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Malnutrition Among Elderly: Prevalence, factors and the effect of Nutritional Therapy

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ABSTRACT

Background and Objective: This study is being done to identify the prevalence of malnutrition among elderly patients in Obaidullah Senior Citizen Hospital, Ras Al Khaimah (RAK), United Arab Emirates (UAE) by Nutritional risk screening. Required nutritional therapy was implemented in the nutritional care plan to combat malnutrition among these elderly patients.

Material and Methods: A retrospective observational study was conducted in Obaidullah Senior Citizen Hospital. The subjects selected for the study were included based on the criteria of age ≥ 65 years, admitted between Jan 2017 to Dec 2019, without any organ transplants and whose length of stay was more than 72 hours. Initial information like age, anthropometric measurements, clinical diagnosis and date of admission were obtained from the patient's medical records. We used NRS 2002 and the recommendations supported by the Australia & New Zealand Society for Geriatric Medicine to determine the cut-off for BMI. SPSS software used to analyze the data. Paired t-test and Chi-square test were used.

Results: 65 participants were included within the age group of 65 to 107 years with a mean of 82 years and SD of 10.8 years. Malnutrition was 43% using the NRS 2002 score. Based on the recommendations supported by the Australia & New Zealand Society for Geriatric Medicine a total of 51 patients were found to have a BMI of less than 23 kg/m^2 and were classified as underweight based on these recommendations. All the patients in the study group were treated with appropriate nutritional therapy to improve their nutritional status by providing required nutritional therapy using different types of feeding methods. Overall 23% of patients achieved a healthy weight and 4.6% became overweight after the implementation of nutritional therapy. There was a statistically significant association observed in the case of NRS initial and NRS final scores. The chance of death for patients with NRS-initial score more than or equal to 3 is 7.2 times more compared to those with NRS-initial score < 3 . Similarly, the chance of death for patients with an NRS-final score more than or equal to 3 is 3.9 times more compared to those with an NRS-final score < 3 .

Conclusion: Prevalence of malnutrition was 43% among the elderly. Statistically significant factors associated with outcome (mortality) are NRS-initial and NRS-final; the degree of association observed was high in NRS-initial compared to NRS-final. The Australia & New Zealand Society for Geriatric Medicine to identify the risk of malnutrition among elderly using BMI" may be used more effectively to identify patients with malnutrition.

KEYWORDS: Malnutrition, Nutritional risk, Assessment, comorbidities

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I. INTRODUCTION

Nutritional status in older adults is compromised due to aging, physical changes associated with it, psychological, cognitive, social factors and other comorbidities. The prevalence of malnutrition increases to 30-65% in elderly admitted in hospitals and home care facilities, as health and functional capacities deteriorate with age [1]. During hospital admission anthropometric, biochemical and clinical signs of malnutrition as well as biochemical evidence of micronutrient deficiencies are frequently observed leading to weight loss and poor nutritional status during hospitalization [2]. Increased risk of short-term mortality, poor quality of life and increase health care costs are the negative effects of malnutrition [3].

Most elderly are at risk of malnutrition, a condition that occurs in underweight, overweight and obese adults whose nutritional needs are unmet. According to the 2016 systematic review of 54 studies, up to 83% community-living adults aged 65 and older are at risk for malnutrition using validated tools to screen malnutrition [4]. Another review was conducted in 2013 which included 77 studies on nutritional problems in nursing home residents found that malnutrition prevalence rates varied widely, though most studies found that 20% to 39% of residents were malnourished and 47% to 62% were at risk of malnutrition [5].

Nutritional risk screening (NRS2002) is considered to be the gold standard in nutritional risk investigations and is a strong and independent risk score for malnutrition-associated mortality and adverse outcomes [6]. It is based on the concept that nutritional support is indicated in patients who are severely ill with increased nutritional requirements, or who are severely undernourished, or who have certain degrees of severity of disease in combination with certain degrees of under nutrition. Degrees of severity of disease and under nutrition was defined as absent, mild, moderate or severe from data sets in a selected number of randomized controlled trials (RCTs) and converted to a numeric score which helps to distinguish between trials with a positive effect vs no effect, and it can probably identify patients who are likely to benefit from nutritional support" [7].

In classifying BMI for elderly population there are no existing evidence-based practice guidelines to assist clinicians. However, the WHO cut-offs may not be appropriate in increasing age according to strong emerging evidence. A recent meta-analysis among elderly, aged ≥ 65 years found a U-shaped association between all-cause mortality, with mortality risk lowest at BMI 24 - 31 kg/m². This relationship remained when adjusting for smoking status, early death, pre-existing disease and geographical location. "Therefore,

in practice, it may be appropriate to adjust BMI classifications for people aged ≥ 65 years as Underweight < 23 kg/m², Healthy weight 24-30 kg/m² and Overweight > 30 kg/m². This recommendation is supported by the Australia & New Zealand Society for Geriatric Medicine" [8].

Due to multiple chronic disorders, long-term use of several medications is common among elderly which causes nausea, xerostomia, anorexia or influence olfactory and gustatory abilities thereby suppressing food intake. The bioavailability of nutrients decreases due to these medications as well as gastrointestinal diseases. Long-term use of medications in conjunction with the metabolic and digestive changes that occur in elderly may increase the potential for drug-nutrient interactions [9],[10]. Dietary choices, nutritional needs, and food intake among the geriatric population is affected by chronic health conditions such as hypertension, cardiovascular disease, type 2 diabetes, and arthritis.

Among the hospitalized patient's malnutrition is a serious but under-diagnosed problem and approximately one-third of the admitted patients may become malnourished during their stay [11]. Oral supplemental nutrition is required along with a healthy diet to improve the nutritional status of these patients. "WHO defines Oral supplemental nutrition as the provision of additional high-quality protein, calories and adequate amounts of vitamins and minerals tailored to the individual's needs assessed by a trained health care professional" [12]. Enteral feeding pumps are considered as the most accurate means of enteral feeding provision across all patient groups and health care settings. Automatic priming, dose setting, advanced memory, and the continuing use of easily loaded cassettes, for one-handed consistent pump setup, are the integral features. Flow rate selection offers incremental increases in delivery; important in critical care settings where low infusion rates are crucial in maintaining gut integrity and where tolerance and maximizing the feeding volume are finely balanced [13], [14].

This study was done to identify the prevalence of malnutrition among elderly patients in Obaidullah Senior Citizen Hospital, Ras Al Khaimah (RAK), United Arab Emirates (UAE) by nutritional screening and assessment of nutritional status. Therefore, to combat malnutrition, the existing nutritional care plan for the elderly was reviewed and the gaps were identified. Changes were implemented to improve their nutritional status through early nutritional intervention. Required nutritional therapy was implemented in the nutritional care plan to combat malnutrition among these elderly patients.

II. MATERIALS AND METHODS

A retrospective observational study was conducted in Obaidullah Senior Citizen Hospital. Institutional ethics committee approval was obtained before conducting the study (Approval reference number: MOHAP/REC/2019/45-2019-MOH-DR). The subjects selected for the study were included based on the criteria of age ≥ 65 years, admitted between Jan 2017 to Dec 2019, without any organ transplants and whose length of stay was more than 72 hours. Any patients not belonging to this criterion of selection were excluded from the study. A total of 65 patients were included in the study based on the inclusion criteria. Data of all elderly patients (≥ 65 years) was collected to identify the prevalence of malnutrition by nutritional screening.

We used NRS 2002 which is the gold standard in nutritional risk investigations to identify malnourished patients. Initial information like age, anthropometric measurements, clinical diagnosis and date of admission were obtained from the patient's medical records. Based on the recommendations supported by the Australia & New Zealand Society for Geriatric Medicine, the BMI cut-offs for the elderly were used to identify patients at risk of malnutrition. The nutritional assessment included parameters like medical diagnosis, medications, allergies, physical appearance, nutritional diagnosis, dietary assessment, nutrition risk factors, appetite, food preferences, nutritional concerns, type of feeding, basal energy expenditure, estimated energy requirements, estimated protein requirements, and estimated fluid requirements. Nutritional assessment and nutritional intervention were carried out for all the patients who were malnourished, those at risk of malnutrition and to prevent malnutrition among those who were well-nourished. Patients were assessed based on their caloric needs and nutrition intervention was provided. Patients who were not able to meet the nutritional requirements through oral feeds were supported with nutrition supplements. Patients who were unable to feed orally were supported with enteral nutrition. Improved patient outcomes were recorded by improving their nutritional intake either orally or enterally with different methods of feeding. The different feeding methods used were oral feeds, enteral intermittent feeds and enteral continuous pump feeds as per the nutritional assessment of each patient. Medical nutrition formulas were given either as intermittent feeds or continuous pump feeds. Supplemental nutritional therapy is required to improve nutritional status among the elderly. Considering this fact, we tried to incorporate different feeding methods to improve treatment outcomes.

Data of 65 elderly patients was analyzed using SPSS (Ver-26) software. Paired t-test was used to test

the difference before and after the intervention. Chi-square test was used to test the association between categorical variables. $P < 0.05$ was considered statistically significant.

III. RESULTS

In the present study, 65 participants were included within the age group of 65 to 107 years with a mean of 82 years and SD of 10.8 years. The age distribution of the participants is given in table -1. More than 60% were in the age group of 76-95 years and only two patients (3.1%) were above the age of 105 years. Among the total, 29 (44.6%) were males and 36 (55.4%) were females. With regard to comorbidities, 45 (69.2%) reported hypertension, 43 (66.2%) had CVA, 29 (44.6%) had diabetes mellitus and 13 (20%) had dementia.

Table -1 Age distribution of participants

Age group	Frequency	Percent
65-75	18	27.7
76-85	20	30.8
86-95	21	32.3
96-105	4	6.2
>105	2	3.1
Total	65	100.0

In our study, we observed malnutrition was 43% using the NRS 2002 score. Concerning gender, among them, 50% of females and 34.5% of males were malnourished as per NRS 2002 score (Table-2).

Table -2 Malnutrition in Elderly patients

NRS score	Male	Female	Patients with malnutrition
Score ≥ 3 (Nutritional risk)	10 (34.5%)	18 (50.0%)	28 (43.1%)
Score < 3 (Not at risk)	19 (65.5%)	18 (50.0%)	37 (56.9%)
Total	29 (100%)	36 (100%)	65 (100%)

As per the recent consensus definition released by ESPEN one of the options is to use BMI for identifying the patients at risk of malnutrition. Therefore, based on the recommendations supported by the Australia & New Zealand Society for Geriatric Medicine we proceeded to fulfill the criteria of identifying the patients at risk of malnutrition. A total of 51 patients were found to have a BMI of less than 23 kg/m^2 and were classified as underweight based on these recommendations. These 51 patients were at risk of malnutrition. Only four patients out of all the 65 subjects were found to be obese with BMI $> 30 \text{ kg/m}^2$ (Table 3).

All the patients in the study group were treated with appropriate nutritional therapy to improve their nutritional status by providing required nutritional therapy using different types of feeding methods. Among them, 35.4% were with oral feeds, 24.6% were with enteral intermittent-bolus feeds and 40% were with enteral continuous pump feeds. The improvement in the nutritional status was observed as 17.3% (healthy weight) among those with oral feeds, 12.5% with enteral intermittent bolus feeds and 34.6% with enteral continuous pump feeds. The outcome improved drastically with continuous pump feeds due to slow flow rate and better absorption. Overall 23% of patients achieved a healthy weight and 4.6% became overweight after the implementation of nutritional therapy (Figure-I).

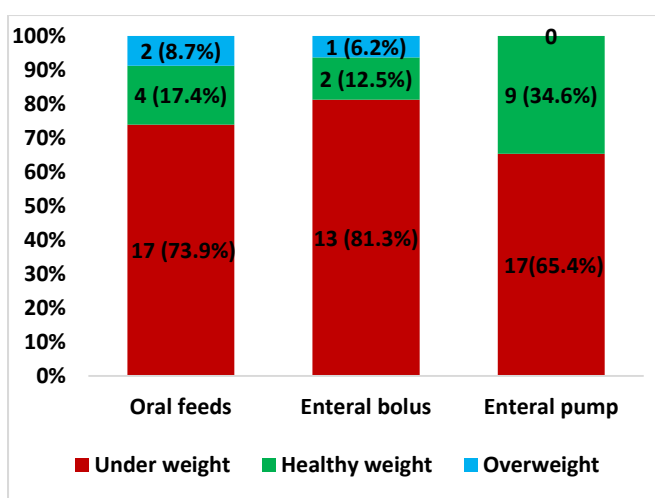


Figure I: Distribution of BMI according to different types of feeding after intervention

The outcome showed 23% improved to have a healthy weight and around 5% became overweight (Table 3).

Table- 3 Nutritional risk status in the elderly using BMI recommendations supported by the Australia & New Zealand Society for Geriatric Medicine

BMI	Before nutritional therapy		After nutritional therapy	
	No.	%	No.	%
Underweight (<23 kg/m ²)	51	78.4	47	72.3
Healthy weight (24-30 kg/m ²)	10	15.3	15	23.1
Overweight (>30 kg/m ²)	4	6.1	3	4.6
Total	65		65	

The mean difference in weight before and after the intervention was not statistically significant. An increase in weight was observed after the intervention except those with oral feed. The increase observed was more among patients who fed through enteral intermittent bolus and enteral continuous pump feeds compared to the Enteral bolus. The correlation coefficient between age and BMI was very weak (-0.14) and not significant statistically. The mean weight of patients before and after oral supplemental nutrition is given in table -4. The difference was not significant statistically.

Table -4 Mean weight of patients before and after required nutritional therapy

Type of feed	Weight in Kg	Mean	N	SD	P
Oral feeds	Before	55.8	23	14.4	NS
	After	55.5	23	12.9	
Enteral bolus	Before	49.9	16	12.0	NS
	After	50.3	16	12.9	
Enteral pump	Before	47.5	26	9.5	NS
	After	49.4	26	8.9	

The outcome of the participants was divided into 'alive' and 'expired'. Among the total, 48 were alive and 17 expired. The association between the outcome and other variables such as age, gender, number of conditions, NRS initial score and NRS final score were assessed using the Chi-square test. Statistically significant association was observed in case of NRS initial and NRS final scores. Among those with NRS initial score <3, only 4 (10.8%) expired whereas those with NRS initial score ≥3, 13 (46.4%) expired. In the case of NRS-final score also those with score <3, 9 (18.8%) expired whereas those with score ≥3, 8 (47.1%) expired. The details are given in table 5.

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Table- 5

Variables	Group	Outcome				Total	P
		Alive		Expired			
		No.	%	No.	%		
Gender	Male	22	75.9	7	24.1	29	NS
	Female	26	72.2	10	27.8		
Age	65-85	27	71.1	11	28.9	38	NS
	>85	21	77.8	6	22.2	27	
No. of conditions	<=2	37	75.5	12	24.5	49	NS
	>2	11	68.8	5	31.2	16	
NRS-Initial	<3	33	89.2	4	10.8	37	<0.001
	>=3	15	53.6	13	46.4	28	
NRS-final	<3	39	81.3	9	18.8	48	<0.05
	>=3	9	52.9	8	47.1	17	

The variables showed a statistically significant association (NRS-initial, NRS-final) are included in the simple binary logistic regression to calculate the degree of association with the outcome variable. The chance of death for patients with NRS-initial score more than or equal to 3 is 7.2 times more compared to those with NRS-initial score <3. Similarly, the chance of death for patients with NRS-final score more than or equal to 3 is 3.9 times more compared to those with NRS-final score <3 (Table 6).

Table- 6

Crude OR and Confidence interval for variables associated with death

Variable	Group	OR	CI	P
NRS-Initial	<3	1.0	--	<0.01
	≥3	7.2	2.0-25.6	
NRS-final	<3	1.0	--	<0.05
	≥3	3.9	1.2-12.8	

IV. DISCUSSION

The current study conducted among 65 elderly patients indicates that 43% of the study participants were malnourished according to NRS 2002 score compared to 57.6% in a study conducted in Zagreb, Croatia using NRS 2002 score [15]. We found 78.4% were at risk of malnutrition in our study based on the recommendations by the Australia & New Zealand Society for Geriatric Medicine to identify the risk of malnutrition among the elderly using BMI cutoff which is attributed to a variety of age-related changes which predispose the elderly to malnutrition by complicating and reducing dietary intake. Slow basal metabolic rate and loss of lean body mass with age also contribute to the physiological anorexia of ageing. The prevalence of malnutrition was high in our study as the mean age was high (82 years compared to the Croatia study where the mean age was 70 years) and more than 60% of patients were in the age group of 75-95 years. The nutritional status among the elderly can be affected adversely even with a minor stress of short duration. "The term "geriatric syndrome" is used to capture those clinical conditions in older persons that do not fit into discrete disease categories. Many of the most common conditions cared for by geriatricians, including delirium, falls, frailty, dizziness, syncope and urinary incontinence, are classified as geriatric syndromes" [16]. Concerning comorbidities, the most prevalent morbidity reported is hypertension (69.2%) compared to a study conducted in Saudi Arabia which showed a prevalence of (59.1%), CVA (66.2%) vs (34.9%), diabetes mellitus (44.6%) vs (57.3%) and dementia. (20%) vs (28.5%) [17]. In patients having chronic diseases a subclinical inflammatory state leads to increased production of catabolic cytokines, decreased appetite and increased rate of muscle catabolism. The chance of mortality among these patients before intervention with NRS 2002 score ≥3 is 7.2 times more compared to those with NRS-initial score <3. Similarly, the chance of mortality for patients with NRS-final score ≥3 is 3.9 times more compared to those with NRS-final score <3 which was statistically significant. Therefore, we observed that malnutrition is associated with several adverse clinical outcomes and is mostly thought to be

modifiable, it is important to develop and implement adequate interventions to prevent, diagnose, and treat malnutrition. Based on this recommendation, supplementation was considered an effective intervention strategy to improve the nutritional status of these patients. Overall 23% of patients achieved healthy weight and 4.6% became overweight after the implementation of nutritional therapy.

In our study, we could not observe any significant association between gender, age, comorbidities and outcome. However, the findings from our study indicate that intervention should not only target the nutritional status but also the problems in functional, social and somatic domain.

Our study has several strengths like the use of a validated questionnaire to elicit the prevalence of malnutrition and an extensive and complete electronic data. Small sample size is the limitation of the study.

V. CONCLUSION

In our study, the prevalence of malnutrition was 43% among the elderly. Nutrition intervention with adequate nutritional therapy improved the nutritional status of 23% of elderly patients. The statistically significant factors associated with outcome (mortality) are NRS-initial and NRS-final; the degree of association observed was high in NRS-initial compared to NRS-final.

Another important conclusion from this study is that "the recommendations of Australian & New Zealand Society for Geriatric Medicine to identify the risk of malnutrition among elderly using BMI" may be more effectively used to find the risk of malnutrition among elderly.

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