Scientific Research Publishing

Food and Nutrition Sciences, 2024, 15, 565-575
https://www.scirp.org/journal/fns
ISSN Online: 2157-9458
ISSN Print: 2157-944X

Nutritional Screening Tools in Institutionalized People: A Case Study of Using Nutritional Risk Screening (NRS 2002) and Mini Nutritional Assessment (MNA)

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How to cite this paper: Santana, A.C.A., dos Santos, D.C. and Egea, M.B. (2024) Nutritional Screening Tools in Institutionalized People: A Case Study of Using Nutritional Risk Screening (NRS 2002) and Mini Nutritional Assessment (MNA). *Food and Nutrition Sciences*, **15**, 565-575.
https://doi.org/10.4236/fns.2024.157037

Received: June 4, 2024
Accepted: July 14, 2024
Published: July 17, 2024

Abstract

Nutritional status expresses the physiological and nutritional needs to maintain the composition and adequate functioning of the organism. NRS 2002 and MNA protocols were applied to short-term institutionalized patients in Rio Verde (Brazil). Older adults and people with special needs of all ages, both sexes, regardless of possible pathology they may have, except if it causes contagion, were included, patients duly authorized by the person responsible for the institution and who were able to undergo evaluation. Thirty-eight patients from the institution were evaluated, of which ten were excluded from the research according to pre-established criteria. More than 50% of participants were male, with an overall average age of 63.43 years. The characteristics related to nutritional status by NRS 2002 and MNA showed that the risk of malnutrition and its absence are associated with a wide age range. The MNA presents a more nuanced nutritional risk classification, showing that even 61% of the 96% of participants who would be out of nutrition risk, according to the NRS 2002, are "at risk of malnutrition". Applying the MNA can demonstrate more conservative results than the NRS 2002.

Keywords

Nursing Home, Elderly, Nutritional Risk, Overweight

1. Introduction

An individual's nutritional status is determined by the relationship between ener-

gy intake from nutrients and micronutrients and the body's needs, as well as the capacity for digestion, absorption, use of nutrients, and response to pathological factors. Furthermore, this nutritional status influences quality of life and outcomes in illness or medical complications [1] [2].

The increase in the population's life expectancy has brought changes in the epidemiological profile of the Brazilian and world population [3]. In this sense, the process of dehospitalization of older adults or people with disabilities arises, which is the removal of the patient from the hospital environment to continue treatment at home, which is highly related to humanization actions. However, not all families have the physical, economic, social, and emotional conditions to welcome older adults or people with disabilities back into their homes because they require prolonged care and attention [4]. Thus, facilities emerge that offer personalized programs to serve older people and people with disabilities on a temporary (day- or short-term care) or permanent (long-term care) basis to welcome and provide quality of life for this population. In these facilities, in addition to receiving primary care, individuals receive various types of health treatments and are involved in activities to enable socialization and interaction [5].

Older adults and people with disabilities have a higher risk of malnutrition due to a decline in physiological or mental functions and reduction in lean mass, in addition to having sensory changes, heart and respiratory problems, a greater frequency of hospitalizations, infections, and pressure ulcers, often accentuated by the presence of an underlying disease [6]-[8].

Thus, the screening and assessment of nutritional status becomes essential in the quality of life of older people and people with disabilities [9]. On the other hand, malnutrition or protein-energy malnutrition in this population is also strongly associated with increased functional disability, susceptibility to infections, increased hospitalizations, reduced quality of life, and increased mortality [10] [11].

As nutritional assessment depends on time and a trained professional, nutritional screening tools were instituted, which are tools used to detect nutritional risk by applying a quick and low-cost questionnaire that any health professional can apply. Once nutritional risk is detected, the individual is referred for a nutritional assessment to plan nutritional therapy [10].

Nutritional Assessment and Nutritional Screening (NS) must be different. Nutritional assessment must be more detailed, applied by trained professionals, and involve anthropometric measurements to determine nutritional status [2] [12]. The NS must have questions and procedures that are easy to collect and cover the largest number of patients. This screening is hampered by limitations intrinsic to screening tools, such as interobserver variability that may occur due to poor training or lack of experience, difficult reproducibility, lack of tool validation, and heterogeneity of the population being evaluated, among others [10].

There are several nutritional screening tools, including Nutritional Risk Screen-

ing 2002 (NRS 2002) and Mini Nutritional Assessment (MNA) [13]. The NRS 2002 is a nutritional screening tool for adults and older adults that detects malnutrition or the risk of developing it, classifying patients according to the deterioration of nutritional status, adjusted for age when over 70 years old. NRS 2002, recommended by the European Society for Parenteral and Enteral Nutrition (ESPEN), presents a good correlation between anthropometric parameters, including mortality prediction, and greater effectiveness than other protocols.

The most common validated screening tool for older persons is the MNA tool, which includes a form that is used as a screening tool (MNA-SF) and a complete form that requires a more in-depth nutritional assessment of the subjects (MNA-FF) [12] [14]. The MNA tool has been designed to provide a single and rapid assessment of nutritional status among older people in different settings and adult people. This tool has proven helpful in pointing out the malnutrition risk, showing predictive value to outcomes such as mortality and emergency room discharge in older adults [14]-[16].

2. Material and Methods

2.1. Protocol Study

This observational, cross-sectional, and quantitative study applies the NRS 2002 and MNA tools to patients living in a short-term institution. The institution where the research was developed is an institution that serves an average of 50 and 100 patients for long and short terms, respectively, in the city of Rio Verde (Goiás, Brazil). The research followed the Declaration of Helsinki and was previously approved by the University of Rio Verde Research Ethics Committee under number 6,229,029.

Older adults (age > 60 years) and people with disability of all ages, both sexes, regardless of possible pathology, except for those who caused contagion and who consented to their participation, were included. Patients who refused to participate in the research were absent on the evaluation days or had left the institution during the research period, and they were excluded from the study.

2.2. Anthropometric Assessments

The assessments were carried out by a trained researcher using the instructions present in the tools. For anthropometric assessment, height (m) was measured using a stadiometer, body mass (kg) was measured using scales, and Body Mass Index (BMI) was calculated based on body mass and height (Equation (1)).

$$\mathrm{BMI}\left(\frac{\mathrm{kg}}{\mathrm{m}^2}\right)=\left(\frac{\text{body mass}}{\text{hight}^2}\right) \tag{1}$$

In patients who used wheelchairs or those with difficulty standing up, knee height and brachialis circumference according to the Chumlea *et al*.'s technique [17], and armspan according to Kwok and Whitelaw [18]. The body circumferences were measured with a flexible and non-elastic tape graded in centimeters.

Adult patients were classified according to BMI using the WHO classification

(1998) as lean or underweight (<18.5), eutrophic (18.5 - 24.9 kg/m^2), overweight or pre-obese (25.0 - 29.9 kg/m^2), grade I obesity (30.0 - 34.9 kg/m^2), grade II obesity (35.0 - 39.9 kg/m^2), and severe or grade III obesity (≥40.0 kg/m^2). Based on BMI, elderly patients were classified as underweight (<22 kg/m^2), eutrophic (22 - 27 kg/m^2), or overweight (>27 kg/m^2) [19]. These results were classified in the number of patients who fit each nutritional classification by the total number of patients × 100 to obtain the value in percentage.

2.3. Assessment of Nutritional Status

Patients were assessed using the nutritional screening tools of NRS 2002 [13] and MAN-FF [14]. The NRS 2002 uses Body Mass Index (BMI), unwanted weight loss in the last trimester, reduced food intake in the last week, and severe illness in the first part of the tool. A second part of the tool classifies the responses from the initial screening, considering the percentage of weight lost and time, BMI, diet acceptance, and degree of severity of the disease. The NRS 2002 total score is the sum of the nutritional status and disease severity scores and the age-adjusted score. It is a tool for summing points, in which the maximum score is 7, where 0 indicates patients with no risk of malnutrition, 1 - 2 indicates low risk, and 3 - 7 indicates moderate to severe risk of malnutrition.

The MNA is a tool that has 18 questions divided into four parts: 1) anthropometric measurements including weight, height, arm circumference, calf circumference, and weight loss during the last three months; 2) global assessments with six questions related to lifestyle, medication, and mobility; 3) dietary questionnaires (eight questions related to the number of meals, food and liquid intake and autonomy in eating); and 4) subjective assessments containing questions on self-perception of health and nutrition. The total score represents the nutritional status of the participants based on the following categories, with a score < 17 classifying the patient as malnourished, 17 - 23.5 classifying the patient at risk of malnutrition, and 24 - 30 classifying the patient as having a normal nutritional status.

2.4. Statistical Analysis

The results were tabulated using Microsoft software (Office Excel 2016) and expressed as mean ± standard deviation. These results were classified in the number of patients who fit each nutritional classification by the total number of patients × 100 to obtain the value in percentage. The results obtained were evaluated for normality using the Shapiro-Wilk test. When considered non-normal, they were evaluated using the Spearman correlation (non-parametric) test using Statistica 5.0 software (StatSoft, USA).

3. Results and Discussion

The use of nutritional screening tools has been constantly discussed due to their objective of improving patient outcomes and reducing costs [20]. An excellent

nutritional screening tool must include the patient's conditions at the time of application and consider the patient's stability and possible outcomes they may suffer [13]. This research used NRS 2002 and MNA as tools for assessing nutritional risk. Initially, 38 patients from the institution were invited to carry out the research (Figure 1), of which ten were excluded from the research according to pre-established criteria, seven were dismissed, one was transferred from the facility, one refused to remain in the evaluation and 1 died.

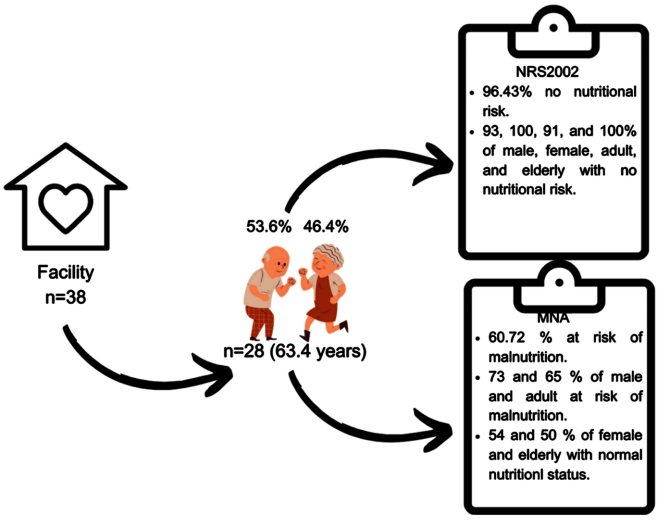

Figure 1. General outline of the research study protocol and population characterization using nutritional screening tools.

A total of 28 patients were evaluated. Most participants were male (53.66%), with an overall average age of 63.43 (Table 1). The group evaluated was generally classified in the overweight BMI range with no significant difference between the sexes. Regarding age, the elderly population fell into the normal BMI range, and the Spearman correlation coefficient demonstrated that as age increases, BMI decreases ($\rho = -0.38$, $p < 0.05$). Although this correlation is considered weak, probably due to the total number of the sample, this trend demonstrates what has been reported in the literature about older adults who tend to demonstrate a decrease in body mass, which may be due to the sarcopenia process [21].

Table 1. Demographic data residing in short-term institutionalized people (n = 28).

Variables	Age (year)*	BMI (kg/m²)*
All (n = 28)	63.43 ± 17.13 (24 - 90)	27.21 ± 6.45 (13.99 - 43.79)
Male (n = 15)	60.67 ± 20.66 (24 - 90)	25.68 ± 4.65 (18.63 - 33.87)
Female (n = 13)	66.62 ± 12.88 (43 - 85)	28.99 ± 8.10 (13.99 - 43.49)
Adult (n = 12)	47 ± 10.19 (24 - 59)	27.83 ± 5.31 (19.44 - 39.11)
Elderly (n = 16)	73.76 ± 9.68 (60 - 90)	26.75 ± 7.52 (13.99 - 43.79)

Note: *Mean ± standard deviation (low value - high value); *BMI: Body Mass Index.

Figure 2 presents the classification of nutritional status according to age group. Most elderly individuals (25%) demonstrated a nutritional diagnosis according to the BMI within the eutrophic range (Figure 2), while for adult individuals, the majority (21.4%) demonstrated within the obesity range. Sousa *et al.* [22] demonstrated in their study a similar result to the present study, where in a population of 131 older adults, the majority were classified within the BMI range of overweight (~50%) and normal weight (~48%).

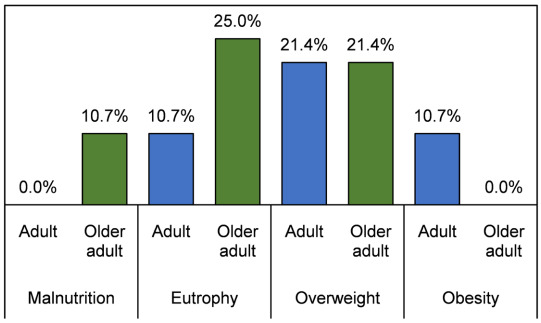

Figure 2. Classification of the nutritional status of short-term institutionalized people (n = 28) according to Body Mass Index (BMI).

The literature has discussed that the occurrence of overweight and obesity in elderly patients is a paradox: while obesity may have a "protective" effect (especially about the mass loss that occurs in sarcopenia) compared to patients with normal or underweight BMI [23] [24], it may also increase the risk of cardiovascular diseases, chronic inflammation and poor quality of life, in addition to being associated with negative attitudes related to the social stigma of obesity [25].

However, it is necessary to consider the knowledge of age-related changes in body composition (loss of fat-free mass called sarcopenia) and fat distribution (especially central fat) may be more important than the simple assessment of BMI regarding health risk in older ages. This occurs because obesity can worsen sarcopenia (and, in this case, known as sarcopenic obesity), leading to reduced strength and more significant disability, frailty, and higher morbidity and mortality rates [26].

Table 2 presents the classification of the nutritional risk of individuals according to the entire population and according to sex using the two tools used. MNA demonstrated a more nuanced nutritional risk classification, showing that even ~61% of the ~96% of participants who would be out of risk according to NRS 2002 are actually "At risk of malnutrition" and require greater attention (Table 2).

As the MNA has more classification categories, it fragmented the evaluated sample more. For example, in the case of female individuals, it was possible to notice that while the NRS 2002 indicated that everyone was at no nutritional risk, the MNA practically divided this public between "normal nutritional sta-

tus" and "at risk of malnutrition" (Table 2). The same behavior can be seen when the same comparison was made with elderly individuals.

Table 2. Classification of nutritional risk of short-term institutionalized people (n = 28) according to sex and age group.

	All (n = 28) (%)	Male (n = 15) (%)	Female (n = 13) (%)	Adult (n = 12) (%)	Elderly (n = 16) (%)
NRS 2002 (%)					
No nutritional risk	27(96.43)	14 (93.33)	13 (100)	11 (91.67)	16 (100)
Nutritional Risk	1 (3.57)	1 (6.67)	-	1 (8.33)	-
MAN (%)					
Normal nutritional status	10 (35.71)	3 (20.00)	7 (53.85)	2 (16.67)	8 (50)
At risk of malnutrition	17 (60.72)	11 (73.33)	6 (46.15)	9 (75)	8 (50)
Malnourished	1 (3.57)	1 (6.67)	-	1(8.33)	-

Note: MAN = Mini Avaliação Nutricional; NRS = Triagem de Risco Nutricional.

Similar studies that also compared nutritional screening tools carried out among older people and adults revealed that the MNA presented a higher prevalence of nutritional risk when compared to the NRS 2002 [27]-[30].

In this way, the MNA-SF appears to be a more efficient way to screen nutritional risk, especially when dealing with institutionalized elderly individuals, even in the short term. This may have occurred because the audience for this study was primarily older people (~74%), and this tool was developed specifically for this audience. On the other hand, the NRS 2002 was initially developed to be applied in hospitals [13], and even including the age factor in the evaluation has not proven to be a good tool for tracking or predicting malnutrition in older people [27]-[30].

Unlike the BMI classification (Figure 2), the nutritional screening tools applied to the sample were evaluated in addition to anthropometric measurements, lifestyle-related issues, dietary questionnaires, and subjective assessments. That is, they evaluate many more criteria that affect nutritional status than necessarily weight and height. Thus, even if BMI is not an indicator of low weight in individual, nutritional screening tools have demonstrated that the individual may be at nutritional risk, which can result in a worse health care outcome.

Although in our work, we did not find elderly individuals suffering from malnutrition, our percentage of older adults at risk for nutrition (MNA tool) was higher (50%) than what had been reported by Donini *et al.* [7] for older age people (50 - 102 years) living in nursing homes in Italy. This difference may have occurred because we consider ourselves older adults to be people over 60 years old; also, it is because Italy is considered a developed country, and therefore, nutrition rates are better than in Brazil.

There seems to be a consensus in the literature that different nutritional screening tools can result in different proportions of patients at nutritional risk [31]. Therefore, it is suggested not only for this facility and its audience but also in general that more than one tool be used so that the limitations of each tool are reduced by the application of another tool, thus suggesting more excellent reliability in nutritional screening of patients in the range of different situations potentially encountered [10] [32].

Finally, this work also has limitations, including the sample size used in the study, which was limited due to the variability of short-term residents at the facility. Also, in this work, due to the limitation of research execution time and although we considered the recommendations of government agencies, we included only two screening tools (NRS 2002 and MNA), and we could also have included the Malnutrition Universal Screening Tool (MUST) and Subjective Global Assessment (SGA). However, we chose to remove MUST because it was a tool developed for hospitalized individuals (a situation already covered by the NRS 2002) and SGA because its relationship with patient classification and outcome had not been discussed much in the literature [13].

4. Conclusions

The results of the present work demonstrated that the MNA has a more conservative approach than the NRS 2002, as it allows the population at nutritional risk to be reassessed periodically. Interventions to recover the nutritional status of evaluated individuals must be based on control/portioning of meals served in the institution for obese patients, supplementation and menu adaptation for malnourished patients, and periodic reassessment for those at nutritional risk.

Considering this, the importance of using this method to analyze the nutritional risk of patients attending the association was realized. Older people and people with disabilities are more susceptible to developing diseases, resulting in an excellent need for evaluation and monitoring nutritional status and presence of risk or not to designate necessary interventions to help recover the individual's health.

Acknowledgements

The authors acknowledge the financial support from CNPq, FAPEG, CAPES (001), and IF Goiano (Process no 23218.001808.2024-40).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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