



Malnutrition and Influencing Factors in Aged Patients: A Hospital Based Cross-sectional Study

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Abstract

Malnutrition refers to a nutritional ailment that functionally and clinically distresses the body. It is very common in aged people. The nutritional status of this vulnerable group in low-income countries does not remain focused upon. Therefore, this study was designed to investigate the magnitude of malnutrition and to correlate different factors amongst aged patients administered in a reputed Medical College Hospital in Dinajpur district, Bangladesh. An observational cross-sectional study was conducted to evaluate the nutritional eminence of hospitalized aged patients through the original 18-item full Mini Nutritional Assessment (MNA) screening tool. We evaluated 238 patients in this study. Of whom, 144 (60.5%) were men and 94 (39.5%) were women, whose average age were 68.7 ± 7 years. MNA revealed a prevalence of 46.2% for risk of malnutrition, 31.9% for malnutrition, and 21.8% for within normal. Aged patients who lived alone were malnourished than the patients living with others ($p < 0.001$). Laboratory investigation revealed that malnourished individuals had substantively decreased levels of serum albumin (2.5 ± 0.7 g/dl), hemoglobin (10.3 ± 1.7 g/dl), lymphocytes ($1.4 \pm 0.9 \times 10^9/L$), and cholesterol (150 ± 35.9 mg/dl). About forty-nine and 32.9 percent of individuals with malnutrition had a severe or a moderate decrease in food intakes respectively. Different health problems collectively had influenced malnutrition. Malnourished patients had a tendency to hospitalize for a longer period of time. Thus malnutrition in hospitalized aged patients was highly prevalent and was associated with low food intake, the presence of health problems, and prolonged length of hospital stay.



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Introduction

Malnutrition is called a nutritional ailment that functionally and clinically distresses the human body.¹ It is very common in aged hospitalized people.² Healthcare personnel identify hospital malnutrition as a current problem. A study gathered data from 12 countries stated that about 23% of aged people are malnourished. The prevalence rate of malnutrition was 50.5% in rehabilitation centers, 13.8% in nursing homes, 38.7% in hospitals, and 5.8% in communities.³ The mortality rate of aged hospitalized patients increases 20-50% due to malnutrition.² Malnutrition is related to numerous undesirable health effects in aged people, including patients' response to treatment, morbidity, and mortality, length of hospital stay,^{2, 4, 5} risks of complications, healthcare expenses, functional injury,⁶ quality of life,⁷ prognosis, electrolyte imbalances, muscle wasting, increased infections, and fatigue.^{8, 9}

The degree and magnitude of malnutrition in aged people just begins to be understood. When people get aged, many physiological changes arise that influence nutritional condition. Half of all community dwelling aged people suffer from chronic pain which may contribute to loss of appetite and decrease of food intake.¹⁰ Different sensory problems with vision, odor, and taste, change the hunger in different manner that direct to a reduced food intake in aged people. These changes upset the digestive tract and subsequently modify the digestion, absorption as well as utilization of food, which results in specific nutritional deficiency or malnutrition. Such malnutrition becomes more remarkable and noticeable when aged persons are hospitalized. Admitted aged patients are more vulnerable due to their weak immune system, catabolic state, less or delayed nutritional support, some investigations require fasting and presenting disease manifestations. These aspects raise the nutritional requirements and decline the nutritional spares that results in malnutrition.¹¹

Most of the low- and middle-income countries in the world including Bangladesh having a pyramid shaped population structure which indicates a population with progressive aging. The increase growth of this population group equally increases the rate of chronic disease.¹² Aging process related to different physiological changes which act as predisposing factors for aged to fall into nutritional

problem.¹³ Besides these outcomes, numerous reports sought that malnutrition was left under-recognized in the hospitalized patients.¹⁴ This signifies the establishment of necessary initiatives dedicated to the prior identification of malnutrition and intervention strategy to hold up or prevent related poor outcomes.¹⁵ In this context, some screening tools like Mini Nutritional Assessment shortly called MNA tool have been settled, which is useful to assess malnutrition.¹⁵

The MNA is a screening tool that consists of 18 items classified into four categories: general condition, anthropometric assessment, dietary pattern, and some subjective assessment. The advantages of MNA include simple, inexpensive, time-saving, internationally validated, requiring less technical support, and being performed by less trained staff.¹⁶ The sensitivity and specificity of MNA are 96% and 98% accordingly in the evaluation of malnutrition among aged people in various health care settings.¹⁶ This study aimed to estimate the prevalence of malnutrition in hospitalized aged patients in M. Abdur Rahim Medical College Hospital located in Dinajpur district, Bangladesh using the MNA tool. In addition, several routine laboratories data, socio-demographic data, health profile data, and lengths of hospital stay were evaluated to find out any association with nutritional status. This study might help to reduce mortality rate, healthcare costs, suggest preventive plans, treatment for malnutrition, and improve patients' quality of life.

Materials & Methods

Setting of Study and Sample Size

An observational and descriptive cross-sectional study was conducted in the aforementioned Medical College Hospital, Bangladesh, which is a government teaching hospital providing a tertiary level of services.

Sample size calculation was performed by the Raosoft software package using the single proportion equation method. We considered the frequency (50%) with sufficient knowledge, the level of confidence was 95%, size of the population was 350, and a 5% margin of error was accepted. The calculated sample size was 184. But, the final sample size was 238 to compensate for non-responders.

We consecutively evaluated a total of 238 aged patients (over 60 years of age) within the first 48 h of admission to the hospital from January 2019 to March 2019. The MNA was performed by the investigator on patients with the help of their caretakers if required.

For the accuracy of height and/or weight measurement, patients with terminal cancer, limb amputation, any abnormality (defect), and re-admitted within the period of the study were excluded. Patients and/or their kin, who were unwilling or unable to give written approval were omitted from this study. This study was permitted by the Ethical Committee of the Institute of Biological Sciences, University of Rajshahi, Bangladesh (memo no: 31/320/IAMEBBC). All the participants signed a written informed consent document before data collection.

Study Tools and Data Collection Procedure

Data were collected using two tools. First, a standard questionnaire was developed to gather various socio-demographic variables with persons' name, gender, age, marital status, level of education, living arrangement, monthly earning, alcohol consumption, history of smoking, chronic illness, and some other questions. Second, the MNA tool (latest version) was engaged to evaluate patients' nutritional condition.¹⁷

The MNA was applied in two stages. The screening stage was a short and easy technique to identify nutritional status. The first stage composed of six sections which evaluate one dietetic, two anthropometric and three general parameters.

The assessment stage was consisted of twelve parameters. These were two anthropometric, five dietetics, three global, and two subjective assessment parameters. Protein intake was assessed as selected consumption markers for protein intake at least one serving of dairy products (e.g. milk, cheese, yogurt) per day; two or more servings of legumes or eggs per week, and meat, fish, or poultry every day. If three options were yes, indicate adequate intake while if two or less were yes, indicate moderate or low intake of protein. The maximum score of first and second stage was 14 and 16 points, respectively. After adding the scores from two stages, the respondents were grouped into three categories include not malnourished

(score greater than 23.5), malnutrition risk (score within 17 to 23.5) and malnourished (score less than 17).

All anthropometric measurements including body mass index (BMI), mid-arm circumference (MAC), calf circumference, height and weight were taken following standard techniques. Biochemical as well as hematological measurements relevant to nutritional status with hemoglobin (g/dl), albumin (g/dl), lymphocyte count ($\times 10^9/L$), total cholesterol (mg/dl), total protein (g/dl) and triglycerides (mg/dl) were recorded from patients' charts for analysis. All tests were performed at aforementioned hospitals' central biochemistry laboratory using standard methods. Presence of different health problems include chronic diseases such as asthma, arthritis, cancer, coronary heart disease, osteoporosis, stroke, diabetes mellitus, sensory problems, surgeries, impaired chewing or swallowing, stomach problem, pain (acute pain, chronic pain, nociceptive pain, neuropathic pain), depression, sleeping problem were recorded by self-reported health problems.

Statistical Analysis

All data were analyzed using SPSS version 20.0 (SPSS Inc., Chicago, USA). Variables that are normally distributed were expressed as mean \pm standard deviation (SD). Categorical and dichotomous variables were expressed as frequency and percentage. The significance of categorical variables was assessed by chi-square test. To determine association between different parameters and MNA results, Spearmans' rank correlation was used. ANOVA was used to compare means of groups and continuous variables. P value less than 0.05 was regarded as statistically significant.

Results

Among 238 aged hospitalized patients, males and females were 60.5% and 39.5%, respectively. The mean age of patients was 68.7 ± 6.8 years and ranged between 60 and 85 years. The majority of them lived with joint families (83.6%). Most of them were illiterate (75.3%). Of 238 patients, almost one-half 110 (46.2%) were at risk for malnutrition (MNA score within 17 to 23.5 points), 76 (31.9%) were already malnourished (MNA score below 17 points) and the rest 52 (21.8%) were well-nourished or within the normal range (MNA score 24 to 30 points).

Regarding the anthropometric measurement, that moderately reveals malnutrition, as estimated, 61.8% of malnourished people were grouped as underweight, contrasted to 0% of the normally nourished.

From laboratory investigation, it was found that malnourished aged patients had significantly reduced levels of lymphocyte count ($1.4 \pm 0.9 \times 10^9/L$), hemoglobin (10.3 ± 1.7 g/dl), albumin (2.5 ± 0.7 g/dl), and cholesterol (150 ± 35.9 mg/dl) as compared to the normally nourish and risk of malnourished patients.

Malnourished patients were exposed to either a moderate (32.9%) and severe (48.7%) decrease in food intake when compared to normally nourish. Besides, the percentage of malnourished patients (28.9%) that could walk without assistance is much lower than the percentage of normally nourished (86.5%). Moreover, malnourished patients remained about 5 more days in the hospital contrast to patients who were not malnourished ($p = 0.001$). A significantly higher percentage of patients with normal nutrition (84.6%) took an adequate intake of protein than malnourished patients (25.0%) (Table 1).

Table 1: Nutritional status of aged patients based on their socio-demographic, anthropometric and clinical attributes

Variable	Normal nutrition, n = 52	At risk of malnourished, n = 110	Malnourished, n = 76	P-value ^c
Demographic characteristics				
Sex ^a				
Males	30 (57.6)	69 (62.7)	45 (59.2)	0.639
Females	22 (42.3)	41 (37.3)	31 (40.8)	
Age ^b	68.1 \pm 7.0	68.5 \pm 6.2	69.3 \pm 7.1	0.358
Living arrangement^a				
Living along	3 (5.8)	22 (28.9)	14 (12.7)	<0.001
Living with others	49 (94.2)	54 (71.1)	96 (87.3)	
Anthropometric measurements: BMI categories^a				
Underweight	0 (0.0)	38 (34.5)	47 (61.8)	< 0.001
Normal	22 (42.3)	20 (18.2)	8 (10.5)	
Overweight	17 (32.7)	28 (25.5)	9 (11.8)	
Obese	13 (25.0)	24 (21.8)	12 (15.8)	
Clinical and biochemical measurements^b				
Albumin (g/dl)	3.4 \pm 0.6	2.9 \pm 0.7	2.5 \pm 0.7	0.037
Hemoglobin (g/dl)	13.67 \pm 1.3	11.8 \pm 1.7	10.3 \pm 1.7	<0.001
Lymphocytes ($\times 10^9/L$)	2.7 \pm 0.8	1.9 \pm 0.8	1.4 \pm 0.9	<0.001
Total protein (g/dl)	6.8 \pm 1.1	6.1 \pm 0.9	5.7 \pm 1.2	0.247
Cholesterol (mg/dl)	168 \pm 37.4	155 \pm 40.1	150 \pm 35.9	0.013
Triglycerides (mg/dl)	175 \pm 84	143 \pm 76	139 \pm 40	0.541
Food intake^a				
Severe decrease	1 (1.9)	4 (3.6)	37 (48.7)	0.001
Moderate decrease	5 (9.6)	62 (56.4)	25 (32.9)	
No decrease	46 (88.5)	44 (40.0)	14 (18.4)	
Mobility^a				
Yes, walk without assistance	45 (86.5)	79 (71.8)	22 (28.9)	<0.001
Walk with assistance	7 (13.5)	23 (20.9)	19 (25.0)	
Bed or chair bound	0 (0)	8 (7.3)	35 (46.1)	
Length of hospital stay (days) ^b	4.1 \pm 1.8	5.5 \pm 2.5	9.5 \pm 2.7	0.001

Protein intake^a

Low or moderate intake	8 (15.4)	47 (42.7)	57 (75.0)	0.020
Adequate intake	44 (84.6)	63 (57.3)	19 (25.0)	

Note: ^a, Values are expressed as integer and percentage (%)

^b, Values are expressed as mean and standard deviation.

^c, Chi-square test as well as one-way ANOVA are used for categorical variables and for continuous variables respectively to determine significance among groups.

This study also observed significant differences between malnourished and healthy patients. The malnourished patients had diabetes mellitus, sensory problems, depression, or/and sleeping

problems more than healthy patients. Impaired swallowing or/and stomach problems revealed an equivocal level of significance ($p = 0.030$) as a factor (Table 2).

Table 2: Health problems of respondents associated with malnutrition among aged patients

Variable	Normal nutrition, n = 52	At risk of malnourished, n = 110	Malnourished, n = 76	P-value ^b
Chronic illness	42 (80.7) ^a	65 (85.5)	88 (80.0)	0.653
Diabetes mellitus	23 (44.2)	41 (53.9)	56 (50.9)	0.003
Sensory problem	12 (23.1)	31 (40.8)	55 (50.0)	0.001
Surgeries	19 (36.5)	26 (34.2)	39 (35.4)	0.414
Impaired chewing, swallowing and/or stomach problem	6 (11.5)	11 (14.5)	20 (18.2)	0.030
Pain	15 (28.8)	27 (35.5)	34 (31.0)	0.487
Depression or/and sleeping problem	1 (1.9)	22 (28.9)	41 (37.3)	0.001

Note: ^a, Values are expressed as positive integer and percentage (%)

^b, Chi-square test, as well as one-way ANOVA, are used for categorical variables and for continuous variables respectively to determine significance among groups.

Discussion

The prevalence among malnourished hospitalized aged patients ranges from 12% to 75% globally.¹⁸ This study revealed that three-quarters of the aged patients (76.6%) admitted in the M. Abdur Rahim Medical College Hospital, in Dinajpur district, Bangladesh had a poor nutritional status. Such findings were in accordance with the findings of a previous study performed 14 years ago in a rural area named Matlab, 55 km southeast of Dhaka City, Bangladesh, on non-hospitalized, home living aged people, where used the MNA tools and showed that 88% of home living aged people show evidence of malnutrition.¹⁹ Of which, 62% home living aged people were a threat of malnutrition and 26% was completely malnourished.¹⁹ Using MNA short form, a recent study found a similar prevalence rate of malnutrition (29%) and the threat of malnutrition

(47.6%) among Saudi Arabian aged patients,²⁰ which are in agreement with the findings of this study. These statistics suggest that malnutrition is very prevalent among aged hospitalized patients worldwide. Though, the progress in the assessment of malnutrition, greater awareness in the public domain and healthcare personnel, and improved nutritional intervention techniques, the prevalence rate of malnutrition in hospitalized aged persons remains the same level.

The shockingly high prevalence rate of either at risk of malnutrition or malnourished aged people in Bangladesh generates several issues. A complication of various factors is responsible for the high prevalence of malnutrition in aged people than younger has been proven by the researcher from Western societies. Several factors

contributed to this high prevalence, including age-related contemporaneous medical conditions, food insecurity in low-income countries, low food intake,²¹ polypharmacy,²² changes in the taste/or smell, poor appetite,^{23,24} cognitive changes,²⁵ poor dietary habits, collective consequences of adverse financial factors and the presence of illness.¹⁹

Social isolation is another reason that contributes to malnutrition among aged people. Our study found that aged patients who lived alone are malnourished than the patients living with others, and it was significant ($p < 0.001$). This may be due to aged people being unable to earn money, so they face scarcity of food and also unable to prepare food.²⁶ This highlights the significant role of social support for aged people.

Aging is described by the loss of strength, decline in functionality, sarcopenia (loss of lean muscle mass), dementia, poor endurance,²⁷ and alteration in bone density that is responsible for the risk of osteoporosis.²⁸ These changes of the body gradually reduce the mobility power of aged persons. In this study, the limited movement was observed in malnourished aged patients. Most of such patients were bedridden and/or only walked with assistance.

The economic crisis is common in low-income countries which are related to the lack of money for purchasing food resulting in food insecurity. So, a vast part of the people remains a less frequent and smaller quantity of food intake.²⁹ The outcome of the present study showed the percentage of malnourished aged patients who experienced either moderate (32.9%) or severe (48.7%) decrease in food intake was significantly higher. These findings are consistent with the previous report in which authors observed severe declines in food intake among aged patients (52.2%) with poor nutritional status.³⁰ Similar results have been reported and were ascribed to chewing and swallowing difficulties, digestion problems, and anorexia.³¹ Some other issues include poor economic condition and cognitive impairment, which may affect food choices and eating habits.³²

Among the biochemical measurements, serum total protein, albumin, hemoglobin, and lymphocytes have been used as indicators of nutritional status. These measurements can predict the health condition,

mortality, and other outcomes in aged people.³³ In previous studies, it was found that geriatric patients with low albumin levels, specifically less than 38 g/L, were associated with the higher hospital resource use,³⁴ were hospitalized for a longer time, and increased the threat of being readmission to the hospital.^{20, 35} In this study, serum albumin (2.5 ± 0.7), hemoglobin (10.3 ± 1.7), lymphocytes (1.4 ± 0.9), and cholesterol (150 ± 35.9) levels were found as significantly lower in malnourished aged patients than their healthy counterparts.

One of the interesting findings of this study is that malnourished patients were hospitalized for a longer period of time as contrasted to well-nourished counterparts. This observation is also in accordance with the findings of the previous report.⁴ These findings suggest that a good nutritional state is the key to maintain good health and play an important role in patient recovery.⁴ Consequently, a malnourished aged patient will have the risk of further complications as compared to a well-nourished patient with a similar medical state when admitted to the hospital. That's why the malnourished patient has to stay in the hospital for a greater length of time.³⁶ So, it is essential to assess patient nutritional status immediately upon admittance to the hospital. Thus, aged patients who are at risk for malnutrition can be identified and a proper intervention program can be launched.¹³

In the case of developing countries like Bangladesh, it is suggested that health profile rather than an increase in chronological age and other demographic factors are more practical to explain malnutrition among aged persons.^{19, 37} Based on this view; it was focused to correlate the nutritional status with more specific health profiles of patients. The findings of the present study indicate that health problems which include diabetes mellitus, sensory problems, impaired chewing, swallowing, and/or stomach problem, and depression and/or sleeping problem have adverse effects on the health and nutritional condition of aged people. Another study demonstrated that the cumulative effects of these health problems have a significant impact on the nutritional status of geriatrics.¹⁹

The main limitation of this study is the small sample size. Patients had multi-diseases at different stages resulting in a risk of heterogeneity which might

influence the generalization of findings. In future studies, it is necessary to identify at what stage of life in this population group, malnutrition is likely to occur and sustain into aging.

Conclusion

In conclusion, malnutrition in hospitalized aged patients was highly prevalent and was related to low food intake, the presence of health problems, and the prolonged length of hospital stay. Therefore, it is crucial to diagnose aged patients who are already malnourished and who are at threat of malnutrition and to initiate proper treatment to minimize its shocking consequences on the aged patients. MNA is a useful tool to identify malnutrition and its causes, which is helpful to provide care for

these vulnerable people, and therefore, increasing scopes for healthy aging.

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Conflict of Interest

The authors do not have any conflict of interest.

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