerbation of COPD were normally nourished (p<0.0001) [Table/Fig-2].

Patients with malnutrition were more likely to have prolonged hospital stays, with 12% staying over 20 days compared to only 2% of well-nourished patients. A shorter stay (<10 days) was seen in 2% of malnourished patients, while 28% of both at-risk and well-nourished patients had shorter stays. The association between nutritional status and length of hospital stay was statistically significant (p<0.0001) indicating nutritional status has a strong impact on length of hospital admission [Table/Fig-3].

Mechanical ventilation was needed in 12 of malnourished and 14 of at-risk patients, compared to 6 of well-nourished patients. Oxygen therapy (via face mask or NIV) was more commonly required in at-risk and well-nourished groups. The need for respiratory support showed a significant link to nutritional status (p=0.0018) [Table/Fig-4].

The ICU mortality was highest among malnourished patients (n=6) compared to 1 in the well-nourished group. Discharge with follow-up occurred in only 4% of malnourished patients, versus 36 patients among well-nourished. There was a significant association (p<0.0001) between better nutritional status and improved patient outcomes [Table/Fig-5].

Parameters	Value
Gender wise distribution	
Male	53%
Females	47%
Age wise distribution	
60-74	74%
75-84	18%
85-92	08%
Mean±SD of age in years	
Males	69.17±8.48
Females	69.04±7.09
Mean	69.11±7.82
Diet	
Vegetarian	35%
Mixed	65%
Appetite	
Normal	52%
Reduced	48%
Mid-arm circumference (MAC) (cm)	
>22.5 cm	81%
Mini nutritional assessment- short form (MNA-SF®)	
I- Malnourished (0-7)	17%
II- At risk of malnutrition (8-11)	40%
III- Normal nutrition status (12-14)	43%
Duration of hospital stay (Days)	
Below 10 days	58%
10-29 days	24%
Above 20 days	18%
Need for oxygen or mechanical ventilation	
Mechanical ventilation	32%
Non-invasive ventilation (NIV)	28%
Oxygen by mask	26%
No oxygen requirement	14%
Out-come of patients	
Discharge against medical advice (DAMA)	19%
Death	10%
Discharge with follow-up (DFU)	71%

[Table/Fig-1]: Characteristics of study population.

DISCUSSION

The mean age of patients in this study population was ~70 years, with a small percentage of patients belonging to the very elderly age group (85-92 years), which reflects the actual demographic profile of the Indian elderly population [10].

MNA-SF scores	Main diagnosis						p-value
	I	II	III	IV	V	VI	
MNA-SF® I (0-7)	03 (3%)	08 (08%)	01 (01%)	04 (04%)	00	01 (01%)	<0.0001 (Significant)
MNA-SF® II (8-11)	09 (09%)	14 (14%)	05 (05%)	01 (01%)	04 (04%)	07 (07%)	
MNA-SF® III (12-14)	25 (25%)	11 (11%)	06 (06%)	00	01 (01%)	00	

[Table/Fig-2]: Nutritional status of common respiratory diseases requiring ICU admission.
Main diagnosis I-Acute exacerbation of Chronic Obstructive Pulmonary Disease (COPD)
Main diagnosis II- Lower respiratory tract infection Main diagnosis III- Cor-pulmonale
Main diagnosis IV- Acute Respiratory Distress Syndrome (ARDS)
Main diagnosis V- Br. Asthma Main diagnosis VI- Miscellaneous- Carcinoma Lung, Pleural effusion and Interstitial Lung Disease

Duration of hospital stay (days)	MNA-SF® I n (%)	MNA-SF® II n (%)	MNA-SF® III n (%)	p-value
Below 10	2 (2%)	28 (28%)	28 (28%)	<0.0001 significant
10 to 20	3 (03%)	8 (08%)	13 (13%)	
Above 20	12 (12%)	4 (04%)	2 (02%)	

[Table/Fig-3]: Impact of malnutrition on the duration of hospital stay.
MNA-SF® I: Score 0-7-Malnourished; MNA-SF® II: Score 8-11-At risk of malnutrition;
MNA-SF® III: Score 12-14-Normal nutrition

Need for oxygen or ventilation (%)	MNA-SF® I	MNA-SF® II	MNA-SF® III	p-value
Mechanical ventilation	12	14	6	0.0018 (significant)
Oxygen via mask	2	12	12	
NIV	2	11	15	
No oxygen requirement	1	3	10	

[Table/Fig-4]: Impact of nutritional status on the need of oxygen or mechanical ventilation.

Patient outcome (%)	MNA-SF® I	MNA-SF® II	MNA-SF® III	p-value
DAMA	7	6	6	<0.0001 significant
Death	6	3	1	
Discharge with follow-up	4	31	36	

[Table/Fig-5]: Patient out-come versus nutritional status.

Various studies from the different parts of the globe showed prevalence of malnutrition ranges from 13 to 54% [11]. Whereas findings of some of the Indian studies reported the prevalence of malnutrition in Allahabad to be 25%, in West Bengal it was 29.4% and in Haryana it was 53.4% [11]. Research findings of this study are comparable with the findings of Yuvaraj Krishnamoorthy et al., a study done in rural Puducherry community and reported that 17.9% of elderly in their study were found to be malnourished [11]. The present study reported similar findings in which 17% of the elderly hospitalised patients with respiratory pathology fall in malnourished group.

Lower prevalence of malnutrition in this study and in the Puducherry study, in comparison to other global and Indian studies can be attributed to the type of method used in screening and evaluation of malnutrition. While this study employed MNA-SF®, which comprehensively covers dietary intake, weight loss in past three months, Psychological state, Neuro-psychological stress and anthropometric parameters to screen nutritional status, other studies used only anthropometric measurements, which might have over-estimated the burden of malnutrition in their respective research findings.

Vandervee K et al., in their study reported that there is established association between respiratory diseases and malnutrition [12]. Similar findings were reported by Sorensen J et al., in their EuroOOPS study which concluded that 48-57% of the geriatric population is Western Europe is at risk of malnutrition [13]. Also, the EuroOOPS study showed that nutritional risk is associated with poor clinical out-come as was the finding in the present study with 40% of the study population were found to be at risk of malnutrition [13].

Considering the causes of mortality in elderly patients with respiratory diseases, Söderström L et al., [14] reported in their study that among malnourished patients, 7.2% died due to Pneumonia, 9% died due to COPD, and reported 12% deaths due to diseases of respiratory system, excluding Pneumonia and COPD. Among malnourished patients, the present study reported 11% deaths in patients presented with breathlessness, 7% deaths in malnourished patients with three co-morbidities, and total of 6% deaths due to COPD and lower respiratory tract infections.

Liu H et al., reported mortality of 10.29% in their study and longer average duration of hospitalisation of 12.58±9.25 days [15]. The present study has reported similar findings. There is 10% overall mortality in the present study with 12% of malnourished patients stayed for more than 20 days. Both these findings in the present study were statistically significant with p-value <0.0001, respectively.

The present study's findings using the Mini Nutritional Assessment–Short Form (MNA-SF®) are consistent with those reported by Feng M et al., who assessed nutritional status using the Geriatric Nutritional Risk Index (GNRI) in a large cohort of elderly patients with COPD [16]. Both studies highlight the critical impact of malnutrition on outcomes in older adults with respiratory illnesses requiring intensive care. In this study, poor nutritional status was significantly associated with greater need for mechanical ventilation, longer hospital stays, and increased mortality. Similarly, Feng M et al., found that malnutrition (GNRI ≤98) independently predicted higher in-hospital mortality (OR 1.48), greater risk of pressure injuries (OR 1.97), and extended ICU stays (OR 1.51).

Similarly, Xu Y et al., who reported that lower GNRI scores were associated with an increased risk of COPD and higher mortality in older adults [17]. These findings underscore the importance of assessing nutritional status as part of comprehensive respiratory care in the elderly. Comparison of the findings in present study with the previous studies is shown in [Table/Fig-6] [11-15].

S. No.	Authors name (Ref. no.)	Place and year of the study	Sample size	Prevalence of malnutrition	Association between malnutrition and respiratory diseases	Risk of malnutrition	Mortality due to COPD and LRTI	Overall mortality
1.	Present study- Kumar S et al.,	Vijayapura 2024	100	17%	Present	40%	6%	10%
2.	Krishnamoorthy Y et al., [11]	Puducherry 2016	279	17.9%	--	--	--	--
3.	Vandervee K et al., [12]	Belgium 2007	2329	--	Present	--	--	--
4.	Sorensen J et al., [13]	Multi-Centre 2008	5051	--	--	48-57%	--	--
5.	Söderström L et al., [14]	Sweden 2008	1767	--	--	--	16.2%	--
6.	Liu H et al., [15]	China 2018	5516	--	--	--	--	10.29%

[Table/Fig-6]: Comparative analysis of various scientific studies with the present study [11-15].

Limitation(s)

The present study is the first attempt to evaluate prevalence of malnutrition risk and its impact on the outcome in elderly ICU patients with respiratory diseases. One limitation is that the study was conducted in a single center with small numbers of elderly patients. As the chosen hospital for this research is a biggest private tertiary care center in the district, the hospital's ICU receives referral of complicated medical cases with high level of severity. As a result these research findings cannot be generalised to large elderly patient population of the area.

CONCLUSION(S)

Establishing a database on the clinical and demographic profile of elderly under nourished patients requiring critical care admission due to respiratory diseases will redefine healthcare delivery to the older patient population in terms of early recognition of warning signs, and level of care needed to improve their outcomes in the future. The adverse outcome depends upon the baseline functional status, the nutritional status at presentation, the final diagnosis, severity of respiratory diseases at presentation, and the number of co-morbidities. Hence, the focus of future ICU setups should optimally have a patient centered approach, delivered through well trained multi-disciplinary teams in dedicated geriatric critical care units to promptly manage all elderly patients, thus providing holistic health care with faster functional recovery and improved quality of life.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: May 19, 2025
- Manual Googling: Jul 12, 2025
- iThenticate Software: Jul 15, 2025 (18%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **May 02, 2025**
Date of Peer Review: **May 19, 2025**
Date of Acceptance: **Jul 17, 2025**
Date of Publishing: **Aug 01, 2025**