ORIGINAL ARTICLE

THE IMPACT OF MALNUTRITION AND FRAILTY ON MORBIDITY AND MORTALITY IN GERIATRIC INTERNAL INTENSIVE CARE PATIENTS: A PROSPECTIVE STUDY

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Abstract

Introduction: This study aims to assess the impact of malnutrition and frailty on morbidity and mortality in geriatric patients in the internal intensive care unit.

Materials and Method: The study is prospective, descriptive, and cross-sectional in design, conducted at intensive care unit. Demographic data, anthropometric measurements, clinical evaluations, and laboratory parameters are recorded for each patient. Various nutritional screening tools such as the modified NUTRIC score, Subjective Global Assessment, Nutritional Risk Screening, Mini Nutritional Assessment - Short Form, and frailty assessment scales like Edmonton Frailty Scale and Clinical Frailty Scale are used.

Results: The patients were divided into two groups: survivors and non-survivors. The mean Nutritional Risk Screening -2002 score was 5.20±0.70 for the survivors group and 6.15±0.57 for the non-survivors group ($p<0.001$). The mean Mini Nutritional Assessment - Short Form score was 8.20±0.82 for the survivors group and 6.46±1.02 for the non-survivors group ($p<0.001$). According to the modified NUTRIC score, 40 patients (97.6%) in the non-survivors group were at high risk of malnutrition ($p<0.001$). According to the Edmonton Frailty Score, in the non-survivors group, 1 patient (2.4%) was classified as light frail, 21 patients (51.2%) as mild frail, and 19 patients (46.3%) as severe frail ($p<0.001$). The mean Clinical Frailty Score was 5.89±0.99 for the survivors group and 8.0±0.0 for the non-survivors group ($p<0.001$).

Conclusion: Due to the significant prevalence of malnutrition and frailty in the critical patient population being monitored in the intensive care unit, both conditions should be regularly assessed.

Keywords: Intensive Care Unit; Malnutrition; Frailty; Mortality; Geriatrics.

INTRODUCTION

The global demographic landscape is undergoing a notable shift with a marked increase in the elderly population, as highlighted by data from the World Health Organization. Projections suggest that the proportion of individuals aged 60 and above will escalate from 12% in 2015 to 22% by 2050 (1). This demographic trend translates into a corresponding rise in admissions of vulnerable and frail elderly individuals to Intensive Care Units (ICU) (2). Notably, alongside the surge in patient numbers, there is a discernible elongation in the duration of ICU stays. Specifically, individuals aged seventy-five and older account for a staggering 70-fold increase in ICU bed days per annum compared to their counterparts under sixty-five years old (3). The utilization of substantial ICU resources, encompassing bed occupancy and financial outlays, by the elderly population underscores the persistent challenge confronting ICU personnel in managing geriatric patients (4).

In the elderly patient population, various factors such as cognitive impairment, comorbidities, polypharmacy, depression, and anorexia can compromise oral intake and disrupt nutrition (5). Moreover, this demographic is particularly susceptible to the detrimental effects of malnutrition, attributed to both the depletion of the body's homeostatic reserves due to chronic illnesses and the heightened stress levels associated with acute ailments (5). While elderly patients in ICU receive treatment for their primary conditions, the significance of adequate nutrition may be overlooked, exposing them to the risk of malnutrition upon ICU admission and throughout subsequent care periods (6). The catabolic processes induced by inadequate nutrition can exacerbate existing risks of morbidity and mortality (4). These factors underscore the necessity of conducting regular nutritional risk assessments in geriatric ICU patients.

Despite the availability of various nutrition screening tools to identify malnutrition risk, determining the "ideal choice" for assessing inadequate nutrition remains unclear (7). Nonetheless, the practical utility of these tools in clinical settings continues to be investigated, particularly in the elderly patient population, where challenges related to cooperation may arise (8).

Frailty stands out as a significant concern rendering the geriatric population vulnerable (9). It manifests as a multidimensional biological syndrome characterized by a decline in the organism's resilience to stress and physiological reserves due to cumulative impairment across multiple physiological systems (10) . Diagnosis of frailty in a patient necessitates meeting three criteria from decreased grip strength, diminished energy levels in daily activities, slowness in walking, reduced physical activity, and unintended weight loss (9). Despite extensive study, the relationship between frailty and inadequate nutrition in the elderly remains ambiguous (11). Regular assessments for both malnutrition and frailty in geriatric patients are crucial for early diagnosis and intervention for both conditions (11).

We have two main aims in this research. First; The aim is to determine before ICU malnutrition and frailty rates in patients who do not have surgical pathology and are admitted to the internal medicine ICU. Our second aim is to determine the relationship between malnutrition and frailty detected in the internal medicine patient group and mortality and morbidity. Thus, we aim to overcome the difficulties in assessing the impact of the pre-intensive care health status of geriatric patients on intensive care outcomes by assessing the risk of malnutrition and frailty.

MATERIALS AND METHOD

Study design

This study is a prospective, descriptive, and cross-sectional investigation. Approval for the study was obtained from the Local Ethics Committee (approval

number: 2022/40-02). Among the geriatric patients followed in a three-month period at the Faculty of Medicine, Internal Medicine ICU, ninety six patients who met the inclusion criteria were accepted into the study. Exclusion criteria comprised patients under 65 years old, individuals with psychiatric conditions or difficulties in cooperation, those unable to provide a nutritional history due to impaired consciousness, and patients receiving enteral or parenteral nutrition before ICU admission. Informed consent was obtained from eligible patients before their participation in the study. The cases were divided into two groups: survivors and non-survivors. Throughout their ICU stay, patients' nutritional regimens were administered in accordance with the primary physician's orders based on their clinical status, with no modifications made for the study.

Study population

Demographic information including age, gender, and comorbidities of consenting patients were documented. Patient heights were measured by the ICU team. Patients' weights upon ICU admission, weight fluctuations, and percentage changes over the previous six months were obtained from conscious patients directly and from their relatives in the case of unconscious individuals. The clinical status of each patient within the first 24 hours of ICU admission was assessed using the Acute Physiology and Chronic Health Evaluation II (APACHE II), Sequential Organ Failure Assessment (SOFA) scoring systems and Charlson comorbidity index. Additionally, pre-ICU hospitalization duration, ICU length of stay, and ICU mortality rates were recorded.

Evaluation of biochemical parameters and screening malnutrition

Hospital records and laboratory data for each patient were reviewed, and the following laboratory parameters upon initial admission to the ICU were documented: complete blood count, serum electrolyte levels (sodium, potassium, calcium), arterial blood gas analysis (including PaO_2, $PaCO_2$, FiO_2, PO_2/FiO_2, HCO_3, lactate levels, and SpO_2 values). Furthermore, C-Reactive Protein(CRP), procalcitonin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), serum creatinine (Cr), and blood urea nitrogen (BUN) values were recorded.

In this study, in addition to anthropometric measurements, Modified NUTRIC score, Subjective Global Assesment (SGA), Nutritional Risk Screening (NRS-2002) and Mini Nutrition Evaluation Screening Form (MNA-SF) were used for screening patients for malnutrition.

The Edmonton Frailty Scale (EFS)

The Edmonton Frailty Scale comprises 9 components, encompassing cognitive function, overall health status, self-perception of health, functional independence, social support, polypharmacy, mood, urinary incontinence, and functional performance, with a maximum score of 17 (12). In our study, two components requiring patient performance were adapted to suit ICU patients. Unlike the frailty phenotype, it also assesses cognitive function. Based on the total score obtained, individuals were categorized regarding frailty as follows: 0-5 points: Robust, not frail; 6-7 points: Vulnerable; 8-9 points: Mildly frail, pre-frail; 10-11 points: Moderately frail; 12-17 points: Severely frail. The suitability and validity of the EFS for assessing frailty in hospitalized patients have been demonstrated (12).

Clinical Frailty Scale (CFS)

Frailty phenotype and cumulative frailty index models pose challenges for bedside evaluations and critical patients (13). One of the scales developed in response is the Clinical Frailty Scale,

which correlates with frailty assessment based on the Fried frailty phenotype criteria. Clinicians score elderly individuals from 1 (very fit) to 9 (terminally ill) based on their clinical judgment. As the score increases, the degree of frailty escalates. A score ≥5 indicates "frailty" (13).

Evaluation of complications

Following admission to the ICU, the presence, type, and severity of various complications occurring during patient follow-up were documented. These complications were defined based on objective criteria, including pulmonary complications (excluding pneumonia and atelectasis), sepsis (with positive culture), pneumonia (evidenced by infiltration on new chest X-ray, purulent sputum ± positive culture), and delirium (characterized by acute-onset neuropsychiatric symptoms and signs disrupting global brain function). Additionally, patients' ICU length of stay and ICU mortality were recorded.

Statistical analysis

SPSS 24.0 (Chicago, IL) software was utilized for statistical analysis. Data with categorical values (BMI, TSF, MAMC, age, weight, height) were presented as mean ± standard deviation (SD). The Mann-Whitney U test was employed to compare anthropometric and systemic evaluation methods in the study. Frequency data were presented as number and percentage (%), and the chi-square test was used to compare malnutrition status and frequency data. Spearman's correlation test was employed to determine correlations. A p-value <0.05 was considered statistically significant.

RESULTS

Ninety six patients who met the inclusion criteria were accepted into the study. In the survivors group, the mean age was 75.5±7.29, while in the non-survivors group, it was 78.6±8.36 (p=0.74). In terms of weight, the mean weight of the survivors group was 73.09±8.64, while the non-survivors group was 68.5±6.33 (p=0.004). The mean APACHE II score was 13±3.11 for the survivors group and 23.68±3.04 for the non-survivors group (p<0.001). Non-survivors had longer hospital stays before ICU admission and longer ICU length of stay (p=0.004, p=0.001, respectively). The characteristics of the entire cohort are given in Table 1. There was no statistically significant difference in laboratory findings between the survivors and non-survivors groups (Table 2).

Evaluation of anthropometric measurements

When both groups were evaluated in terms of anthropometric measurements, statistically significant differences were found in TSF (triceps skinfold thickness), MAC (mid-arm circumference), and MAMC (mid-arm muscle circumference) between the survivors and non-survivors groups (p<0.001) (Table 3).

Evaluation of nutritional tools

The mean NRS-2002 score was 5.20±0.70 for the survivors group and 6.15±0.57 for the non-survivors group (p<0.001). The mean MNA-SF score was 8.20±0.82 for the survivors group and 6.46±1.02 for the non-survivors group (p<0.001). The mean SGA score was 5.87±0.66 for the survivors group and 3.51±1.09 for the non-survivors group (p<0.001). The mean mNUTRIC score was 3.49±0.63 for the survivors group and 5.68±0.65 for the non-survivors group (p<0.001) (Table 1 and Table 3).

Evaluation of frailty assessment tools

The mean Edmonton Frailty Score was 8.22±1.95 for the survivors group and 11.37±0.88 for the non-survivors group (p<0.001). The mean Clinical Frailty Score was 5.89±0.99 for the survivors group and 8.0±0.0 for the non-survivors group (p<0.001) (Table 1 and Table 3).

Table 1. Characteristics of the patients, nutrition screening tools and frailty assessment index

Characteristic		All Patients (n =96)	Survivors (n = 55)	Non-survivors (n = 41)	p- value
Age (mean±standart deviation)		76.9±7.87	75.5±7.29	78.6±8.36	0.740*
Age (range)	Youngest old (65-74 years) Middle old (75-84 years) Oldest old (over 85 years)	45 (46.9%) 34 (35.4%) 17(17.7%)	30 (54.5%) 18 (32.7%) 7 (12.7%)	15 (36.6%) 16 (39%) 10 (24.4%)	0.159*
Weight (mean±standart deviation)		71.15±8.03	73.09±8.64	68.5±6.33	**0.004***
Height (cm) (mean±standart deviation)		167±5.47	166.75±5.73	167.61±5.12	0.432*
BMI (mean±standart deviation)		25.5±2.98	26.29±2.99	24.44±2.64	**0.002***
Sex	Female Male	48 (50 %) 48 (50 %)	27 (49.1%) 28 (50.9%)	21 (51.2%) 20(48.8%)	0.837*
APACHE II		17.56±6.21	13±3.11	23.68±3.04	**<0.001****
SOFA score		7.56±2.91	5.44±1.61	10.41±1.46	**<0.001****
Length of hospital stay before ICU (days)		5.81±3.37	4.95±3.45	6.98±2.92	**0.004****
Length of ICU days		11.31± 5.54	9.38±3.74	13.9±6.49	**<0.001****
BMI	< 25 25-30 > 30	47 (49%) 41 (42.7%) 8 (8.3%)	22(40%) 27 (49.1%) 6 (10.9%)	25 (61%) 14 (34.1%) 2 (4.9%)	0.109**
NRS malnutrition	Yes No	95 (99%) 1 (1%)	54 (98.2%) 1 (1.8%)	41 (100%) 0 (0%)	0.573**
MNA malnutrition	Yes No	46 (47.9%) 0 (52.1%)	9 (16.4%) 46 (83.6%)	37 (90.2%) -4 (9.8%)	**<0.001****
SGA	No malnutrition risk Mild malnutrition Severe malnutrition	42 (43.8%) 45 (46.9%) 9 (9.4%)	41 (74.5%) 14 (25.5%) 0 (0%)	1 (2.4%) 31 (75.6%) 9 (22%)	**<0.001****
mNutrıc score	Low risk High risk	55 (57.3%) 41 (42.7%)	54 (98.2%) 1 (1.8 %)	1 (2.4%) -40 (97.6%)	**<0.001****
Edmonton Frailty Scale	Non frail Prefrail Light frail Mild frail Severe frail	2 (2.1%) 18 (18.8%) 23 (24%) 33 (34.4%) 20 (20.8%)	2 (3.6%) 18 (32.7%) 22 (40%) 12 (21.8%) 1 (1.8%)	0 (0%) 0 (0%) 1 (2.4%) 21 (51.2%) 19 (46.3%)	**<0.001****
Clinic Frail Score	4 5 6 7 8	1 (1%) 23 (24%) 16 (16.7%) 11 (11.5%) 45 (46.9%)	1 (1.8%) 23 (41.8%) 16 (29.1%) 11 (20%) 4 (7.3%)	0 (0%) 0 (0%) 0(0%) 0 (0%) 41 (100%)	**<0.001****

All values are expressed as numbers (percentages) or median (interquartile range).
Abbreviations:BMI: Body mass index, 1. APACHE II: Acute physiology and chronic health evaluation II, 2. CCI: Charlson Comorbidity Index, SOFA:Sequential Organ Failure Assessment score, MNA-SF=Mini Nutritional Assessment—Screening Form, NRS-2002=Nutritional Risk Screening
1. On the day of ICU admission
2. Includes hematological and solid organ malignancies
*: Mann–Whitney U test, Data presented as median ± standard deviation
**: Chi Square test. Data presented as frequency and percentance

Table 2. Laboratory findings of patients

Laboratuary Findings	All Patients (n =96)	Survivors (n = 55)	Non-survivors (n = 41)	p- value*
White blood cell count, 10^3 /mL	12069.47±6131.84	11656.36±6653.53	12637.5±5370.7	0.086
Hemoglobin, g/dL	12.13±2.05	12.33±2.11	11.5±1.98	0.166
Platelet, 10^3 /mL	300812.5±205127.5	321690.9±256484.8	272804.88±98596.5	0.795
Sodium, mmol/L	142.9±6.85	142.7±6.65	143.1±7.20	0.758
Potassium, mmol/L	4.43±0.77	4.51±0.82	4.32±0.70	0.280
Calcium, mmol/L	7.86±0.62	7.84±0.60	7.89±0.66	0.719
AST, IU/L	82.85±102.29	86.05±114.44	78.56±84.48	0.932
ALT, IU/L	54.35±70.15	58.13±85.91	49.29±40.95	0.747
Blood urea nitrogen, mg/dL	42.19±30.91	41.4±30.16	43.24±32.23	0.994
Creatinine, mg/dL	2.09±0.98	1.06±0.65	3.37±1.12	0.356
Glucose, mg/dL	146.42±60.57	143.89±67.3	149.8±50.76	0.257
Albumin, g/dL	1.64±0.78	1.48±0.61	1.84±0.94	0.350
C-reative protein	165.68± 107.52	149.73±100.40	187.07± 114.16	0.108
Procalsitonin	3.82±11.25	3.91±10.74	3.70±12.06	0.131
pH	7.35±0.13	7.37±0.14	7.38±0.12	0.703
pO_2	70±27.63	71.38±32.75	68.66±18.99	0.813
pCO_2	38.01±13.14	36.93±11.48	39.46±15.13	0.830
Lactat	2.86±1.41	2.39±1.59	2.13±1.11	0.472
HCO_3	22.11±4.87	22.15±5.43	22.18±4.05	0.824
SpO_2	90.55±5.58	90.85±5.11	90.15±6.19	0.885

Abbreviations: ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, LDH:Lactate dehydrogenase. PaO2 : Arterial partial oxygen pressure, PaCO2:Arterial partial carbon dioxide pressure, HCO3: Serum Bicarbonate,

* (Mann–Whitney U test). Data presented as median ± standard deviation

Table 3. Values of Nutrition screening tools, Frailty assessment index, Anthropometric measurements.

	All Patients (n=96)	Survivors (n=55)	Nonsurvivors (n=41)	p value*
NRS	5.60±0.81	5.20±0.70	6.15±0.573	**<0.001**
MNA-SF	7.46±1.25	8.20±0.82	6.46±1.02	**<0.001**
SGA	4.86±1.46	5.87±0.66	3.51±1.09	**<0.001**
mNUTRIC score	4.43±1.20	3.49±0.63	5.68±0.65	**<0.001**
Edmonton Frailty score	9.56±2.23	8.22±1.95	11.37±0.88	**<0.001**
Clinic frailty score	6.79±1.28	5.89±0.99	8.0±0.00	**<0.001**
TSF	119.26±106.8	128.39±110.92	107.24±101.29	**<0.001**
MAC	27.60±3.96	29.50±3.10	25.03±3.54	**<0.001**
MAMC	202.23±28.61	214.8±23.99	202.23±28.61	**<0.001**
CCI	8.64±2.23	7.16±1.39	10.51±1.51	**<0.001**

MNA-SF=Mini Nutritional Assessment—Screening Form, NRS-2002=Nutritional Risk Screening, MAC=mid-arm circumference, MAMC=mid-arm muscle circumference (in cm), TSF=triceps skin fold.

*: Mann-whitney U test

Correlations of nutrition screening tools with complications

Positive correlations were found between NRS-2002 (r = 0.614), mNUTRIC score (r=0.866), Edmonton Frailty Score (r=0.763), Clinical Frailty Score (r = 0.848), APACHE II (r=0.854), and CCI (r=0.778) with ICU mortality, and a negative correlation was found between SGA (r=-0.312) and ICU mortality (p<0.05). ICU length of stay showed positive correlations with NRS-2002 (r = 0.322), mNUTRIC score (r=0.310), Clinical Frailty Score (0.303), APACHE II (r=0.403), SOFA (r=0.405), and CCI (r=0.397), and a negative correlation with SGA (r=-0.813) (p<0.05). Delirium showed positive correlations with mNUTRIC score (r=0.272), Edmonton Frailty Score (r=0.264), Clinical Frailty Score (r = 0.278), SOFA (r=0.208), and CCI (r=0.289), and a negative correlation with SGA (r=-0.813) (p<0.05). The correlations of nutrition screening tools, frailty assessment scores, and critical illness scores with ICU complications are given in Table 4.

Table 4. Corelations of Nutrition screening tools, Frailty assessment index with complications.

	Mortality in ICU	Length of Stay ICU	Delirium	Pressure Ulcer	ARF	Septic Shock	ARDS
NRS-2002	0.614**	0.322**	0.128	0.399**	0.246*	0.516*	0.243*
SGA	-0.312**	-0.813**	-0.251*	-0.496**	-0.307**	-0.574**	-0.381**
MNA-SF	0.000	0.002	0.014	0.000	0.002	0.000	0.000
mNUTRIC score	0.866**	0.310**	0.272**	0.494**	0.384**	0.617**	0.443**
Edmonton Frailty score	0.763**	0.194	0.264**	0.343**	0.283**	0.491**	0.387**
Clinic Frail score	0.848**	0.303**	0.278**	0.416**	0.329**	0.552**	0.387**
APACHE II	0.854**	0.403**	0.163	0.432**	0.350**	0.625**	0.361**
SOFA Score	0.841	0.405**	0.208*	0.420**	0.337**	0.602**	0.392**
CCI	0.778**	0.397**	0.289**	0.464**	0.311**	0.535**	0.393**

*p<0.05 (Spearman correlation test).
**p< 0.001 (Spearman correlation test).

Table 5. Corelations of Nutritional screening tools, Frailty assesment index and Critical ilness scores with each others.

	NRS-2002	SGA	MNA-SF	mNUTRIC Score	Edmonton Frailty Score	Clinic Frailty Score	APACHE II	SOFA scoe	CCI
NRS-2002	-----	-0.653**	-0.744**	0.598**	0.443**	0.500**	0.634**	0.537**	0.533**
SGA	-0.633**	-----	0.770**	-0.797**	-0.690**	-0.741**	-0.681**	-0.620**	-0.573**
MNA-SF	-0.744**	0.770**	-----	-0.716**	0.579**	-0.640**	-0.642**	-0.584**	-0.607**
mNUTRIC score	0.598**	-0.797**	-0.716**	----	0.667**	0.783**	0.802**	0.752**	0.674**
Edmonton Frailty score	0.443**	-0.690**	-0.579**	0.667**	----	0.786**	0.626**	0.620**	0.507**
Clinic Frailty score	0.500**	-0.741**	-0.640**	0.783**	0.786**	----	0.705**	0.727**	0.638**
APACHE II	0.634**	-0.681**	-0.642**	0.802**	0.626**	0.705**	-----	0.912**	0.653**
SOFA score	0.537**	-0.620**	-0.584	0.772	0.620**	0.727**	0.912**	-----	0.661**
CCI	0.533**	-0.573**	-0.607**	0.674**	0.507**	0.638**	0.653**	0.661**	-----

*p<0.05 (Spearman correlation test).
**p< 0.001 (Spearman correlation test).

Correlations of nutritional screening tools, Frailty assessment scores, and Critical illness scores with each other

NRS-2002 showed a positive correlation with mNUTRIC score (r=0.598) and negative correlations with SGA (r=-0.653) and MNA-SF (r=-0.744) ($p<0.05$). SGA showed positive correlations with MNA-SF (r=0.770) and negative correlations with mNUTRIC score (r=-0.797) ($p<0.05$). MNA-SF showed a negative correlation with mNUTRIC score (r=-0.716) ($p<0.05$). The Edmonton Frailty Score showed a positive correlation with the Clinical Frailty Score (r=0.786) ($p<0.05$). The correlations among nutrition screening tools, frailty assessment scores, and critical illness scores are presented in Table 5.

DISCUSSION

In this study, we explored the correlation between malnutrition and frailty scores with morbidity and mortality among 96 geriatric patients admitted to the internal medicine ICU for non-surgical reasons during a three-month period. Our findings revealed a statistically significant relationship between disease severity, body mass index, anthropometric measurements, and intensive care mortality rates. Moreover, we observed a significant association between malnutrition rates, as assessed by MNA-SF, SGA, and mNUTRIC score, and ICU mortality rates. Utilizing the Edmonton Frailty Scale, we identified a notable correlation between moderate and severe frailty and mortality rates. Likewise, there was a statistically significant association between increasing clinical frailty index scores and mortality rates. These results underscore the importance of considering both malnutrition and frailty assessments in the management and prognosis of geriatric patients in intensive care settings.

One of the primary objectives of this research was to ascertain the prevalence of malnutrition upon admission of elderly patients to ICU and to investigate its association with ICU mortality. Malnutrition has been linked to various adverse health outcomes, including declines in functional status, muscle strength, bone mass, immunity, cognitive function, wound healing, surgical recovery, as well as elevated hospital readmission rates and mortality (14). According to our study findings, 47.9% of geriatric patients admitted to the ICU were identified as malnourished based on the Mini Nutritional Assessment (MNA), 56.3% according to the Subjective Global Assessment (SGA), and 42.7% according to the modified Nutrition Risk in the Critically ill (mNUTRIC) score. Consistent with our findings, previous study reported malnutrition rates ranging from 37% to 50% among patients admitted to medical and surgical ICUs using SGA classifictions (3). However, it is noteworthy that this study encompassed a cohort with younger patients. Malnutrition rates can vary according to the clinical characteristics of patients followed ICU. In another previous study, they classified 26% of ICU patients as moderately malnourished and 11% as severely malnourished based on SGA and found SGA to be applicable in critically ill patients (15). One of the reasons for the different results between our study and this study is that the study population consisted of younger patients with predominantly surgical pathologies rather than geriatric internal medicine patients. Evaluating the nutritional status of elderly patients is challenging. In a study by Atalay et al. (16), the prevalence of malnutrition assessed using SGA in patients over 70 years old was found to be 33.6%. According to the authors' knowledge of the literature, no study has been found that demonstrates the prevalence of malnutrition in the geriatric patient group aged 65 and older who are admitted to the internal medicine ICU without any surgical pathologies. However, it is known that 20-50% of all hospitalized geriatric patients are affected by malnutrition (17). Unfortunately, the nutritional status of critical patients deteriorates rapidly after admission to the ICU, and the effects of inadequate nutrition are added to severe stress-

induced catabolism (17). This explains the high rate of malnutrition in geriatric patients in our study.

In our study, we observed a significant correlation between malnutrition rates assessed by the MNA, SGA, and mNUTRIC scores and ICU mortality rates. Similarly, a review encompassing 1168 articles investigating the relationship between malnutrition and adverse clinical outcomes in the ICU revealed that malnutrition was associated with an elevated risk of prolonged ICU length of stay, readmission, and hospital mortality (18). Furthermore, in critically ill COVID-19 patients diagnosed with malnutrition using SGA and NRS-2002, increased mortality rates were also observed (19). These findings underscore the clear association between inadequate nutrition and adverse clinical outcomes among hospitalized patients (5).

Another objective of our study was to ascertain the levels of frailty and their association with mortality among patients aged 65 and older presenting with internal pathologies upon admission to the ICU. The impact of frailty on elderly patients has predominantly been investigated in community-based studies, with fewer studies focusing on hospitalized or ICU-bound elderly individuals (20). A review analyzing studies examining frailty in community settings reported a prevalence ranging from 4% to 59.1% among a total of 61,500 patients (20). Frailty is often undiagnosed condition in hospitalized elderly patients, with prevalence ranging from 27% to 80% (21). Failure to consider and recognize frailty may contribute to the difficulty in diagnosing it.

Our study has demonstrated a lower prevalence of frailty compared to studies conducted in the community. Particularly among patients followed in the ICU, frailty appears to be more common, as observed this study. In the study we present, 20 patients (20.8%) were categorized as severely frail according to the Edmonton Frailty Scale, while 45 patients (46.9%) were classified as severely frail according to the Clinical Frailty Scale. Consistent with our findings, frailty is more commonly observed in patients under ICU monitoring. A meta-analysis investigating the impact of frailty on ICU outcomes reported a frailty prevalence of 33.1% among 3030 geriatric patients with internal and surgical pathologies, and 30% among all patients (9).

Assessing patients' frailty alongside critical illness assessment scores upon ICU admission can be advantageous in evaluating cognitive, mobility, functionality, and social aspects (22). In a study conducted among patients aged 60 and older in the ICU, the prevalence of frailty was measured at 21.3% using a frailty index (22). In the United States, among 52 intensive care patients aged 80 and over, the prevalence of frailty according to th e Clinical Frailty Scale (CFS) was 88.5%, with an average CFS score of 5.8 (23). While aging does not inherently imply frailty, the prevalence of frailty tends to increase with age (23). The inclusion of patients aged 80 and over may have contributed to the observed high prevalence. Moreover, the prevalence can vary depending on the frailty scale utilized. In a multicenter community study conducted in our country, the prevalence of frailty was 27.8% according to the frailty index and 10% according to the Frail scale (24). However, significant differences in prevalence among the same patient group were not observed between the Edmonton Frailty Scale and the Clinical Frailty Scale in our study; both scales exhibited statistically significant correlations.

In the presented study, we observed a statistically significant association between the presence of frailty upon admission to the ICU and an elevated risk of mortality. Among deceased patients, 46.3% exhibited severe frailty, and 51.2% displayed moderate frailty according to the Edmonton Frailty Scale ($p<0.001$). Similarly, in a review examining the relationship between frailty and mortality, being frail was demonstrated to increase the risk of hospital mortality by 1.71 times, long-term mortality risk by 1.53 times, and ICU mortality risk by 1.51 times (9). Previous studies have identified frailty as an

independent risk factor for ICU mortality, length of stay, and readmission (4). A study reporting an ICU mortality rate of 69% found a correlation between frailty and SOFA and APACHE II scores (25). Given the association between frailty and mortality, assessing frailty alongside ICU scores may be crucial in evaluating these patients.

Our study has certain limitations. Being conducted in a single center's ICU, the generalizability of the results may be limited. The utilization of malnutrition and frailty assessment tools in the geriatric population, which may exhibit less cooperation, and reliance on information provided by family members in cases of insufficient data could introduce bias.

Nonetheless, our study also possesses strengths. It was conducted in a highly homogeneous patient group admitted to the internal ICU without surgical pathology. We extensively evaluated this patient group using clinical, anthropometric measurements, and comprehensive screening tools. To the best of our knowledge, this study is the first to address this issue in this patient population.

Our findings indicate the prevalence of malnutrition and frailty in a significant portion of ICU-monitored patients. In ICU settings, the focus often centers on conditions such as respiratory failure, septic shock, and acute kidney injury, potentially overlooking malnutrition and frailty in elderly patients and their associated adverse outcomes. Both conditions may be as critical as or even more important than the acute issue leading to ICU admission.

In conclusion, evaluating the impact of pre-intensive care health status on ICU outcomes among elderly patients poses challenges. Assessing the risk of malnutrition and frailty could provide a method to address this challenge. Therefore, regular assessment of nutrition status and frailty in critically ill patients is imperative.

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