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Research Article

Assessment of Nutritional Status for Patients Admitted to Adult Intensive Care Unit in Orotta National Referral Hospital, Eritrea 2025

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ABSTRACT

Background: The World Health Organization defines nutrition as the amount of food consumed in relation to the body's dietary needs and outlines the distinction between good and bad nutrition. Good nutrition is a combination of a balanced diet and exercise, while poor nutrition is a catalyst for adverse health conditions including reduced immunity, increased susceptibility to disease, impaired physical and mental development and reduced productivity, So Malnutrition is one of the major problems during the stay in the intensive care units (ICUs) as most critically ill patients are immunosuppressed.

Aim: the aim of the study was to assess the nutritional status of patients admitted to adult intensive care unit of Orotta national referral and teaching hospital between admission and discharge.
Method: A prospective observational study design was used from admission to discharge. Data was collected using subjective global assessment (SGA) and anthropometric measurements from all patients admitted to the intensive care unit during the study period.

Results: sixty-one patients were participated in the study. From those, the average mean age of the participants was 52.07 years (SD=19.18) and majority of the participants were male (60%) and married (73%). Patients were assessed using anthropometric measurements during admission and discharge. And the results showed that, there were significant decrease with ($P<0.001$) compared admission to discharge. A Comparison of the overall nutritional status using the SGA rating between admission and discharge, using McNamara's test, revealed a slight increment in well-nourished patients from 6.6% at admission to 11.5% at discharge.

Conclusions: the study concluded that the majority of patients presented with mild or moderately malnourishment using SGA and with significant decrease in anthropometric measurement during their stay.

Nursing Implication: Primarily the research provides an opportunity for nurses to contribute to the growing body of knowledge, in this area farther more nurse could have played a pivotal role in raising awareness among patients the potential risk and implementing preventive measures to minimize malnutrition in the critical ill patients.

Keywords

Malnutrition, Critical ill patient, Intensive care unit, Nutrition assessment, Nutritional status.

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Abbreviations

BMI: Body mass index, CI: Confidence interval, IBM: Ideal body weight, ICU: Intensive care unit, IQR: interquartile range, LOS: Length of hospital stay, MD: Mean difference, mNUTRIC: modified nutritional risk in critically ill, MUAC: Mid upper arm circumference, NPO: Nothing by mouth, PG-SGA: Patient general subjective assessment, SPSS: Statistical package for social sciences, WHO: World health organization.

Introduction

Nutrition is a fundamental biological process that involves the intake of nutrients from the surrounding environment and their utilization for essential physiological processes such as development, reproduction, and maintenance of overall bodily health, regardless of a person's level of well-being [1]. The World Health Organization (WHO) defines nutrition as the amount of food consumed in relation to the body's dietary needs and outlines the distinction between good and bad nutrition. Good nutrition is a combination of a balanced diet and exercise, while poor nutrition is a catalyst for adverse health conditions including reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity. Nutrition in critical illness plays a pivotal role in ICU [2]. The importance of sufficient nutrition among critically ill patients is augmented by boost in the metabolic stress response, impaired immune function and the severity of illness.

Malnourishment is a condition that results from eating a diet in which nutrients are either not enough or are too much such that the diet causes health problems. It may involve calories, protein, carbohydrates, vitamins or minerals. Not enough nutrients are called under nutrition while too much is called over nutrition. So most of the time malnutrition is often referred specifically to under nutrition, where there are not enough calories, protein, or micronutrient [3]. Malnutrition has been correlated with a prolonged length of ICU/hospital stay and is strongly related with increased morbidity and mortality among critically ill patients, On the other hand according to a consensus statement by the Academy of Nutrition and Dietetics (AND) and the American Society for Parenteral and Enteral Nutrition, defined malnutrition as the presence of any two or more of these entities: Insufficient energy intake, weight loss, loss of muscle mass, loss of subcutaneous fat, localized or generalized fluid accumulation, or decreased functional status [4]. Critical illness is a life-threatening condition characterized by infection trauma or any medical illness and involves massive surge of pro-inflammatory mediators, which incites host catabolism [5]. In critically ill patients, the prevalence of malnutrition ranges between 38% and 78%, especially at the time of admission to hospital, at least one-third of patients have some degree of malnutrition and two-thirds of them progress to further decline without adequate nutritional provision. Additionally, two-thirds of patients who were without malnutrition will become malnourished during hospitalization [6].

In our setting during our clinical exposure, although it needs evidence-based study but malnutrition is a common effect of prolonged hospitalization, especially in critically ill patients who were admitted to the intensive care unit (ICU). According to [7] the prevalence of malnutrition was 13% to 78% in acutely ill patients between 1996 and 2005. Malnutrition can be the result of both hyper metabolism and inadequate intake of energy and protein in those patients [7]. Hospital malnutrition can be prevented and treated by given optimal care, this will improve patient clinical results, and reduce expenses, and also early nutrition management can lower mortality rate, readmission rates, complication rates, hospital stay times, and cost of treatment [8]. The metabolic response of critical illness to Critically ill patients hospitalized in the ICU demand complex and individualized nutritional therapy. Like trauma leads to a metabolic response that affects individual requirements for energy and nutrients during the critical phases. The initial phase after a trauma is referred to as the Ebb phase and lasts for 24-48 hours before the transition to the flow phase. Metabolic activity drops during this phase, leaving mobilized substrates such as glucose from liver glycogen and free fatty acids from fat tissue unused. These changes dramatically in the flow phase when the metabolism is highly affected by an increase in pro-inflammatory cytokines and catabolic hormones, explaining critically ill patients being in a severely catabolic state [9]. Research showed that having some degree of malnutrition prior to admission to the ICU in seriously ill patients was able to compromise micro- and macronutrient reserves [10]. Additionally, nutrient deficiency has been correlated with a prolonged length of ICU/hospital stay and is strongly associated with increased based on the informal observation of the researchers' in clinical practice; less attention is given to nutrition for all the critically ill patients. Because of that although no objective measurements we did, but from the informal observation most of the patients who are admitted to ICU transferred or discharged with decreased bodyweight and also they did not get the daily requirement of nutrition. As a result, most patients become wasted their muscles and adipose tissues. This problem is more severe to the very critical and those patients with no verbal or other means of communication or if they are with no support, morbidity and mortality among critically ill patients increased. Therefore, assessment of nutritional status in critically ill patients in ICU is highly important, so that the study would help to assess what is the current problem and to pass necessary recommendations to improve the patient assessment of nutritional status and to open a gate for further studies.

Nutritional Status Assessment at ICU Admission

A descriptive observational study was conducted among the critically ill patients in hospital of South India, on 2024 In ICU admitted patients age of 18 years and above, with the 60 participants involved in the study, 53 (88.3%) were aged 41 years and above and all of them had existing co-morbidities. Mostly about 32 (53.3%) of them had the mNUTRIC score of 5, 16 (26.6%) had score of 6, seven (11.7%) had score of seven and another four and one had score of 8 and 9, respectively [11]. Similar to this a prospective observational study that conducted by [12] in shree krishan hospital India carried among 98 participant using PG-SGA showed that 59.1% were well-nourished, 9.18% were malnourished

and 31.6% were overweight during their admission in the intensive care unit. Another similar prospective observational study was conducted to identify the nutritional risk in MV patients using modified NUTRIC (mNUTRIC) score in ICU admitted patients in Chennai, Tamil nadu India, the study conducted in a total of 678 MV patients, out of them 42.5% of MV patients admitted to ICU were at nutritional risk, and high mNUTRIC score was associated with increased ICU length of stay and higher mortality [13].

In contrary, to the above study's, a retrospective cohort study of adult patients who were consecutively admitted to the ICU from January 2017 to December 2018 for >24 hours were conducted in Pahang Malaysia the result showed that seventy-seven (20.2%) of those patients were at high nutritional risk. They had also longer mean ICU LOS (7.1±7.5 days versus 4.2±4.0 days, p=0.001), greater proportion of prolonged MV (57.1% versus 14.4%, p<0.001) [14].

Nutritional Assessment at ICU discharge

An observational, prospective (follow-up) study was conducted in Shiraz, Iran. The study was done among 125 patients participated on the study on their ICU stay of average 17.9 days the prevalence of malnutrition among the critically ill patients on ICU discharge day was (58.62%) compared to ICU admission day (28.8%) according to the SGA questionnaire [15]. A Similar study conducted in Tehran Iran showed that the rate of malnutrition was (12.3%) on the day of discharge as compared to the admission day (6.3%) [16].

On the contrary a study that conducted by [17] reported that a decrease in malnutrition prevalence from 47.6% at admission to 38.1% at discharge using NRS 2002 method.

A prospective cohort observational study was done in Beni Suef of University Department of critical care & faculty of Medicine, Egypt on 2023 among 50 subjects aged >18 years old, both sex, 52% of them were male & 48% are females, from the subject 18 patients needed mechanical ventilation (MV) representing 36% of cases with mean ventilation days 10.7±7.1, and the mortality proportion 34%. The results further reported that 52% of cases had SGA score grade A, 34% had SGA score grade B, and only 14% of cases of SGA had grade C. A substantial association existed between the advanced grade of SGA (grade C) and mortality (P = 0.001) [18].

Similar results reported that, out of 1034 individuals involved in that report 636 (61.5%) had SGA grade A, 327 individuals (31.6%) had grade B and 71 (6.9%) had grade C. There was a significant independent influence of SGA on ICU mortality with SGA-C had significantly higher mortality ($p < 0.001$) and contrasted to well-nourished individuals, mortality was substantially greater in the malnourished, throughout the ICU admission [19]. Another observational study conducted in Australia reported that 60% of ICU survivor experienced significant functional decline during their hospital stay, with 30% requiring assistance with activities of daily living at discharge [20]. Similarly, a systematic review reported that up to 50% of ICU survivor exhibited impaired physical function and reduced quality of life at 6 months post discharge [21].

Objectives of the Study

General Objectives

The main objective of this study is to assess the nutritional status of patient admitted to adult intensive care unit at Orotta national referral and teaching hospital between admission and discharge.

Specific Objectives

- To assess the nutritional status of patient during admission in adult intensive care unit.
- To assess the nutritional status of patient during discharge from adult intensive care unit.
- To determine the prevalence of malnutrition during admission and discharge time.

Research Questions

- What is the nutritional status of patients admitted to Adult intensive care unit during admission?
- What is the nutritional status of patients admitted to the Adult intensive care unit during discharge?
- What is the prevalence of malnutrition during admission and discharge time?

Methodology

Study Design

A descriptive observational study design with a prospective type was used to assess the nutritional status of patients admitted to ICU from their admission to discharge home or transfer to other wards.

Study Area

The study was done in ONRH and teaching hospital in patients admitted in the intensive care unit. This hospital is located in Asmara, the capital city of Eritrea and this hospital is one of the tertiary hospitals in the country. It facilitate to patients referred and self-referred from all over country.

ONRH and Teaching Hospital includes medical, surgical (general and neurology wards), Intensive care unit (ICU), Emergency Room (ER), Operation Room (OR), Recovery Room (RR). The intensive care unit has nine beds and is both surgical and medical intensive unit. The unit gives service for about 300 patients annually.

Study Population and Period

All patients admitted to the adult intensive care unit during the study period (November 2024 to January 2025) were included in the study population.

Criteria for Sample Selection

All patients over 18 years of age admitted to intensive care unit were included and those patients who are admitted for less than 24 hours and unwilling to participate were excluded from the study.

Sampling Techniques and Sample Size

Since this study includes all patients who were admitted to ICU

during the study period a complete enumeration method was used.

Data Collection Tools and Methods

The baseline nutritional status and development of nutritional status throughout the stay on the ICU were assessed with anthropometric measurement & Subjective Global Assessment. The anthropometric measurement was taken in the admission time & on discharge. The anthropometric measurements were weight, height, Body Mass Index (BMI), and Mid Upper Arm Circumference (MUAC).

Subjective Global Assessment

Detailed history and physical assessment about prior loss of weight, marked alterations in food intake, subcutaneous fat loss in two locations (facial, triceps), and muscle tissue loss. Symptoms related to nutrition and its effects on functional capacity were obtained by asking to either the patient themselves, a relative member, or by reviewing the individual's medical records. The process of subjectively evaluating all available data yielded a numerical value that categorized the individuals as either adequately nourished (SGA-A), mildly to moderately malnourished (SGA-B), or severely malnourished (SGA-C) [22].

Anthropometric Measurements

Anthropometric measurements provide information on body muscle mass and fat reserves. The most practical and commonly used measurements are Body Weight, Height, Mid Upper Arm Circumference (MUAC), and BMI. The MUAC was measured at the half point between the acromion of the shoulder and the olecranon process at the elbow, using a measuring tape. The measurement was attempted to be taken with a 90-degree bend in the elbow with the arm held parallel to the body. Patients that were not accessible on the left side were measured on the right arm. MUAC measurements was assessed using proposed reference values where <22.5 cm is considered the cut-off for malnutrition.

Body weight is one of the most useful nutritional parameters to follow in patients who were acutely or chronically ill. Unintentional weight loss during illness often reflects use of lean body mass (muscle and organ tissue), especially if it is rapid and is not caused by diuresis. Such weight loss can be ominous sign. BMI was obtained using the formula, body weight in kilogram divided to height in meters are (BMI=Weight (kg)/Height (m^2) and by estimation for patient which we cannot measure the BMI. The reference standard for body mass index (BMI) value <18.5 are considered underweight, <17 significantly underweight, and 16 severely wasted, values of 18.5—24.9 are normal, 25—29.9 over weight and > 30 obese [23].

Data Quality control

During the research process each researcher were carefully observed, measured and recorded frequently patients' nutritional status starting from admission until the discharge. The researchers were checked the clarity, completeness and validity of the data. The completeness of the data were assessed and reviewed in a daily base to avoid loss of information by the researchers.

Data analysis

Data was directly entered into Statistical Package for Social Sciences (SPSS, Version 26.0) for statistical analysis. The entered data was cleaned and recoded so as to make ready for analysis. Descriptive analysis was conducted using frequency, percentage, mean (SD) and median (IQR). Summary of the anthropometric measurements was performed using mean (SD) and comparisons made using paired samples T-test. The difference in mean for the anthropometric measurements was along with the 95% CI was computed and reported. The difference in nutritional status of each subjective global assessment item was assessed using Wilcoxon signed Ranks test. The difference in nutritional status using the overall SGA rating between the admission and discharge was assessed using McNemar's Test.

Results

Table 1: Socio-demographic characteristics of the patients.

Variable	Number	Percentage
Sex of patient		
Male	37	60.66
Female	24	39.34
Age of patient (M=52.07, SD=19.08)		
<= 40	20	32.79
41 to 60	20	32.79
>=61	21	34.43
Marital status of patient		
Single	6	9.84
Married	45	73.77
Divorced	4	6.56
Widowed	6	9.84
Profession		
Artist	1	1.64
Carpenter	1	1.64
Driver	1	1.64
Farmer	9	14.75
Finance	1	1.64
House wife	18	29.51
National Service	11	18.03
Shop keeper	1	1.64
Teacher	4	6.56
Technician	1	1.64
Trade	2	3.28
Waiter	2	3.28
Not available	9	14.75

Socio-demographic characteristics

The socio-demographic characteristics of the ICU patients are given in Table 1. The results showed that 60.66% of the patients were males and almost three fourth (73.77%) were married. By age group, the average age of the patient was 52.07 (SD= 19.08) years. By profession, most of the patients were housewives (29.51%) followed by national service (18.03%), farmers (14.75%).

Anthropometric measurements of the patients

Comparison of the anthropometric measurements among the

patients during admission and discharge was performed using paired t-test (Table 2). The result showed that there was significantly lower (p<0.001) weight during discharge (M=58.05, SD=10.92) as compared to admission (M=60.8, SD=11.5). Similarly, there was significantly lower BMI among the patients during discharge (M=20.52, SD=3.12) as compared to that of admission (M=21.50, SD=3.33). MUAC during discharge (M=22.11, SD=2.51) was significantly lower as that of admission (M=23.5, SD=2.59).

Table 2: Anthropometric measurements of the patients on ICU during admission and discharge.

Variables	Admission	Discharge	MD(95% CI)	Paired T-test
	M ± SD	M ± SD		p-value
Weight	60.8 ± 11.5	58.05 ± 10.92	2.75 (1.74, 3.76)	<0.001
BMI	21.50 ± 3.33	20.52 ± 3.12	0.98 (0.62, 1.33)	<0.001
MUAC	23.5 ± 2.59	22.11 ± 2.51	1.39 (0.95, 1.84)	<0.001

BMI: Body Mass Index; MUAC: Middle Upper Arm Circumference; MD: Mean Difference; CI: Confidence Interval.

Subjective assessment of nutritional status during admission and discharge

History of the patients was taken from the patients and family during both admission and discharge. During admission 83.6% of the patients gave the history themselves, while 88.5% of the patients gave the history themselves during the discharge. Moreover, all the patients passed through physical examination.

Comparison of the nutritional parameters during the admission and discharge was performed for the 7-point subjective global assessment items. The results are displayed in Table 3. Almost half of the patients reported that weight loss in the last 6 months was <3% during admission (50.82%) and discharge (49.18%). Regarding dietary intake in past 2 weeks, 37.70% said well (>3/4 to 1 share of usual meal) during admission but 27.87% said well (>3/4 to 1 share of usual meal) during discharge. Regarding the GI symptoms that persisted for >2 weeks, 37.70% reported no symptoms followed by some symptoms 2 to 3 times a day but improving (29.51%) during admission. Similarly, 34.43% responded that there was no GI symptom that persisted for >2 weeks followed by some symptoms 2 to 3 times a day but improving (26.23%). No significant difference in nausea, vomiting, and diarrhea was observed during admission and discharge. With regards to functional status (nutrition related), 67.21% said that there was mild to moderate loss of stamina during admission, but only 32.79% responded the same during discharge. On the same parameter, severe loss of functional ability was observed in 29.51% during admission but increased to 54.10% during discharge. Almost half (45.90%) of the patients reported that there was no increase in metabolic demand during admission, but 21.31% said it during discharge. Severe depletion in muscle wasting was reported by only 6.56 during admission while 26.23% reported so during discharge. No depletion in all areas of the fat stores was reported by 45.90% and 14.75% during admission and discharge respectively. On the other hand, severe depletion of fat stores was reported by 3.28% during admission but 22.95% during discharge. No nutrition related edema was reported by 88.52% of the patients during admission but nearly half (52.46%) reported so during discharge.

The results of the Wilcoxon Signed ranks test are summarized in Table 4. The result showed that there were a total of 8 patients whose weight has declined from admission to discharge (p=0.005). Dietary intake in the past two weeks was observed to increase in only 2 patients but declined in 15 patients; while remaining 44 had no change in dietary intake, leading to an overall decrease in dietary intake (p=0.002). The change in GI symptoms (that persisted for >2 weeks) was observed to improve in 6 patients but went worsened in 14 patients, with no significant difference between admission and discharge (p=0.284). No significant difference in functional status (nutrition related) was also observed between admission and discharge (p=0.139), considering the recovery observed among 12 patients to those who get worsened in 22 patients. The remaining results on disease state affecting nutritional requirements, muscle wasting, fat stores, and edema (nutrition related) are shown in Table 4.

Table 3: Comparison of the 7-point subjective global assessment items during admission and discharge.

Parameters	Admission n (%)	Discharge n (%)
Weight loss (in last 6 months)		(p=0.005)
>15%	0 (0)	0 (0)
10 to 15%	0 (0)	1 (1.64)
7 to 10%	3 (4.92)	2 (3.28)
5% to 7%	4 (6.56)	6 (9.84)
3 to 5%	10 (16.39)	11 (18.03)
<3%	31 (50.82)	30 (49.18)
0%	13 (21.31)	11 (18.03)
Dietary intake in past 2 weeks		(p=0.002)
Starvation <1/4 of usual meal	0 (0)	1 (1.64)
Poor <1/2 of usual meal but decreasing/no change	2 (3.28)	1 (1.64)
Poor <1/2 of usual meal but increasing	5 (8.20)	5 (8.20)
Border line 1/2 to ¾ usual meal no change/ decreasing	2 (3.28)	8 (13.11)
Border line 1/2 to 3/4 meal but increasing	18 (29.51)	20 (32.79)
Good >3/4 to 1 share of usual meal	23 (37.70)	17 (27.87)
Good – full share of usual meal	11 (18.03)	9 (14.75)
GI symptoms (that persisted for > 2 weeks) (p=0.284)[$]		
Some or all symptoms >3 times/day	2 (3.28)	1 (1.64)
Some symptoms 2 to 3 times/day- getting worse	1 (1.64)	0 (0)
Some symptoms 2 to 3 times/day- no change	5 (8.20)	12 (19.67)
Some symptoms 2 to 3 times/day- improving	18 (29.51)	16 (26.23)
Very few intermittent symptoms 1 times/day	12 (19.67)	11 (18.03)
No symptoms	23 (37.70)	21 (34.43)
GI symptom (Nausea)		(p=0.893)*
Yes	16 (26.23)	17 (27.87)
No	45 (73.77)	44 (72.13)
GI symptom (Vomiting)		(p=0.582)*
Yes	24 (39.34)	27 (44.26)
No	37 (60.66)	34 (55.74)

GI symptom (Diarrhea)		(p=1.000)*
Yes	14 (22.95)	14 (22.95)
No	47 (77.05)	47 (77.05)
Functional status (nutrition related) (p=0.139)$		
Severe loss of functional ability (bedridden)	18 (29.51)	33 (54.10)
Mild to moderate loss of stamina	41 (67.21)	20 (32.79)
Full functional capacity	2 (3.28)	8 (13.11)
Disease state affecting nutritional requirements (p=0.001)$		
Drastic increase in metabolic demand (high stress)	5 (8.20)	11 (18.03)
Mild to moderate increase in metabolic demand (moderate stress)	28 (45.90)	37 (60.66)
No increase in metabolic demand (no or low stress)	28 (45.90)	13 (21.31)
Muscle wasting	(p<0.001)$	
Severe depletion	4 (6.56)	16 (26.23)
Mild to moderate depletion	28 (45.90)	35 (57.38)
No depletion in all areas	29 (47.54)	10 (16.39)
Fat stores	(p<0.001)$	
Severe depletion	2 (3.28)	14 (22.95)
Mild to moderate depletion	31 (50.82)	38 (62.30)
No depletion in all areas	28 (45.90)	9 (14.75)
Edema (nutrition related)		(p<0.001)$
Severe edema	1 (1.64)	2 (3.28)
Mild to moderate edema	6 (9.84)	27 (44.26)
No edema	54 (88.52)	32 (52.46)

$Wilcoxon Signed ranks test for paired data was used; *McNemar's test was used.

Table 4: Comparison of the nutritional parameters between admission and discharge using Wilcoxon Signed ranks test.

Nutritional parameters	Positive	Negative	Ties	p-value
Weight loss (in last 6 months)	0	8	53	0.005
Dietary intake in past 2 weeks	2	15	44	0.002
GI symptoms (that persisted for > 2 weeks)	6	14	41	0.284
Functional status (nutrition related)	12	22	27	0.139
Disease state affecting nutritional requirements	9	30	22	0.001
Muscle wasting	7	36	18	<0.001
Fat stores	5	35	21	<0.001
Edema (nutrition related)	2	24	35	<0.001

Nutritional status overall SGA rating

Comparison of the nutritional status for the overall SGA rating was performed between the admission and discharge, using McNemar's test. The result revealed that the number of well-nourished patients increased from 4 during admission to 7 during discharge. However, as per the McNemar's test, there is no significant difference in the overall nutritional status of the patients between admission and discharge (p=0.453).

Distribution of the patients during admission and discharge by nutritional status is shown in Figure 1. The result revealed that slight increase in well-nourished patients from admission (6.6%) to discharge (11.5%). On the contrary, the percentage of patients who were mild or moderately nourished declined from 93.4% in admission to 88.5% in discharge. The results are shown in Figure 1.

Table 5: Comparison of the overall nutritional status using SGA rating.

		Discharge		McNemar's Test (p-value)	Decision
		Mild or moderately malnourished	Well nourished		
Admission	Mild or moderately malnourished	52	5	0.453	Retain the null hypothesis
	Well nourished	2	2		

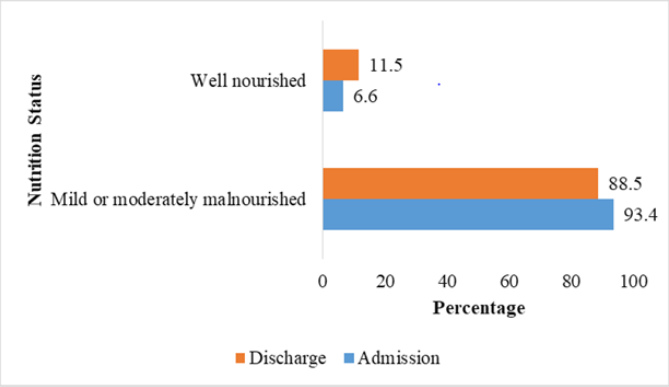

Figure 1: Percentage distribution of overall nutritional status during admission and discharge.

Discussion

Over view of the study

The significance of nutrition in the hospital setting (and especially in ICU) cannot be overstated. Critical illness is typically associated with a catabolic stress state in which patients demonstrate a systemic inflammatory response coupled with complications of, increased infectious morbidity, multiple organ dysfunction, prolonged hospitalization, and disproportionate mortality, so assessment of nutritional status and taking of appropriate intervention to malnutrition is advisable.

Socio demographic characteristics

In the current study the demographic characteristics showed that the average age of the patients was 52.07 years (SD= 19.08). Consistent to the current study, by [15], showed mean age of the study participants was 49 years (SD=21.2). However, the study by [19], reported an overall mean age of 64.75 years (SD =16.21) which is dissimilar to our findings. The present study found that the majority of participants were males (60%), married (73%) and housewives (29%) according to sex, marital status and profession respectively. These findings suggest a predominance of males, married individuals, and housewives, which may be attributed to the fact that many ICU admissions result from trauma (motor vehicle accident), cardiovascular diseases and respiratory diseases. This is consistent with a study by [12,13], which reported 61.2%

males and 38.7% females and 67.32% male participants respectively.

Anthropometric measurements

Anthropometric measurements of the patients during ICU admission and discharge, including weight, BMI, and MUAC were assessed, and the results that showed there were significant decrease ($p<0.001$). Specifically, Weight decreased from a mean of 60.8kg (SD=11.5) at admission to 58.05kg (SD=10.92) at discharge. Similarly, BMI decreased from 21.50kg/m^2 (SD=3.33) to 20.52kg/m^2 (SD=3.12), and MUAC decreased from 23.5cm (SD=2.59) to 22.11cm (SD =2.51). These changes might be influenced by the increased metabolic demand during critical illness, which leads to catabolism, inadequate enteral feeding, the absence of parenteral feeding and nutritional therapists, and in some instances patients were kept NPO. These significant changes in the anthropometric measurements carry a substantial clinical significance, such as muscle wasting and functional impairment, increased in morbidity and mortality, and impact on recovery. These study results are similar to a study conducted by [15] reported a decrease in mean BMI from 25.7kg/m^2 at admission to 22.8kg/m^2 at discharge, a decrease in mean MUAC from 30.1cm (SD=4.5) to 27.6cm (SD=4), and a decrease in mean weight from 73.4kg (SD= 12.7) to 66.6kg (SD=11.6). Additionally, [24] has demonstrated lower levels of weight, BMI, and MUAC at discharge compared to admission.

Another similar studies reported by [25], showed that a mean weight of the population was 76kg (SD=17), a mean BMI of 25.2kg/m^2 (SD=5), and a mean MUAC of 31cm (SD=4) at admission. At discharge the Mean difference in weight was -0.4kg (SD=4.6), and the mean difference in MUAC was -0.7cm (SD=1.0).

Overall, the anthropometric measurements indicated a decline in the nutritional status of most ICU admitted patients from admission to discharge. Even though, some research conducted by [26] reported that there were significantly increase in percent of ideal body weight (IBW) and BMI. They also concluded in their study, increase in critically ill patients may be due to the extravascular space expansion, resulting in edema. Therefore, any parameter involving weight may be unreliable and underestimate under nutrition.

Subjective Global Assessment (SGA)

In the analysis of the patient weight loss, approximately half of the patients reported a weight loss of 50.80% in the last six months at admission and 49.8% at discharge. This suggests that weight loss in the past six months is primarily due to the diseases process, as most ICU admitted patients are not able to recall the reduction of previous ideal body weight. The difference in weight loss from admission to discharge may be attributed to a good prognosis in some patients, who felt they had gain weight during their ICU stay. Similar study conducted by [12] reported that 57% of participants complained of weight loss in the last six months. Regarding dietary intake in the past two week, 37.7% reported good intake (>3/4) at admission, while 27.87% reported good intake (>3/4 to 1 share of usual meal) at discharge. This reduction might be associated with psychological and physical stress, which leads to appetite loss and personal dietary intake preferences. Conversely, another study conducted by [27] reported that 96% of patients had changed their dietary intake within two weeks. According to the functional capacity, 67.21% reported mild to moderate loss of stamina at admission, while only 32.79% reported this at discharge. Severe loss of functional ability increased from 29.51% at admission to 54.10% at discharge. This may be associated with longer hospital stays and prolonged immobility, disease severity, predisposing patients to hospital acquired infections and feelings of hopelessness.

A Similar study conducted by [28], Found that 67% of participants had mild to moderate functional limitation, and 33 % were bed ridden out of the 98 participants. In terms of physical examination using SGA parameters, severe depletion in muscle wasting increased from 6.56% at admission to 26.23% discharge. No depletion in all areas of the fat stores decreased from 45.90% at admission to 14.75% at discharge, while severe depletion of fat stores increased from 3.28% to 22.95%. This is due to the increased catabolic process during illness. No nutrition-related edema decreased from 88.52% at admission to 52.46% at discharge, which may be associated with low protein intake, hypoalbuminemia, fluid overload and development of organ failure. A Similar study conducted by [12] on physical examination of muscle depletion, fat depletion, and edema reported 27%, 31%, and 30% of participants, respectively.

Nutritional Status overall SGA rating

A Comparison of the overall nutritional status using the SGA rating between admission and discharge, using McNemar's test, revealed a slight increase in well-nourished patients from 6.6% at admission to11.5% at discharge. Conversely, the percentage of mild or moderately malnourished patients decreased from 93.4% at admission to 88.5% at discharge. However, as per the McNemar's test, there was no significant difference in the overall nutritional status of the participants between admission and discharge ($p=0.453$). The lack of a statistically significant difference in the overall SGA rating between admission and discharge, despite significant anthropometric changes might be the duration of ICU stay in some patients might not have been long enough for significant changes in overall SGA rating to manifest. While, anthropometric changes can occur relatively quickly, changes in overall SGA classification may require a more extended period of nutritional decline or improvement. Another reason might be patients difficulty in remembering their dietary intake and pre-admission weight loss accurately, heterogeneity of patient population, and fluid shift and edema. This is similar to a study that conducted by [17] reported that a decrease in malnutrition prevalence from 47.6% at admission to 38.1% at discharge using NRS 2002 method.

On the contrary to the current study a research conducted by [15], showed a significant increment in the prevalence of malnutrition among the critically ill patients on ICU discharge day (58.62%) compared to ICU admission day (28.8%) according to the SGA questionnaire. Similar to this rate of malnutrition on ICU admission day was between about 30% and 50% [29] and similarly a study by

[30] reported a 20% to 50% rate of hospital-related malnutrition.

In our study the prevalence of mild or moderately malnourished patients decreased from 93.4% at admission to 88.5% at discharge, and well-nourished patients increased from 6.6% to 11.5%, compared with anthropometric measurements ($p<0.001$). From the nutrition assessment tool of SGA, the result we got has indicated that SGA measurement alone cannot be a reliable indicator of nutritional status of an individual admitted in critical care unit, because its mainly subjective data. On contrary a study conducted by [31], has indicated that anthropometric measurement alone cannot be a reliable indicator of nutritional status of an individual admitted in critical care unit.

Conclusion

This study investigated the nutritional status of patients admitted to the adult intensive care unit in Orrota National Referral Hospital from the time of admission to discharge. In the study reported that the majority of patients presented with mild or moderately malnourishment, and there was slightly increasing to the number of well-nourished patients during their stay. However, as per the McNemar's test, there is no significant difference in the overall nutritional status of the patients between admission and discharge using SGA questionnaire. According the anthropometric measurements, the result showed that there was significantly lower in weight, BMI, and MUAC from admission to discharge.

Limitation of the study

The study conducted only in adult ICU, which is the only area in the country, that's why we use small number of patients, and it is difficult to compare and contrast the finding with other ICU. We studied a heterogeneous group of patients with various diagnoses, with varying outcomes. Biochemical measurements were not used due to its shortage, which makes the work and finding the results much easier.

Declaration

We the principal authors hereby declare that, we are the sole authors of this thesis entitled "assessment of nutritional status for patients admitted to adult intensive care unit in Orotta national referral hospital, Eritrea 2025". This is our creative effort and the thesis or any part thereof has not been submitted for the award of a degree to any other university or college.

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