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**Research Article**

# SENSITIVITY AND SPECIFICITY OF MALNUTRITION SCREENING TOOL IN HOSPITALIZED PATIENTS IN INDIA

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**A R T I C L E I N F O**

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***Key words:***

The malnutrition screening tool used in this study is based on only two questions that assesses only weight loss and loss of appetite.

**A B S T R A C T**

**Background:** Recent digitization of patients' hospital records in our country provides a new opportunity to assess hospital based nutritional outcomes, such as malnutrition. Currently, there is no universally accepted nutrition screening tool for detection of malnutrition. It is suggested to assess malnutrition at an early stage, by a simple tool based on scientific evidence. The malnutrition screening tool used in this study is based on only two questions that assesses only weight loss and loss of appetite.

**Objective:** The aim of the study is to determine ability of malnutrition screening tool (MST) in patients hospitalized for tertiary care to accurately identify patients with malnutrition.

**Participants/setting:** A prospective observational was conducted that included 310 patients admitted to surgical wards of All India Institute of Medical Sciences, New Delhi between October, 2018 to July 2019. To assess the study population demographic, anthropometric and MST scores were obtained.

**Statistical Analysis:** The results were expressed as mean, standard deviation and median. Chi square tests were used to compare category variables. Sensitivity, specificity and predictive values was calculated. The receiver operating characteristics (ROC) curve was determined.

**Results:** 310 patients were enrolled in the study with higher number of males (63.5%) than females. Sensitivity was found to be 94.20%, specificity of 66.80% and positive likelihood ratio of 2.84.The area under the ROC curve was 0.8050.

**Conclusion:** There is lack of research validating the MST in patients hospitalized for tertiary care to accurately identify patients with malnutrition. Therefore, further large scale studies are necessary to evaluate the effectiveness of the MST.



## INTRODUCTION

Nutritional screening is a simple, rapid and general procedure used in hospitalized patients on admission internationally as a first step in recognizing the patients who may be at nutritional risk or potentially at risk for referral for appropriate nutrition intervention (1). Globally, it is used by nursing, medical or other staff on visit to a patient on admission to plan guidelines for implementation of action for provision of appropriate nutritional advice. Patients identified may either just need dietary advice with eating or drinking or may need to be referred for specialized dietary advice to improve nutritional status and clinical outcomes.

Currently, incidence of malnutrition in patients on admission in hospitals in India is not clearly known and therefore highlights the need for application of nutritional screening tools.

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Malnutrition in hospitalized patients have been associated with longer length of hospital stay (2), higher rates of complications and mortality (3), increased risk of infections and pressure ulcers, delayed wound healing, decreased nutrient absorption and accelerated loss of muscle mass (4). The cost of hospitalization increases by approximately 68% in malnourished patients, due to longer hospital stays, greater expenses with medications to treat complications, as well as greater costs of nutritional support to treat the established malnutrition (5). Moreover, severe under - nutrition has long been known to be detrimental to clinical outcome (6). In India, the number of patients requiring admission in the hospital is progressively rising, creating a medical and economic challenge. A variety of nutrition screening tools are currently used on hospitalized patients on admission. Subjective global assessment (SGA) an internationally validated nutrition screening tool is already tested among patients in India to identify clinically relevant malnutrition in Indian patients undergoing cancer surgery (7). Therefore, in the proposed study sensitivity and specificity of an internationally validated

nutrition screening tool known as malnutrition screening tool (MST) was tested (8). The aim of the study was to determine sensitivity and specificity of MST in finding malnutrition in the patients who are actually malnourished without including well nourished patients in the malnourished category.

### *Subjects and Methods*

A prospective observational was conducted that included 310 patients admitted to surgical wards of All India Institute of Medical Sciences, New Delhi between October, 2018 to July 2019.Ethical clearance from All India Institute of Medical Sciences, New Delhi was taken before conduct of study. The patients aged between 18 years to 60 year were included in the study. 310 patients on admission were enrolled in the study, out of which 36.45 % ( 113 ) were male and 63.55% (197 ) were female. Demographic variables ; age in years, gender, body mass index (BMI) , anthropometric measures ; admission weight in kg, height in cm and usual body weight were collected. Other variables that were collected were admission diagnosis, chief complaint on admission and diet prescribed on admission. Time between admission and nutrition screening was documented in hours. Pregnant patients, nursing mothers, patients hospitalized for bariatric surgery or those whose information, for whatever reason, would not be reliably collected were excluded from the study. Length of stay in hospital of the study population was also documented.

### *Nutrition Screening Tools*

Subjective global assessment (SGA), nutrition screening tool was administered on each study subject as per standard guidelines using a predetermined performa. SGA included assessment of nutritional status on the basis of medical history (weight change, dietary intake change, gastrointestinal symptoms that have persisted for more than 2 weeks, changes in functional capacity) and physical examination( loss of subcutaneous fat, muscle wasting, ankle/sacral oedema and ascitis). The classification of patients was categorized as well nourished (SGA-A), moderately or suspected of being malnourished (SGA-B) or severely malnourished (SGA-A)(7). Malnutrition Screening Tool (MST) was applied by a dietitian in this study for nutritional screening. The MST covered following issues: any recent non - intentional weight loss; if yes, how great the loss was; and if the patient was eating poorly due to less appetite. These questions generated a numerical score, in which 0-1 point indicated a low risk , 2-3 points indicated an average risk, and 4-5 points indicated high risk; patients at average or high risk underwent a detailed history taking, nutritional evaluation, and diet therapy (8).

***Statistical Analysis:*** The results were expressed as mean, standard deviation and median. Chi square tests were used to compare category variables. Sensitivity, specificity and predictive values was calculated. The receiver operating characteristics (ROC) curves were determined to describe diagnostic value of MST. Statistical analysis were performed using SPSS 9 version 20.0.SPSS, Inc., Chicago,IL)

## RESULTS

The demographic and clinical characteristics of the study population are shown in Table 1.The total population enrolled in the study was 310. The study population included higher number of males (63.5%) than females (Table 2). The mean age of participants was 43 years. The mean BMI was 21.3 $kg/m^{2,}$ which is within the normal range. The mean length of stay in hospital of the patient under study was around two weeks and the time between admission and administration of nutrition screening tools was 24.4 hours. The average length of stay (LOS) was 14 days. The top six admitting diagnosis for the patient population are shown in Table 3. Diagnostic test results of the total patient population are given in Table 4. Majority of patients were admitted for gastro – intestinal, followed by breast, bone and soft tissues, head and neck region, thorax and genito-urinary tract diseases.

**Table 1** Demographic and Clinical Characteristics of the Study Population

| Characteristics of the Study Population | Study Population (n=310) |
|---|---|
| **Mean Age ± SD (years)** | 43.04 ± 1408 |
| **Body mass Index (BMI) in $kg/m^2$** | 21.3 ± 3.6 |
| **Time between admission and nutrition screening in hours** | 24.4±16.3 |
| **Length of Stay (LOS) in days** | 14.3 ± 10.3 |

**Table 2** Distribution of study population by gender

| Gender | Frequency (%) |
|---|---|
| **Female** | 113 (36.45) |
| **Males** | 197(63.55 ) |
| **Total** | 310 (100) |

**Table 3** Admitting Diagnosis of the study population

| Admitting Diagnosis | Frequency (%) |
|---|---|
| **GI tract** | 180 ( 58.06) |
| **breast** | 56 (18.06) |
| **Bone & soft tissue** | 26 (8.39) |
| **Head & neck region** | 23(7.42) |
| **Thorax** | 16 (5.16) |
| | 310 (100) |

**Table 4** Diagnostic test results of the total patient population

| | Total Population | | |
|---|---|---|---|
| | **Diagnosis +** | **Diagnosis -** | **Total** |
| **MST Score ≥ 2** | True Positive=65 (a) | False Positive=80(c) | 145 |
| **MST Score < 2** | False Negative=4(b) | True Negative=161(d) | 165 |
| **Total** | **69** | **241** | **310** |

**Table 5** Sensitivity, specificity, positive likelihood ratio, negative likelihood ratio and positive predictive value of MST tool

| Statistics | Value | 95% CI |
|---|---|---|
| **Sensitivity** | 94.20% | 85.82% to 98.40% |
| **Specificity** | 66.80% | 60.47% to 72.72% |
| **Positive Likelihood Ratio** | 2.84 | 2.35 to 3.43 |
| **Negative Likelihood Ratio** | 0.09 | 0.03 to 0.23 |
| **Positive Predictive Value** | 44.83% | 40.23% to 49.52% |

Predictive value of MST nutrition screening tool is summarized in Table 5. Sensitivity was found to be 94.20%, specificity of 66.80% and positive likelihood ratio of 2.84.

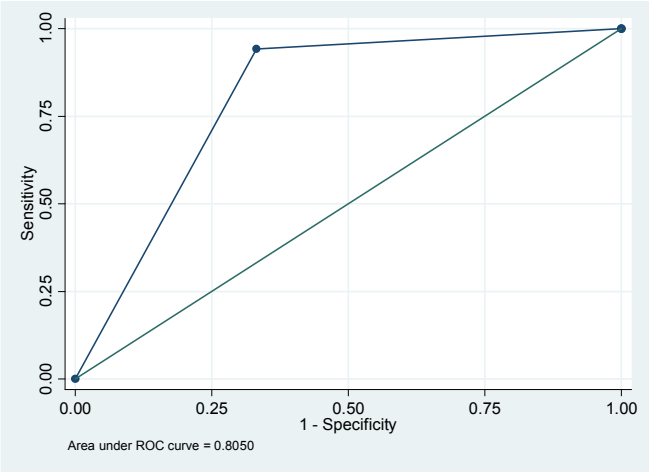


**Figure 1** Receiver operating characteristic (ROC) curve for the MST compared with SGA. The area under curve (AUC) 0.8050

ROC analysis for the cross validity of MST is presented in Figure 1.Goodness of MST was checked by the area under the ROC curve for the MST compared with SGA of 0.8050.

## DISCUSSION

According to NABH (National Accreditation Board for Hospitals and Health care Providers) guidelines, initial assessment of indoor and outdoor patients in a hospital to include screening for nutritional needs (9). This could be done by the treating doctor/ attending nurse or a dietician. The outcome of nutrition screening to be interpreted for the need for a detailed nutritional assessment which shall be done wherever required. Therefore, determining suitability of validated nutrition screening tools in diverse patient population in India is warranted.

Malnutrition rates in surgical patients have been documented to range from 30-50% (10). Along with malnutrition, metabolic stress and starvation associated with major gastrointestinal surgery, confounded often with cancer and pre-operative chemo-radiotherapy can cause a number of changes in metabolism including negative nitrogen balance, an increase in energy expenditure and a hyper-inflammatory response (11). Preoperative nutritional status is a highly significant factor in determining postoperative complications, due to its strong influence on postoperative nutritional status, immunity and the inflammatory response (12). Surgical procedures can also lead to postoperative malnutrition and immune-suppression together with a range of other metabolic and physiological symptoms, which represent the chief causes of postoperative complications (13).

In addition to the consequences of malnutrition discussed earlier, surgical procedures themselves induce an inflammatory response that may become excessive and harmful in some patients (14). Following surgery, a state of undernutrision can deplete the body's antioxidant defence mechanisms and lead to a suppression of lymphocyte function, a situation termed immune-suppression (15). A 2007 study showed the main risk factors for the onset of postoperative complications in patients undergoing major abdominal surgery for cancer were advanced age of the patient, type of surgery (with pancreatic surgery the greatest risk), low serum albumin, weight loss, and the type of nutritional support given (16). The findings of this aforementioned study emphasised the results of other studies which suggest that malnutrition appears to be an independent predictive factor for postoperative morbidity, with the risk of complications positively correlated with weight losses in excess of 10% of body weight (17).

Gastrointestinal surgery can have even more deleterious effects on patients' nutritional status, as often lengthy periods of fasting are required before and after surgery. Also, as gastrointestinal surgical procedures may be undertaken for the treatment of a wide range of disorders of the gastrointestinal tract including cancers, chronic malabsorptive disorders or obstructions causing symptoms including early satiety, fatigue, weight loss and dysphagia, which all potentially play a significant part in the development of malnutrition in suffering patients (18). Several studies have looked specifically at the surgical population to compare complication rates of malnourished and well-nourished patients post-operatively .Complication rates significantly higher in malnourished patients were seen, with 40% of malnourished patients suffering complications compared to 15% of well nourished patients ($p<0.001$) (19). Furthermore, the latter study confirmed the more severe the malnutrition, the more severe the complication suffered. Further studies confirmed morbidity rates, especially severe infections, were higher in malnourished patients with odds ratios being between 3.09 and 8.80 (20,21).

The aim of the study was to evaluate the sensitivity, specificity predictive value and ROC of the MST nutrition screening tool in patients. The MST nutrition screening had a sensitivity of 94.20%, specificity was 66.80% and positive predictive value of 44.83%. Conducting nutritional screening on admission in hospitalized patients is important for recognizing and correcting nutrition related issues. It helps to assure that nutrition care is provided constantly and the focus is directed towards patients at risk of malnutrition. MST classified 65 more patients as malnourished compared to SGA. In our study MST show high sensitivity and low specificity . Therefore it may be good for catching actual patients at risk of malnutrition but they also come with a fairly high rates of false positives. The low positive predictive value and high negative predictive value signify that more information is needed for confirmatory testing of patients at risk of malnutrition.

## CONCLUSION

In the present study high sensitivity of MST depict ability of MST to correctly identify patients who are malnourished usually comes at the expense of lower specificity: meaning false positives. Sensitivity and specificity vary with the cut-off chosen for a diagnostic test and are not intrinsic to the test but critically dependent upon the clinical context. There is lack of research validating the MST in patients hospitalized for tertiary care to accurately identify patients with malnutrition. Therefore, further large scale studies are necessary to evaluate the effectiveness of the MST.

## References


1. Kuzu MA, Terzioglu H, Cenc V, A.B. E, Ozban M, Sonyurek P, *et al*. Preoperative nutritional risk assessment in predicting postoperative outcome in patients undergoing major surgery. World J Surg. 2006;30:378-90.
2. Edington J, Boorman J, Durrant ER, Perkins A, Giffin CV, James R, *et al*. Prevalence of malnutrition on admission to four hospitals in England. The Malnutrition Prevalence Group. Clin Nutr. 2000;19(3):191–195.
3. Naber TH, Schermer T, de Bree A, Nusteling K, Eggink L, Kruimel JW, *et al*. Prevalence of malnutrition in nonsurgical hospitalized patients and its association with disease complications. Am J Clin Nutr. 1997;66(5):1232–1239.
4. Middleton MH, Nazarenko G, Nivison-Smith I, Smerdely P. Prevalence of malnutrition and 12-month incidence of mortality in two Sydney teaching hospitals. Int Med J. 2001;31(8):455–461.
5. Pérez de la Cruz A, Lobo Támer G, Orduña Espinosa R, Mellado Pastor C, Aguayo de Hoyos E, Ruiz López MD. Malnutrition in hospitalized patients: prevalence and economic impact. Med Clin. 2004;123(6):201–206.
6. McWhirter JP, Pennington CR. Incidence and recognition of malnutrition in hospital. Br Med J. 1994;308:945-8.
7. McWhirter JP, Pennington CR. Incidence and recognition of malnutrition in hospital. Br Med J. 1994;308:945-8.
8. Shirodkar M., Mohandas M. Subjective global assessment: a simple and reliable screening tool for malnutrition among Indians. Indian J Gastroenterol. 2005;24:246-250.
9. Ferguson M, Capra S, Bauer J, Banks M. Development of a valid and reliable malnutrition screening tool for adult acute hospital patients. Nutrition (Burbank, Los Angeles County, Calif.). 1999 Jun;15(6):458-464.
10. Samual N *et al*.National Accreditation Board for Hospitals and Healthcare Providers (NABH) Standards: A review.Current medical issues. 2017;3:231-236.
11. Ward N. Nutrition support to patients undergoing gastrointestinal surgery. Nutr J. 2003;2(18).
12. Schiesser M, Muller S, Kirchhoff P, Breitenstein S, Schafer M, Clavien P. Assessment of a novel screening score for nutritional risk in predicting complication in gastro-intestinal surgery. Clin Nutr. 2008;27(4):565-70.
13. Grimble RF. Immunonutrition. Current Opinion Gastroenterol. 2005;21(2):216-22.
14. Krenitsky J. Nutrition and the immune system. AACN Clin Issues. 1996;7(4359-69).
15. Xu J, Zhong Y, Jing D, Wu Z. Preoperative enteral immunonutrition improves postoperative outcome in patients with gastrointestinal cancer. World J Surg. 2006;30(7):1284-9.
16. Calder PC. Immunonutrition in surgical and critically ill patients. Br J Nutr. 2007;98 Supp11:S133-9.
17. Calder PC. Immunonutrition in surgical and critically ill patients. Br J Nutr. 2007;98 Supp11:S133-9.
18. Bozzetti F, Gianotti L, Braga M, Di Carol V, Mariani L. Postoperative complications in gastrointestinal cancer patients: The joint role of the nutritional status and the nutritional support. Clin Nutr. 2007;26:698-709.
19. Shikora SA, Blackburn GL. Nutritional consequences of major gastrointestinal surgery. Patient outcome and starvation. Surg Clin North Am. 1991;71(4509-21.
20. Gianotti L. Nutrition and Infections. Surg Infect. 2006;7(supp12):529-532.
21. Elia M, Zellipour L, Stratton RJ. To screen or not to screen for adult malnutrition. Clin Nutr. 2005;24(4867-84).


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