Original Article

Evaluation of efficacy of Nutritional screening tools to assess Malnutrition among Elderly patients in a tertiary hospital in Telangana, India

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Abstract

Background: Malnutrition among elderly population is very common and often studied less.

Aims and objectives: The present article studies the malnutrition risk among elderly patients using various nutritional assessment tools and to find which is more efficient in identifying the patient at risk.

Materials and Methods: Different tools used were Malnutrition Universal screening tool (MUST), Mini-Nutritional Assessment (MNA), Nutritional Risk Screening (NRS) 2002, and Geriatric Nutritional Risk Index (GNRI) on eighty elderly patients for 6 months.

Results: It was observed from the study that among the four nutritional screening tools the sensitivity and specificity were in the order of NRS > MNA > GNRI > MUST, i.e., highest validity with NRS (93.88% and 96.77%) and the least with MUST tool (38.78% and 9.68% specificity). In contrast, the results were different when it comes to the reliability of the tools where MNA > MUST > GNRI > NRS. The prevalence of malnutrition among the patients with these screening tools varied ranging from 58.75% (GNRI) to 80% (MNA).

Conclusion: Thus, it was difficult to judge one particular screening tool as a standard to detect malnutrition among elderly patients. Hence, it can be concluded that all nutrition screening tools should be selected and used depending on the ease of convenience.

Keywords: Geriatric nutritional risk index, malnutrition, mini nutritional assessment, malnutrition universal screening tool, nutritional risk screening, nutritional assessment tools

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INTRODUCTION

Malnutrition in children and adolescents is widespread, but malnutrition in an elderly group is often heard less. Malnutrition is also seen among individuals above 60 years Which is attributed to many comorbidities. Psychological changes, chronic diseases, physiological changes, and poor nutritional status puts the elderly at a huge risk of malnutrition and mortality. Prolonged hospital stay, hospital-acquired infections, readmissions, and poor convalescence is seen among elderly patients are the ramifications due to malnutrition. Hence, there is a need to provoke the practice of early detection of malnutrition in these patients and tailoring the nutrition care plan accordingly.

Statistics reveal that >50% of the older population was underweight and >90% had an energy intake below the recommended allowances (Haines *et al.*).[1] Elderly people are prone to malnutrition and the problematic components are referred to as 9 D's. These are Depression, Dementia, Dentition, Dysgeusia,

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Dysfunction, Drugs, Disease, Dysphagia, and Diarrhea. Early assessment and care plans can help elderly patients to prevent further malnutrition and improve the recovery outcome, thus it is mandatory to identify the patient at risk of malnutrition by using any validated screening tools.

The dietary assessment tools used for elderly patients to know the risk of malnutrition used in the study are malnutrition universal screening tool (MUST), Nutritional Risk Screening (NRS), Mini Nutritional Assessment-Short Form (MNA-SF), and Geriatric Nutritional Risk Index (GNRI). MNA-SF is an international questionnaire used to evaluate malnutrition with high sensitivity, specificity, and accuracy (Yuvraj *et al*.).[2] On the contrary, GNRI is yet another easy, simple, and widely used single effective predictive marker for mortality on admission which is calculated based only on serum albumin and the ratio between the actual and the ideal body weight.[3] It helps in the early diagnosis of malnutrition (Mathew *et al*.).[4]

Various studies prove the efficacy of these tools. Yanli Zhao *et al*.[5] compared the GNRI and MNA-SF in predicting length of stay in older surgical patients. Another outcome of the study by Nur Adilah *et al*.[6] showed the ability of these assessment tools is preventing the under-diagnosis of malnutrition thus reducing the prevalence of malnourished patients in hospitals of Malaysia. A study by Krishnamoorthy *et al*. studied the prevalence of malnutrition through MNA and factors associated with it among older people in rural Puducherry, India. These tools are also extensively used as predictive markers for multiple comorbidities.

The present study aimed at identifying a better assessment tool among the aforementioned Nutritional screening tools.

METHODOLOGY

Selection of subjects

The study was carried for 6 months at a tertiary hospital in Hyderabad, India, patient over 65 years of age was recruited for the study. Criteria of exclusion include patients who were not able to communicate (n = 10), patients who recently underwent chemo or radiotherapy (n = 4), those who were posted for surgery (n = 6), those who were on enteral or total parenteral nutrition (n = 23). Of a total of 123, only 80 were considered eligible for the study.

Anthropometric and biochemical

General information, anthropometric measurements and biochemical data related to participants were acquired from the patient's case sheet/medical records of the hospital. Information such as socio-economic background, lifestyle, eating habits and weight loss history were acquired with the help of a questionnaire filled in by the investigator during the patient's hospital stay. Biochemical parameters were noted down from the patient's case sheet. No separate biochemical tests were conducted for the study. Biochemical parameters include hemoglobin, albumin, urea, creatinine, serum glutamic-oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), random blood sugar (RBS), fasting blood sugar (FBS), etc.

Nutritional assessment

The nutritional screening was performed using various tools including MNA, GNRI, MUST, and NRS 2002. In absence of a standard for evaluation of malnutrition in elderly individuals, a combined index was used as a reference standard as suggested by Poulia *et al*.,[7] Baek and Heo,[8] where patients who were evaluated as malnourished to any degree or at risk of malnutrition according to any three out of four tools were categorized as malnourished in the combined index classification which was the criterion of true malnutrition.

Statistical analysis

Statistical analysis was done using excel 2013, mean and standard deviation were calculated for quantitative data, namely anthropometric and biochemical parameters, P values for anthropometric measurements were derived from the unpaired t-test, where $P > 0.05$ was indicative of statistical significance. The prevalence of nutritional risk was calculated according to NRS-2002, MUST, MNA, and GNRI. Cohen's Kappa (k) coefficient was calculated to evaluate whether there is an agreement between various screening tools for classifying nutrition risk.

RESULTS AND DISCUSSION

Of the total 80 participants, 32 were female and 48 were male, with an average age of 73.88 ± 15.83 in females and 70.75 ± 8.69 in males. Patients were admitted to the hospital with various diseases such as complications related to diabetes, IBD, pancreatitis, ascites, and liver abscess, and a few were also posted to minor surgeries and later shifted to the postoperative ward.

Mean height, weight, and body mass index (BMI) are represented in Table 1. Biochemical parameters were represented as mean and standard deviation for all male and female participants separately in Table 2 for hemoglobin, albumin, urea, creatinine, sodium, potassium, albumin, RBS, and FBS, etc., Albumin levels were found lower in both male and female participants which is indicative of malnourishment. In contrast, urea was found high in both male and female participants. Low levels of hemoglobin are also indicative of nutritional anemia that was apparent in both genders. Mean hemoglobin content was also lesser when compared to a reference range. Fasting and RBS are also found to be higher than the reference ranges. SGOT values were found to be under the normal reference range but SGPT in contrast was found to be higher in male participants.

Nutritional screening

Four different tests were used to find out the prevalence of malnourishment among participants, GNRI, MNA, Malnutrition

Table 1: Mean anthropometric measurements

	Mean±SD	
	Females	**Males**
Age (year)	73.88±15.83	70.75±8.69
Weight (kg)	70.19±9.15	66.27±11.33
Height (cm)	157.16±5.75	166.625±5.64
BMI (kg/m^2)	24.54±6.11	23.75±3.91
n	32	48

SD: Standard deviation, BMI: Body mass index

Table 2: Mean biochemical and hematological characteristics of subjects

	Females	Males	Reference range*
Age (year)	60.88±15.83	69.75±8.69	-
Hb (g/dl)	10.48±2.57	10.14±2.59	Male-13.8-17.2 Female-12.1-15.1
Urea mg/dl	48.13±42.74	48.46±39.81	13-43
Creatinine mg/dl	1.41±1.3	1.41±0.71	0.7-1.3
Sodium (meq/l)	132.32±5.8	133.38±5.82	136-145
Potassium (meq/l	4.18±0.69	4.41±0.67	3.5-5
Albumin g/dl	2.81±0.65	2.85±0.57	3.5-5
RBS mg/dl	185.57±111.02	141.21±64.94	70-140
FBS mg/dl	140.5±67.81	175.25±25	70-100
Bilirubin mg/dl	0.93±1.55	1.4±1.92	0.3-1.2
Alkaline phosphatase U/l	260.04±130.02	276.47±165.18	80-306
SGPT U/l	31.08±46.11	36.21±43.48	13-40
SGOT U/l	36.96±33.04	60.67±140.78	0-40

*$P>0.000$. Values are represented as mean±SD. SD: Standard deviation, Hb: Hemoglobin, SGOT: Serum glutamic-oxaloacetic transaminase, SGPT: Serum glutamic pyruvic transaminase, RBS: Random Blood Suga, FBS: Fasting Blood Sugar

Table 3: Prevalence of malnutrition based on mini-nutritional assessment

	Normal (%)	At-risk (%)	Malnourished (%)
Women (32)	6 (18.75)	22 (68.75)	4 (12.5)
Men (48)	14 (29.17)	32 (66.67)	2 (4.16)
Total (80)	20 (25)	54 (67.5)	6 (7.5)

Table 4: Prevalence of malnutrition based on geriatric nutritional risk index

	Normal (%)	Mild (%)	Moderate (%)	Severe (%)
Women (32)	3 (9.37)	2 (6.25)	15 (46.8)	12 (37.58)
Men (48)	5 (10.42)	1 (2.08)	21 (43.75)	21 (43.75)
Total (80)	8 (10)	3 (3.75)	36 (45)	33 (41.25)

NRI=(1.519×serum albumin (g/l) + 41.7 × (present weight/usual weight) >100-No risk, 97.5-100-Mild risk, 83.5-97.5-Moderate risk, <83.5-Severe risk. NRI: Nutritional risk index

Table 5: Prevalence based on malnutrition universal screening tool score

	Low risk (%)	Medium risk (%)	High risk (%)
Women (32)	9 (28.12)	15 (46.87)	8 (25.01)
Men (48)	22 (45.8)	23 (47.91)	3 (6.29)
Total (80)	31 (38.75)	38 (47.5)	11 (13.75)

Table 6: Prevalence based on nutritional risk screening score

	No risk (%)	Mild (%)	Moderate (%)	Severe risk (%)
Women (32)	4 (12.5)	11 (34.37)	7 (21.87)	10 (31.25)
Men (48)	4 (8.33)	16 (33.33)	16 (33.33)	12 (25)
Total (80)	8 (10)	27 (33.75)	23 (28.75)	22 (27.5)

universal screening tool (MUST), and NRS-2002 different tests among participants represented individually represented in Tables 3-6, indicates the prevalence of malnutrition among participants. The frequency of degree of malnutrition varied between different screening tools used. According to a combined index, 35% of participants were classified as malnourished or at risk of malnutrition, while the risk of malnutrition according to MNA, GNRI, MUST, NRS (2002) was found to be 75%, 72%, 49%, and 72%, respectively. On the other hand percentage of the patient having normal nutritional status varied as per various screening tools, i.e., MNA, GNRI, MUST, NRS (2002), and the combined index was found to be 25, 10, 38.75, 10, and 56.25, respectively. Prevalence of malnutrition as per different tools among participants represented individually represented in Table 7.

Comparison of various screening tools

Validity analysis of various screening tools according to the combined index which is used as reference revealed that NRS-2002 has good validity with a sensitivity of 93.88% and specificity of 96.77% followed by MNA and GNRI-Sensitivity 71.88% and 85.11% and specificity 93.75% and 81.82%, respectively. MUST found to have poor validity when compared to other screening tools, i.e., 38.78% sensitivity and 9.68% specificity. The reliability among various screening tools was also differing where MNA showed fair reliability followed by MUST, GNRI, and NRS 2002 [Table 7] which is in contrast to sensitivity and specificity results.

The prevalence of malnutrition varied from 58.75% (GNRI) to 80% (MNA) as per the methodology adopted [Figure 1]. This study demonstrated that the rate of malnutrition varied depending upon the screening tool and its purpose and parameters. In the absence of standard reference values for geriatric nutritional assessment, many researchers make use of existing tools depending upon the requirement in their clinical setup.

Nutritional screening tools should be easy to carry out, economical, and convenient to practice. Myoung-Ha Baek *et al.* 2015 suggested MUST as the most reliably tool to assess the nutritional status of the elderly as this makes use of BMI and weight loss score and acute disease score which is easy to carry out. Similarly, NRS 2002 also makes use of weight loss score, BMI, and disease score and no laboratory investigation is required unlike albumin tests in GNRI. Thus, it is convenient to assess malnutrition among elderly patients using NRS 2002 screening tool compared to MNA as the latter requires detailed interrogation which sometimes may not be possible in critical care units. Statistically, it is observed from the study that MUST had the lowest PPV of 40.43%, followed GNRI with a PPV of 86.76%

CONCLUSION

All tools that were used to evaluate the nutritional status of patients represented varied results in terms of rate of malnutrition. Any Nutritional Screening test can be used to evaluate the nutritional

Table 7: Evaluation of nutritional screening tools

	MNA	GNRI	MUST	NRS 2002
Sensitivity (95% CI)	71.88 (59.24-82.4)	85.11 (71.69-93.8)	38.78 (25.2-53.76)	93.88 (83.13-98.72)
Specificity (95% CI)	93.75 (69.77-99.84)	81.82 (64.54-93.02)	9.68 (2.04-25.75)	96.77 (83.3-99.92)
PPV (95% CI)	97.87 (87.27-99.68)	86.96 (76.2-93.28)	40.43 (31.91-49.56)	97.87 (86.98-99.69)
NPV (95% CI)	45.45 (35.57-55.7)	79.41 (65.65-88.62)	9.09 (3.23-23.07)	90.91 (76.93-96.77)
Accuracy	76.25 (35.57-55.71)	83.73 (73.82-91.65)	27.5 (18.1-38.62)	95 (76.93-96.77)
Prevalence	80 (69.56-88.1)	58.75 (47.18-69.65)	61.25 (49.7-71.94)	61.25 (49.7-71.94)
K value (SE)	0.38 (0.98)*	0.09 (0.12)*	0.22 (0.11)*	0.07 (0.12)*

*significant at 5%, MUST: Malnutrition universal screening tool, CI: Confidence interval, GNRI: Geriatric nutritional risk index, MNA: Mini-nutritional assessment, NRS: Nutritional risk screening, PPV: Positive predictive value, NPV: Negative predictive value, SE: Standard error

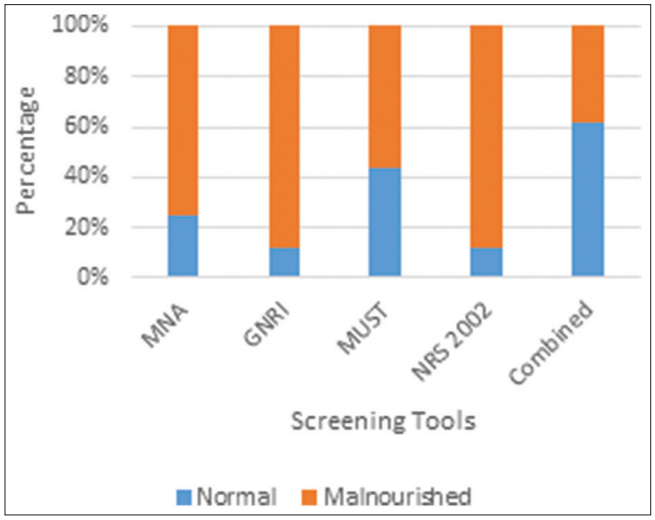

Figure 1: Prevalence of Malnutrition according to various screening tools

status of elderly individuals. GNRI requires albumin values and MNA scoring is time-consuming. NRS 2002 and MUST on other hand found to be more accurate and it is easy to carry out and less time-consuming and requires no biochemical tests to be performed for its calculation. Hence can be practiced with ease. However, more research is required in this area with comparably larger sample size to derive a valid conclusion.

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Limitations

The sample size is too small to reach to valid conclusion regarding NRS and assessment.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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