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Nutritional Status of Patients with Long-Term Stay in the Hospital

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ABSTRACT

Malnutrition in hospitalized patients is a critical healthcare globally. It affects a patient's quality of life, thereby increasing mortality and morbidity. In a hospital setting, where patients are admitted for a long term stay, infection rate increases and expenditure is also increased. The increase in malnutrition-related diseases in people with multiple comorbidities is a growing health concern, and it is strictly related to both the aging of the general population and the improvement in healthcare of note, this population group more often needs hospitalization. Between 20 and 50% of patients are present with malnutrition before hospital admission. Of note, 49% of malnourished patients that are hospitalized for more than a week maintain or face a deterioration of their previous nutritional status. Moreover, about a third of patients with a preserved nutritional status before hospital admission will develop malnutrition during hospital stay (Reziean et al, 2025). In the present study, fifty six patients were thus selected for nutritional assessment, but for anthropometry, it was possible to include only 50 patients, as 6 patients were bedridden and their weight and height measurements were not feasible. The values obtained for height and weight status in this study showed that the patients' initial nutritional status was quite satisfactory, and compared fairly well with the ICMR (2010) values for reference man and woman and patients did not appear to be at a nutritional risk. Weight loss observed in 40% patients after 10-15 days of hospitalization was of a small magnitude and not significant *($p=<0.05$)* but was a matter of concern, as it could possibly increase over a 3-6 month period (as stipulated by Malnutrition Universal Screening Tool or MUST), with continued hospitalization. Inappropriate nutrition as one of the contributory factors for this weight loss thus may be one of the causes that may need to be addressed, although iatrogenic malnutrition may be due to several factors. The average change in BMI over a 10-15 day showed that 58% of patients showed no change in BMI whereas 40% percent showed reduction in BMI which ranged from 0.1-3.9 (0.43- 16.18%) after 10-15 days, but the BMI being still in the normal range. This was as expected and in consonance with changes observed in body weight and a possible cause of concern. It was also seen from the study that in one patient, BMI had increased minimally by 0.38%. Several factors contribute to the worsening of nutritional status during hospitalization: illness-related loss of appetite, fasting for diagnostic procedures, drug-related side effects, diseases that compromise the regular functioning of the digestive system, and the poor management of patient nutrition. Nutritional anthropometry defined by Jelliffe (1989) and WHO (2023) involves "measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition." Common measurements especially in the hospital setting include MUAC, height, weight and BMI. BMI indicates the weight status and MUAC indicates subcutaneous fat which shows nutritional status of a person.

Keywords: long term stay, hospital, nutritional assessment

OBJECTIVE

To assess height, weight and BMI of patients with long term stay in the hospital

INTRODUCTION

Nutritional assessment is a very important process in reflecting the nutritional status of individuals (Alyssa, 2022). It is a purposeful tool which identifies a person as underweight, overweight and obese and further helps in nutritional management of individuals (Vong, 2022)Malnutrition in patients with long tern stay in the hospitals patients is due to increased reduction of nutrient requirements. Increased days of hospital stay leads to infections and time to recover (Bellanti et al, 2022). Severe complications are common among these patients which includes immune dysfunction, poor wound healing, and increased days of hospitalization (Bakshi,2024). a study on elderly individuals found a 9.1% prevalence of malnutrition, while studies in intensive care units showed a high risk of malnutrition (up to 79%) among older and mechanically ventilated patients, and another on hemodialysis patients found nearly half (45.4%) at high risk of malnutrition (Zaki, 2023). The purpose of nutritional assessment in hospital admissions checks a patient's nutritional status and identifies patient's nutritional risk. Studies indicate one in three hospitalized patients are malnourished on admission; however, the documented malnutrition rate in acute care hospitals is often lower. This study measured prevalence of malnutrition on admission and correlated the relationship among malnutrition status, length of stay (LOS), discharge disposition, and readmission rate. MUST is a five-step screening tool to identify adults who are malnourished or at risk of malnutrition (under nutrition), or obese. MUST tool is being used and implemented in many hospitals in India such as MAX Health Care. Patients are screened for malnutrition depending upon the length of stay of patients. Insufficient nutrition in the first week of hospitalization may differ for each patient and his condition. So far, the high intake of calories and protein and its consequences and benefits have not been fully proven.

For this purpose, various screening tools were proposed, allowing patients to be stratified according to the risk of malnutrition. The present review aims to summarize the actual evidence in terms of diagnosis, association with clinical outcomes, and management of malnutrition in a hospital setting.

Length of stay of hospitalised patients

The average length of stay (ALOS) is calculated by adding up the lengths of stay of all admitted patients in the hospital and dividing this by total number of discharges. Clinical teams mostly emphasize on early discharge, and attempts are made to reduce the lengths of stay, wherever possible. With available technology, minimally invasive procedures, day care treatments, and focus on lower complication rates, there is an opportunity to keep the average length of stay on the lower side. Admission and discharge criteria for critical care patients, guiding the decisions about stay in ICUs are beneficial for the patients as well as for the organization. However, all patients cannot have a low length of stay, as their hospitalization may be longer, based on severity of illness, and recovery depends on many inherent factors. Monitoring and focusing

on the length of stay is an important way of reviewing efficiencies and helps in planning patient related activities (MAX Health Care, 2025).

MATERIALS AND METHODS

The present study, exploratory in nature, was carried out in Srinagar city (Jammu and Kashmir) in three phases in order to meet the objectives of the study. A nutritional assessment of a sub sample of patients with hospital stay of more than 10 days was carried out for data collection.

Rationale for sample selection in Phase I of the study

Informed consent and willingness of patients involved in nutrition services to participate in the study formed the basis of sample selection for the study.

Inclusion criteria

All registered hospitals, government, private and autonomous hospitals which had an Inpatient Department (IPD) were selected.

Exclusion criteria

Hospitals which offered only Out Patient Department (OPD) facilities were not considered for the study and adults for nutritional assessment

Table :Sample size and mode of selection of in-patients for patients' perception of nutrition services and nutritional assessment

Sample	Percentage of sample selection	Total number of patients	Total number of Hospitals	Mode of selection
Patients for nutritional assessment	Atleast 2%	50-60	4	Patients with more than 10 days expected stay admitted within 48-72 hours stay in the hospitals

To meet the objectives of this study, interview schedules were developed for nutritional assessment

In the present study, for nutritional assessment, height and weight were measured using standardized equipments and techniques (Jellife et al, 1989). All anthropometric measurements were done in duplicate. Height and weight were measured to calculate BMI. Height and weight were initially measured in duplicate in 10 patients, to ensure reproducibility.

Height was measured with the help of an anthropometric rod which had a sensitivity of 0.1 cm. All readings were taken in duplicate. Subjects were made to stand barefoot on a flat floor with both heels together, legs straight and shoulders relaxed. The head was positioned in the Frankfurt plane. The anthropometric rod was then placed behind the subject so that the lower end was behind the heels and the beam passed vertically between the buttocks touching the back of the head. The head piece or the sliding part of the measuring rod was lowered so that the hair (if present) was pressed flat.

Weight

Weight is one of the most common measurements used to assess body mass and malnutrition on the basis of weight deficit or excess. Weight may be recorded at a single point of time to assess the nutritional status. Rapid loss of body weight should be considered as an indicator of potential malnutrition (Rao and Vijayaraghavan, 2003).

A digital weighing scale with a sensitivity of 0.1kg was used for recording weight. This balance was used because it was portable, light, and convenient to use in the hospital setting. The machine was calibrated with standard weights and accuracy was checked from time to time. The subjects were weighed barefoot with minimal light clothing. They were asked to stand straight and keep the head straight. To avoid errors in measurements due to meal intake, weight was measured before the lunchtime at the hospital. Heavy clothing like sweaters and any heavy ornaments and wrist watches were removed (Jellife et al, 1989).

BMI

The body mass index (BMI), or Quetelet index, is a proxy for human body fat based on an individual's weight and height. BMI does not actually measure the percentage of body fat. It was invented between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics". Body mass index is defined as the individual's body weight divided by the square of his or her height. The formula is universally used as a unit of measure that is, of kg/m^2, indicates both over and under nutrition (WHO, 2025).

The BMI of patients were calculated based on their height and weight.

Malnutrition Universal Screening Tool (MUST)

A modified version of Malnutrition Universal Screening Tool (MUST) was used for the nutritional screening of patients in the study. 'MUST' is a five step screening tool to identify adults, who are malnourished, at risk of malnutrition, undernutrition, or obese. It also includes management guidelines which can be used to develop a care plan. It is for use in hospitals, community and other care settings and can be used by all care workers according to British Association of Parenteral and Enteral Nutrition (BAPEN, 2007). The screening tool was modified with respect to its Step 1 (Figure3.3). As most of the patients did not stay in the hospital beyond about 10-15 days, the change in body weight upon hospitalization was assessed after 10-15 days only instead of 3-6 months, as stipulated by MUST. A detail of MUST and its scoring pattern is depicted in Figure 3.3. The modification made was not validated as it was just used as an indication or pointer of change in nutritional status over 10-15 day period, the time period for which the patients available for this study were hospitalized.

- **Quantitative analysis – anthropometry and dietary intake**

Anthropometric analysis

Anthropometric data of height and weight was used to compute BMI for categorizing weight status of patients based on age, using WHO (2000) and WHO/IASO/ IOTF (2000) and WHO (2004) values. A modified Malnutrition Universal Screening Tool (MUST) was used to assess patients nutrition risk profile, by computing their MUST scores (BAPEN, 2007). For this, the initial weight of long term stay patients was taken (pre test) and compared with their weight after 10-15 days (post test).

RESULTS AND DISCUSSION

Nutritional assessment of patients

Nutritional assessment of patients was done at endocrinology ward only for patients with endocrine disorders and that too, at only 1 hospital (H7) of the 11 hospitals. Anthropometric measurements were recorded, noted and followed up on the next visit at the hospital. Thus, this was a weak area observed in this study, which needs to be addressed and is primarily the responsibility of a dietician. In the present study, both nutritional status assessment and nutrition screening were done in 50 long term stay patients.

Assessment of nutritional status basically involves measuring and interpreting

- Anthropometry

In the present study, for nutritional assessment, height and weight measurements were taken and used to calculate BMI. These measurements were taken initially (pre-test) on selection of the patients with a follow up (post test) after 10 days in the selected hospitalized patients. Changes, if any, in weight and BMI, in this period were then assessed.

Height (cm)

Tables 1 and Table 2 depict the mean anthropometric measurements of patients distributed by gender. Height was measured with the help of an Anthropometer initially on selection of the patients for nutritional assessment. All measurements were taken in duplicate. As no change in height is expected to occur in adult patients within a span of 10-15 days, the initial height measurements were used to calculate the initial BMI and BMI after 10-15 days.

Table 1: Mean height of patients (n=50)

Gender	n	Height Range(cm)	Mean height (cm) ±SD
Male	28	155.6-168.00	161.5±3.60
Female	22	148.8-161.00	154.3±3.16

The mean height values are depicted in Table 1. From the table it is seen that the mean height of males was 161.5±3.60 cm and in case of females, it was 154.3±3.16 cm. The total range in terms of height was 148.8 to 168 cm respectively.

Weight (kg)

In the present study, weight of the patients was measured using a digital weighing scale with a sensitivity of 0.1kg, initially at the point of selection of the patients (pre test) and then repeated after 10-15 days (post test).

Table 2: Initial mean weight of patients (n=50)

Gender	n	Weight Range(kg)	Mean weight (kg) ±SD
Male	28	54.00-73.00	62.6±5.18
Female	22	49.5-60.5	55.2±2.90

Table 2 shows the findings of weight status of patients. As expected, the average mean weight for the male patients (62.6±5.18 kg) was found to be greater than that for the women, that is, 55.2kg ±2.90. The total weight range was 49.3 to 73.0 kgs.

The values obtained for height and weight status in this study showed that the patients' initial nutritional status was quite satisfactory, and compared fairly well with the ICMR (2010) values for reference man and woman and patients did not appear to be at nutritional risk.

Changes in weight status over a 10-15 day period

The change in body weight of the patients during the study period of 10-15 days was measured to assess their nutritional risk using MUST. Although, MUST scoring pattern uses a change in body weight over a 3-6 month period, in this study, the duration of 3-6 months was not found practical as most patients were discharged within 10-15 days. The average weight change in body weight is given in Table 3 and Figure 3.1 and details of weight changes in Annexure XVII. The information elicited showed that 58% of patients showed no change in weight, whereas 40% percent had lost weight, which ranged from 0.17- 2.32% (0.1-2kg). The weight loss observed was of a small magnitude and not statistically significant, but was a matter of concern, as it could possibly increase over a 3-6 month period (as stipulated by MUST), with continued hospitalization. Inappropriate nutrition as one of the contributory factors for this weight loss thus may need to be addressed. It was also seen from the study that one patient had gained weight (+0.3kg).

Fig ure 3.1:Weight changes during the study period of 10-15 days (n=50)

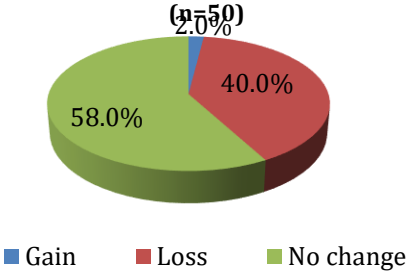


Table 3 : Weight changes during the study period of 10-15 days (n=50)				
Nature of weight change	**Number of patients n**	**Percentage of patients %**	**Range of weight gain (+)/ weight loss (-) kg**	**Percentage Range %**
Gain	1	2	+ 0.3	0.42
Loss	20	40	0.1 to 2	0.17 to 2.32
No change	29	58	-	-

BMI

In the present study, BMI was used to assess the extent of underweight, overweight and obesity in hospitalized patients. The BMI was compared with WHO (2000) standards which give the global cut-off points for BMI and WHO (2004) cut-offs for Asians, as points for public health action. However, it is recommended that countries should use both categories of BMI for reporting purposes, with a view to facilitating international comparisons.

Body Mass Index (BMI) is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). The Quetelet's index or BMI (W/H^2) is the most

widely used height weight index (Lee and Neiman, 2003), which can indicate under nutrition or over nutrition. The mean BMI of the sample, along with the range is given in Table 3.

Table 4: Mean BMI of patients (n=50)			
Gender	**n**	**BMI Range**	**Mean BMI±SD**
Males	28	20.80-28.74	24.00±1.89
Females	22	20.87-25.26	23.17±1.26
Total	**50**	**20.80-28.74**	**23.64±1.68**

BMI categorization of patients according to WHO (2000) cut-offs

In the present study, based on BMI, the nutritional status of patients was found to be quite satisfactory, on comparison of their BMI with the WHO (2000) cut off values (Table 4.1 and Table 4.2).

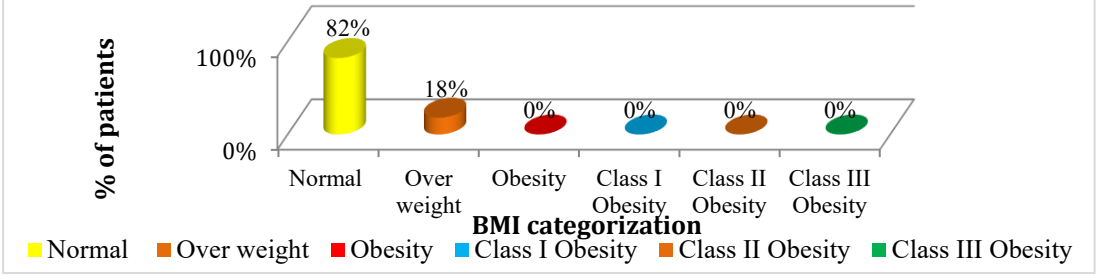
Table 4.70.2 and Figure 4 shows categorization of patients in the present study in terms of BMI. As seen, a higher percentage (82%) of patients fell in the normal BMI category (18.5-24.9kg/m^2) indicating satisfactory weight status. Eighteen percent of patients were seen in category that defines overweight (25-29.9) according to the current WHO standards and none of the patients were obese. It was encouraging to see that a majority of patients fell in the normal category.

Table 4.1: BMI status according to WHO (2000)	
Classification	**BMI (kg/m^2)**
Normal	(18.5-24.9)
Overweight	(25-29.9)
Obesity	(30-39.9)
Class I Obesity	(30-34.9)
Class II Obesity	(35-39.9)
Class III Obesity	(≥ 40)

Table 4.2: BMI status of patients (n=50) according to WHO (2000)							
BMI (kg/m^2)	**Classification**	**Males**		**Females**		**Total**	
		n	**%**	**n**	**%**	**n**	**%**
(18.5-24.9)	Normal	20	40	21	42	41	82

(25-29.9)	Overweight	8	16	1	4	9	18
(30-39.9)	Obesity	0	0	0	0	0	0

Figure 4.: BMI status of patients (n=50) based on WHO (2000)



BMI categorization of subjects according to WHO/IOTF/IASO (2000)/WHO (2004)

The International Obesity Taskforce (IOTF) vision is for declining global obesity burden and narrowing of its related inequalities in children and adults through effective and sustainable policy and environmental changes. The IOTF is working to alert the world to the growing health crisis threatened by soaring levels of obesity. It works with the World Health Organization, other NGOs and stakeholders to address this challenge. The IOTF's mission is to inform the world about the urgency of the problem and to persuade governments that the time to act is now. The WHO/IASO/IOTF (2000) have given classification for BMI, more suited to Asians, including Indians, in view of higher body fat tendency at lower BMI values. These cut off BMI values endorsed by WHO (2004) are indicated in Table 5.

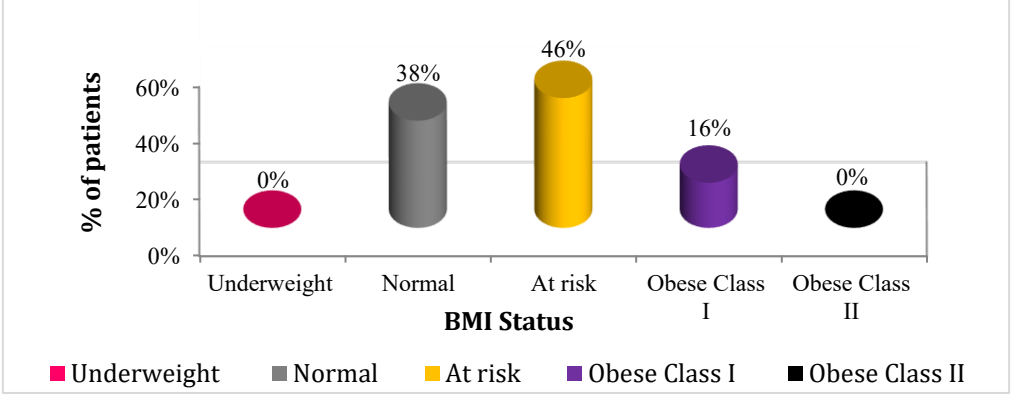
Table 5: BMI classification WHO/IASO/IOTF (2000) and WHO (2004)

Classification	**BMI(kg/m^2)**	**Risk of co-morbidities**
Underweight	≤ 18.5	Low
Normal	18.5 – 22.99	Average
At risk	23.00-24.99	Increased
Obese Class I	25.00-29.99	Moderate
Obese Class II	≥ 30.00	Very severe

Table 5.1: BMI status of patients (n=50) based on WHO/IASO/IOTF (2000) and WHO (2004)

IOTF	**Classification**	**Males**		**Females**		**Total**	
BMI(kg/m^2)		**n**	**%**	**n**	**%**	**n**	**%**
≤ 18.5	Underweight	0	0	0	0	0	0
18.5 – 22.99	Normal	9	0	10	20	19	38
23.00-24.99	At risk	12	24	11	22	23	46
25.00-29.99	Obese Class I	7	14	1	2	8	16
≥ 30.00	Obese Class II	0	0	0	0	0	0

Figure 5: BMI status of patients (n=50) based on BMI IOTF((2000)



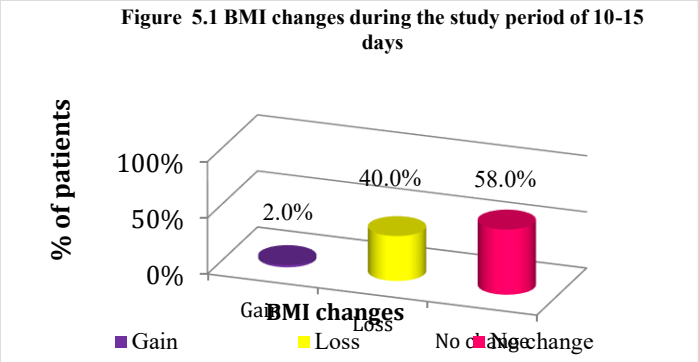
There were differences observed in the weight status categorization of the patients using the classifications of WHO (2024) and WHO/IOTF/IASO (2024). From Table 5.1 and Figure 5, it can be seen that, 38% of patients had normal BMI or weight status according to WHO/IOTF/IASO (2024) as against 82% having normal weight status according to WHO (2024) (Figure 4). According to WHO/IOTF/IASO (2024) 46% patients with BMI in the range of 23.00-24.99 were at risk of obesity and a further about 16% of patients were in Obese Class I category with BMI between 25.00-29.99, which according to WHO (2024) categorization, classifies people as only overweight (Table 4) Thus, while according to WHO (2024), no patient was classified obese as seen in Table 4.1 and Figure 5 according to WHO/IOTF/IASO (2024), 16% of the patients were obese. None of the patient was underweight according to both the classifications, indicating that patients, prior to hospitalization were quite healthy though some could benefit from a little weight loss.

Change in BMI over a 10-15 days period

The average change in BMI over a 10-15 day period is given in Table 5.2 and Figure 5.1 and details of BMI changes in Annexure XVIII. The information elicited showed that 58% of patients showed no change in BMI whereas 40% percent showed reduction in BMI which ranged from 0.1-3.9 (0.43- 16.18%) within 10-15 days but the BMI continued in the normal range. This was as expected and in consonance with changes observed in body weight. It was however still a matter of concern, as a greater loss of weight may be expected in the patients, if they were hospitalized for a longer duration. However, it may be kept in mind that iatrogenic malnutrition may be due to several factors, one of them being an inappropriate diet. It was also seen from the study that in one patient, BMI had increased minimally by 0.38%.

Table 5.2: BMI status of patients (n=50) based on WHO/IOTF/IASO (2000) and WHO (2004)

Change in BMI	Number of patients (n)	Percentage (%)	BMI gain (+) / BMI loss (-)kg	Percentage %
Gain	1	2	+ 0.1	0.38
Loss	20	40	0.1 to 3.9	0.43 to16.18
No change	29	58	-	-



Phase II of the study also comprised nutritional assessment of a sample of patients with an admission within 48 -72 hours and with hospital stay of more than 10 days and above, to enable follow up of anthropometric status pertaining to length of stay in the hospital. In the present study, height and weight measurements of the patients were recorded using standardized tools in order to assess BMI and the nutritional status of the patients. Other parameters on which data was gathered for nutritional assessment included biochemical and clinical profile of the patients and their dietary and nutrient data. A follow up after 10-15 days was done of the same patients to monitor their weight status, and assess their nutritional risk based on the screening tool MUST, modified to meet the situation of the study. The nutritional status/risk of malnutrition in patients with hospital stay >10 days was assessed to throw some light on the effect of their dietary status, if any, and a longer duration of stay in the hospital.

CONCLUSION

Profile of the patients for nutritional assessment

Adult patients admitted to the hospital were selected purposively from only 4 government and private registered hospitals (H1, H5, H6 and H10) because only at these hospitals more patients were observed to have a longer stay. H7 also had patients fulfilling this requirement but permission was not granted at this hospital to conduct the nutritional assessment of the long stay patients. At-least 1-2% of the total patient strength, based on availability of these patients from all hospitals were selected. Fifty six patients were thus selected for nutritional assessment, but for anthropometry, it was possible to include only 50 patients, as 6 patients were bedridden and their weight and height measurements were not feasible.

Anthropometry

Height and Weight Status

In the present study, for nutritional assessment, height and weight measurement were taken and used to calculate BMI (adults). These measurements were taken initially on selection of the patients with a follow up after 10 days in the selected hospitalized patients. The average mean weight for the male patients was 62.58±5.18 kg while for women it was 55.18kg ±2.90, with weight range being 49.30 to 73.00 kgs. The values obtained for height and weight status in this study showed that the patients' initial nutritional status was quite satisfactory, and compared fairly well with the ICMR (2010) values for reference man and woman and patients did not

appear to be at a nutritional risk. Weight loss observed in 40% patients after 10-15 days of hospitalization was of a small magnitude and not significant *(p=<0.05)* but was a matter of concern, as it could possibly increase over a 3-6 month period (as stipulated by Malnutrition Universal Screening Tool or MUST), with continued hospitalization. Inappropriate nutrition as one of the contributory factors for this weight loss thus may be one of the causes that may need to be addressed, although iatrogenic malnutrition may be due to several factors.

BMI

Majority of the patients (82%) had normal BMI in the range of 18.5-24.9 kg/m^2 indicating satisfactory weight status (WHO, 2000). Eighteen percent of patients were seen in the overweight category (25-29.9) and none of the patients were obese. However, according to WHO/IOTF/IASO (2000), 82% were of normal weight status and 18% of the patients were obese. None of the patient was underweight according to both the classifications, indicating that patients, prior to hospital were quite healthy though some could benefit from a little weight loss. The average change in BMI over a 10-15 day showed that 58% of patients showed no change in BMI whereas 40% percent showed reduction in BMI which ranged from 0.1-3.9 (0.43- 16.18%) after 10-15 days, but the BMI being still in the normal range. This was as expected and in consonance with changes observed in body weight and a possible cause of concern. It was also seen from the study that in one patient, BMI had increased minimally by 0.38%.

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