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CHANGES IN NUTRITIONAL STATUS OF HOSPITALIZED PATIENT IN A TERTIARY LEVEL HOSPITAL

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Abstract

Background: Nutrition is an important health parameter among hospital admitted patients. The objective of our study was to evaluate the changes of nutritional status among the adult patients during hospitalization.

Materials and methods: It is prospective observational study done on 100 patients admitted at Medicine ward, CMCH from January 2012 to June 2012. 100. Body Mass Index (BMI) and Mid Arm Circumference (MAC) were compared at the time of admission and at weekly interval and hospital discharge. Data was collected and analyzed by SPSS 20.

Results: Among the 100 patients 52(52%) were male and 48(48%) were female.38 (38%) patients had BMI <18.5 Kg/m^2 and were malnourished whereas 62 (62%) patients had normal BMI. 25 (25%) patients had malignancy, 22(22%) patients had tuberculosis, 18 (18%) patients had chronic liver disease, 14 (14%) patients had connective tissue disease and 21(21%) patients had other diagnosis. Changes of BMI and MAC were found in Malignancy tuberculosis, chronic liver disease and in connective tissue disease during hospital stay. Among the 25 patients of malignancy on admission they had BMI 20.01 ± 2.86 Kg/m^2 which was reduced into 19.22 ± 2.91 Kg/m^2 after 7^{th} day of admission Those patients diagnosed as tuberculosis had BMI 18.19 ± 2.72 Kg/m^2 on admission which was changed into 18.34 ± 2.87 Kg/m^2 after 7^{th} day of admission. Paired t test was done on admission, 7^{th} day, 14^{th} day and 21^{st} day where significant changes were found in BMI and MAC. No significant changes of MAC and BMI were found at 14^{th} and 21^{st} day of hospital stay. 82(82%) patients had average hospital stay of one week, 16(16%) patients had two weeks and only 2(2%) had three weeks.50 (50%) patients had supplied food from hospital, 6(6%) patients had home made food but 44(44%) patients had both sources.

Conclusion: Changes in BMI and MAC in early weeks s of hospital stay was significant among the admitted patients. Disease pattern might also be influenced nutritional changes.

Key words: MAC (Mid Arm Circumference); BMI (Basal Metabolic index); Paired t test.

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Introduction

Nutritional screening is a fundamental aspect of the initial evaluation of the hospitalized patient. Hospital Malnutrition (HM) is highly prevalent. It is estimated that around 30 million people in Europe present HM, and furthermore, it is associated with elevated costs of some €170 billion annually.[1] In this sense, a risk of malnutrition of 32.6% was observed in the EuroooPS Study, in which 5,061 patients admitted to European hospitals were evaluated.[2] HM is associated with delay in patient recovery, prolongs hospital stays, increases the number of readmissions, increases the risk of infection, alters the quality of life and increases mortality.[3-6] Body Mass Index (BMI) corresponds to weight in kg/height in m^2, and is a good marker of malnutrition, present in the majority of existing nutritional screens. Currently, a BMI of 18.5 kg/m^2 is considered a marker of malnutrition. Mid-Upper Arm Circumference (MUAC) is a simple measurement which has been used for many years in nutritional evaluation, being an indicator of protein and energy reserves of the individual.[7]

Malnutrition is associated with more consultations with general practitioners and a higher rate of admission to hospital. Once in hospital the priority becomes diagnosis of underlying illness and associated malnutrition is not recognized most patients, whose nutritional status often deteriorates on discharge back to the community where their chance of readmission is significantly higher.[8] Acutely ill patient become catabolic and that their nutritional requirements can be very high, particularly in those with sepsis, trauma or burns, in the majority of inpatients, however the most important

single factor leading to malnutrition is probably loss of appetite and failure of intake. An independent UK health think tank, the kings fund, first drew attention to the high prevalence of malnutrition in hospital admitted patients in 1992.[9] The kings fund estimated that 50% surgical and 44% of medical inpatients were malnourished, and that 10% in inpatients could have their stay reduced by proper use of nutritional support. A prospective survey of inpatients at Ninewells hospital, Dundee, found that 40% of acute admission in five specialties were under nourished and that 75% of the patient actually lost weight during their hospital admission.[10] The nutritional status of 78% the patient who were already nutritionally depleted on admission actually deteriorated during their hospital stay.[11] Similar results have been found in many studies published subsequently. A study from Glasgow Royal infirmary, using different criteria to define malnutrition, identified 13% of patients was under nourished, but this was not identified by staff in 75% of cases, and those patients nutritional condition, therefore, deteriorated during the admission.[12] The management of malnutrition does not require high technology or expensive intervention. The vast majority of the patients would be helped by ensuring that they receive adequate quantities of proper food and beverages while in the hospital. Complex nutritional support is the best delivered by the multidisciplinary clinical nutrition teams which is not a common practice in Bangladesh. There is no available data regarding nutritional status of hospital admitted patient in our country which addresses the changes in nutritional status in hospitalized patient. So this study aim to describe changes in nutritional status in hospital admitted patients.

Materials and methods

After ethical approval from Chittagong Medical College Hospital (CMCH) ethical review committee, this prospective observational study was done in Medicine Department of Chittagong Medical College Hospital from January 2012 to June 2012. 100 patients were included in this study. 100 patients were selected and sample selection technique was simple random type.With informed consent, patients admitted in Ward-16, Medicine unit - lll, were included. Patients who were discharged before 7 days and who were not eligible to measure BMI and MAC easily (e.g Unconscious patient, severely ill patients) were excluded. Body Mass Index (BMI) is a person's weight in kilograms divided by the square of height in meters. Mid Arm Circumference (MAC) is the circumference of the left upper arm, measured at the midpoint between the tip of the shoulder and the tip of the elbow (Olecranon process and the acromium). All eligible subjects were evaluated as per the pretested questionnaire. The data collected included a detailed history, clinical examination and investigations with particular references to the nutritional abnormalities. Study was done as per rule of ethical committee of CMCH. The obtained data were analyzed and statistical evaluation was performed by SPSS-20 program.

Results

Among 100 patients, 52 patients were male (52%) and 48 patients were female (48%), out of which most patients were aged ≤ 25 to ≥ 70 years. Most of patients (44) patients completed their primary education. Most of the patients (56) had monthly income within 5,000 to 10,000 taka. Out of 100 patients, 25 (25%) patients had malignancy, 22 (22%) patients had tuberculosis, 18 (18%) patients had Chronic Liver Disease, 14 (14%) patients had diagnosis connective tissue disease and 21 (21%) patients had other diagnosis. 38 (38%) patients had BMI <18.5 Kg/m^2 and were malnourished whereas 62 (62%) patients had normal BMI (Table I).

Table I : Distribution of socio-demographic variables, diseases and BMI during hospital admission within the study population (n = 100).

Socio-demographic Variables		Frequency	Percentage (%)
Sex	Male	52	52.0
	Female	48	48.0
Age Groups	≤25 Years	12	12.0
	26 – 35 Years	26	26.0
	36 – 45 Years	28	28.0
	≥46 Years	34	34.0
Educational Levels	Illiterate	30	30.0
	Primary	44	44.0
	Secondary	24	24.0
	Higher Secondary		
or Above	02	2.0	
Monthly Incomes	< 5000 Tk	08	8.0
	5000 – 10000 Tk	56	56.0
	> 10000 Tk	36	36.0
Total	100	100.0	

Distribution of diseases within the study population (n = 100).

Diagnoses	Frequency	Percentage (%)
Malignancy	25	25.0
Tuberculosis	22	22.0
Chronic Liver Disease	18	18.0
Connective Tissue Disorders	14	14.0
Others	21	21.0
Total	100	100.0
BMI Status on Admission	Frequency	Percentage (%)
Malnourished (BMI < 18.5 Kg/m^2)	38	38.0
Not Malnourished	62	62.0
Total	100	100.0

On admission 24 (24%) patients had good appetite and 72 (72%) patients had poor appetite on the other hand during discharge 54 (54%) patients had good appetite and 36 (36%) patients had poor appetite. Out of 100 patients, 82 (82%) patients had average hospital stay of one week, 16 (16%) patients had two weeks and only 2 (2%) had three weeks respectively.

Table II : Appetite level during admission and discharge and duration of hospital stay within the study population (n = 100).

Appetite		Frequency	Percentage (%)
On Admission	Good	24	24.0
	Poor	72	72.0
	Very Poor	04	4.0
On Discharge	Good	54	54.0
	Poor	36	36.0
	Very Poor	10	10.0
Total		100	100.0
Average Hospital Stay		Frequency	Percentage (%)
One Week		82	82.0
Two Weeks		16	16.0
Three Weeks		02	2.0
Total		100	100.0

Patients with malignancy had BMI on admission 20.01 ± 2.86 Kg/m^2 and MAC 24.54 ± 3.26 cm, with tuberculosis had 18.19 ± 2.79 Kg/m^2 and 23.37 ± 2.06 cm, with chronic liver disease had 22.60 ± 2.79 Kg/m^2 and 25.74 ± 2.15 cm, with connective tissue disease had 20.34 ± 2.27 Kg/m^2 and 23.96 ± 1.56 cm respectively (Table III).

Table III : BMI and MAC on admission within the different diseases among study population (n = 100).

Diagnoses	BMI on Admission (Kg/m^2)			
	n	Mean	SD	Range
Malignancy	25	20.01	2.86	14.91 – 25.09
Tuberculosis	22	18.19	2.72	13.92 – 21.06
Chronic Liver Disease	18	22.60	2.79	16.22 – 26.16
Connective Tissue Disorders	14	20.34	2.27	15.71 – 23.30
Others	21	19.45	3.12	15.71 – 29.16
Total	100	20.00	3.10	13.92 – 29.16

Diagnoses	MAC on Admission (cm)			
	n	Mean	SD	Range
Malignancy	25	24.54	3.26	19.00 – 30.50
Tuberculosis	22	23.37	2.06	20.00 – 28.00
Chronic Liver Disease	18	25.74	2.15	22.30 – 30.30
Connective Tissue Disorders	14	23.96	1.56	21.50 – 26.00
Others	21	23.43	2.22	20.50 – 29.00
Total	100	24.19	2.52	19.00 – 30.50

Out of 100 patients, on admission, 25 patients of malignancy had BMI 20.01 ± 2.86 Kg/m^2 which was reduced to 19.22 ± 2.91 Kg/m^2 on 7th day of admission.22 patients of tuberculosis had BMI 18.19 ± 2.72 Kg/m^2 on admission which was changed into 18.34 ± 2.87 Kg/m^2 after 7th day of admission. Paired t test was done on admission, on 7th day, 14th day and 21st day where significant change of BMI was found on 7th day ($p<0.05$) of hospital stay.

Similarly 25 patients of malignancy on admission had MAC 24.54 ± 3.26 cm which was reduced to 24.37 ± 3.28 cm after 7th day of admission Those patients diagnosed as tuberculosis had MAC 18.19 ± 2.72 cm on admission which was changed into 23.47 ± 2.05 cm after 7th day of admission. Paired t test was done on admission, on 7th day, 14th day and 21st day where significant change was found on 7th day ($p<0.05$) of hospital stay (Table IV).

Table IV : Changes of BMI and MAC (Mean ± SD) on during hospital stay among the different diseases (n = 100).

Diagnoses	BMI in Kg/m^2 On Admission	On 7th Day	On 14th Day	On 21st Day
Malignancy	20.01 ± 2.86 (n = 25)	19.22 ± 2.91 (n = 25)	18.55 ± 3.10 (n = 5)	– (n = 0)
Tuberculosis	18.19 ± 2.72 (n = 22)	18.34 ± 2.87 (n = 22)	16.21 ± 1.34 (n = 6)	15.24 ± 0.52 (n = 2)
Chronic Liver Disease	22.60 ± 2.79 (n = 18)	21.86 ± 2.60 (n = 18)	18.78 ± 4.36 (n = 3)	– (n = 0)
Connective Tissue Disorders	20.34 ± 2.27 (n = 14)	20.29 ± 2.19 (n = 14)	19.48 ± 2.66 (n = 3)	– (n = 0)
Others	19.45 ± 3.12 (n = 21)	19.39 ± 3.31 (n = 21)	17.54 ± 0.00 (n = 1)	– (n = 0)
Total	20.00 ± 3.10 (n = 100)	19.70 ± 3.03 (n = 99)	17.90 ± 2.75 (n = 18) t=1.113	15.24 ± 0.52 (n = 2)
t- test		t=4.380	p=0.280	t=-1.561
		p= 0.001		p=0.363

Diagnoses	MAC in cm On Admission	On 7th Day	On 14th Day	On 21st Day
Malignancy	24.54 ± 3.26 (n = 25)	24.37 ± 3.28 (n = 25)	24.90 ± 4.26 (n = 5)	– (n = 0)
Tuberculosis	23.37 ± 2.06 (n = 22)	23.47 ± 2.05 (n = 22)	22.03 ± 1.61 (n = 6)	20.40 ± 0.57 (n = 2)
Chronic Liver Disease	25.74 ± 2.15 (n = 18)	25.72 ± 2.15 (n = 18)	24.60 ± 2.13 (n = 3)	– (n = 0)
Connective Tissue Disorders	23.96 ± 1.56 (n = 14)	23.97 ± 1.56 (n = 14)	22.60 ± 0.95 (n = 3)	– (n = 0)
Others	23.43 ± 2.22 (n = 21)	23.43 ± 2.22 (n = 21)	22.00 ± 0.00 (n = 1)	– (n = 0)
Total	24.19 ± 2.52 (n = 100)	24.17 ± 2.51 (n = 100)	23.35 ± 2.73 (n = 18)	20.40 ± 0.57 (n = 2)
t test		t=2.052 p=0.043	t=0.616 p=0.546	t=-1.0 p=0.500

Significant change of BMI (14.31± 3) seen in 8 patients on 14 days of hospital admission having hospital supplied food. Those having home made food had less change in BMI (19.71± 3.26) during 7 days of hospital stay. Those having food from both sources had less change in BMI (19.71 ± 3.26) during 7 days of hospital Those having home made food had less change in BMI (19.70 ± 3.03) during 7 days of hospital admission..

Significant change of MAC (23.61± 3.41) seen in 8 patients on 14 days of hospital admission having hospital supplied food. Those having home made food had less change in MAC (24.20±2.72) during 7 days of hospital stay. Those having food from both sources had less change in MAC (24.12±2.59) during 7 days of hospital admission (Table V).

Table V : Changes of BMI and MAC (Mean ± SD) on during hospital stay according to source of food (n = 100).

Source of Food	BMI in Kg/m^2 On Admission	On 7th Day	On 14th Day	On 21st Day
Hospital Supplied Food	19.75 ± 2.61 (n = 50)	19.35 ± 2.60 (n = 49)	14.31 ± 3.00 (n = 8)	– (n = 0)
Home Made Food	20.41 ± 3.45 (n = 6)	19.71 ± 3.26 (n = 6)	18.92 ± 0.00 (n = 1)	– (n = 0)
Both	20.24 ± 3.58 (n = 44)	20.09 ± 3.45 (n = 44)	17.43 ± 2.77 (n = 9)	15.24 ± 0.52 (n = 2)
Total	20.00 ± 3.10 (n = 100)	19.70 ± 3.03 (n = 100)	17.90 ± 2.75 (n = 18)	15.24 ± 0.52 (n = 2)

Source of Food	MAC in cm On Admission	On 7th Day	On 14th Day	On 21st Day
Hospital Supplied Food	24.24 ± 2.46 (n = 50)	24.21 ± 2.47 (n = 49)	23.61 ± 3.41 (n = 8)	– (n = 0)
Home Made Food	24.23 ± 2.68 (n = 6)	24.20 ± 2.72 (n = 6)	22.50 ± 0.00 (n = 1)	– (n = 0)
Both	24.12 ± 2.62 (n = 44)	24.12 ± 2.59 (n = 44)	23.21 ± 2.35 (n = 9)	20.40 ± 0.57 (n = 2)
Total	24.19 ± 2.52 (n = 100)	24.17 ± 2.51 (n = 100)	23.35 ± 2.73 (n = 18)	20.40 ± 0.57 (n = 2)

Discussion

The nutrition of an individual is often the result of interrelated factors. It is influenced by adequacy of food intake both in terms of quantity and quality and also by the physical health of the individual.[13] In this study an attempt has been made to find out the different nutritional parameter and their changes in relation with disease and duration of hospital stay. In this study, 52% patients were male and 48% patients were female. The male to female ratio was 1.1:1.

In this study, 25% patients had malignancy, next to it was tuberculosis (22%) chronic liver disease (18%) connective tissue disease (14%) and others (21%).

Mean BMI (22.60) and mean MAC (25.74) on admission was higher among the chronic liver disease patients than the others mainly because of edematous conditions of those patients. Change in nutritional parameter like BMI and MAC, were found significantly reduced ($p<0.05$) among the patients who stayed 7 days in the hospital. Whereas those who stayed more than 14 days and 21 days had no significant change in BMI and MAC in comparison with admission results. These findings might be due to early stressful condition of the disease and poor adaptation in hospital which become stable later on longer duration. Changes of BMI in CLD and tuberculosis are in the declining range in relation to hospital stay. Whereas among the patients of malignancy and connective tissue diseases the BMI change was found less prominent with the length of hospital stay. In-hospital feeding status, patients' appetite and disease itself might have some influence on this change. The findings are correlated with the previous studies.[14]

A prospective observational study was conducted over a 7-month duration at a University Hospital in Chicago, Illinois, USA to assess the association between changes in nutritional status in hospitalized patients and the occurrence of infections, complications, length of stay in hospital, and hospital charges.[15] A total of 404 adults of or more than 18 years old admitted to the inpatient service for more than seven days who were not pregnant or lactating and not a psychiatric patient were included. Major outcome variables included changes in nutritional status as assessed by Subjective Global Assessment (SGA) at hospital admission and discharge, length of stay, hospital charge, complications and infections. The finding in this study also correlates with our study where type of food, type of disease of the patient and duration of hospital stay had influence in the nutritional status of the patients.

A study done in Brazil where hospital malnutrition was analyzed among 4000 patients above 18 years age found that malnutrition was present in 48.1% of patients and severe malnutrition was present in 12.5% of patients. The prevalence of malnutrition was higher in the northern and northeastern regions of Brazil, where per-capita income is lower. Malnutrition correlated with primary diagnosis at admission, age (60y) presence of cancer or infection and longer hospital stay ($p < 0.05$). Fewer than 18.8% of patients' records contained information on nutrition-related issues. Nutrition therapy was used in 7.3% of patients (6.1% enteral nutrition and 1.2% parenteral nutrition).[16] The prevalence of malnutrition in hospitalized patients in Brazil is high, physician awareness of malnutrition is low, and nutrition therapy is under prescribed.[17] These findings were also had some correlation with our study in terms of different diseases and hospital stay.

In everyday clinical practice we encounter a serious inconvenience when we try to carry out a nutritional assessment on a patient who cannot be measured or weighed. The use of subjec- tive parameters such as those provided by the patient, or estimated weight and height, are habitual in clinical practice. Eriksen J. et al demonstrated that the patient's perception of weight loss is usually incorrect, thus reducing effectiveness.[18]

The Nutrition Risk Screening 2002 (NRS 2002) advised that there was little evidence in existence to translate values of BMI values to the corresponding MUAC. Nevertheless, the investigators by undertaking a retrospective analysis of various studies, indicate that an MUAC of <25 cm may correspond to a BMI of <20.5 kg/m^2.[19]

Measurement of BMI is difficult in severely ill patients as it needs to take weight of the patients. Modern costly patient beds of are needed to measure the weight while patients are lying on it. Also MAC can be easily measured by tape and it remain uninfluenced with edematous condition. So MAC can be easily used to assess the nutritional status in hospitalized ill patients.

Ana Manula Ordonez et all in their study showed that fifty percent of the patients in the their study had some degree of weight loss during the hospitalization period, which is higher than the percentage published in another study in a University Hospital, in which 31% of hospitalized patients showed decline in nutritional status during hospitalization.[20] In our current study, most of the patients had reduced BMI and MAC on 7 days of hospital stay. This may have contributed to increase the fasting times which can affect negatively the nutritional status. Most patients were classified as tertiary level care, i.e the underlying disease required nutritional care and it was already associated to nutritional risk factors (Anorexia, decreased food intake, weight loss). This fact can be justified because this is a tertiary hospital, where the patients are admitted when the symptoms are already advanced in a process of underlying diseases investigation and prolonged hospital stay. These clinical symptoms can affect the food intake and interfere with the maintenance of a good nutritional status. Decreased food intake can be a consequence of advanced underlying disease and be related to poor response to medical treatment. In our study, we found that, significant change of BMI and MAC was seen in patients having food from hospital supplied food rather than home made food. This might be due to anorexia or not habituated with hospital food or different regional food habits.

In our current study, Malnutrition is frequently observed in hospitals, concerning 30 to 50% of hospitalized patients. Increased length of stay and cost

of care has made this problem a major economic stake. Indeed, diagnosis and prevention of malnutrition has become one of the priorities of the Government of Bangladesh. Malnutrition results from imbalanced nutritional requirement and intake. It associates weight, protein and functional loss. So maintenance of adequate nutrition is vital to proper and timely recovery from disease conditions.

Limitations

It was a single centre study with small sample size. In this study, only patients admitted in medicine ward were included. To comment on hospital admitted patient's nutrition, patient from other department needs to be included. Complications of malnutrition on patient's morbidity and outcome were not assessed.

Conclusion

Patients with different diseases had poor nutritional status on admission and these nutritional status also declined in early weeks of hospital stay. Later onnutritional parameters were not changed significantly. Disease conditions and appetite might have some influences in the change of nutritional status.

Recommendations

Large scale multicenter study may be done in future to get the actual scenario of Bangladesh.Early nutritional assessment of the admitted patients and possible intervention should be done to reduce major nutritional and disease related complications.

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Contribution of authors

MSA - Conception, design, acquisition data, drafting and final approval.

SMAH – Conception, data collection, critical revision & final approval.

MNM- Interpretation of data critical revision and manuscript writing & final approval.

RH - Data analysis, critical revision & final approval.

HH- Data collection, drafting & final approval.

Disclosure

All authors declared no conflict of interest.

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