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Prediction of Nutritional Risk in Elderly Using MNA®-SF and Its Association with Anthropometric Measures

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ABSTRACT

Background: Physiological changes during aging cause natural losses that make the elderly vulnerable. The Mini Nutritional Assessment, both in its extended and abbreviated version (MNA®-SF) has been shown to be an excellent tool for application in the elderly, with the aim of facilitating early nutritional intervention and preventing morbidity and mortality. **Objective:** to detect nutritional risk in the elderly by using MNA®-SF and correlate its score with age, body mass index, calf circumference and handgrip strength. **Methods:** a descriptive study with the application of the MNA®-SF and anthropometric measurements in 16 non-institutionalized elderly during a social action in a city in a city of Brazilian Northeastern countryside. Pearson's correlation coefficient was applied. **Results:** prevalence of women, adequate body mass index and calf circumference. MNA®-SF score identified individuals with adequate nutritional status and at risk of malnutrition/malnourished. A positive association was demonstrated between the MNA®-SF score and all anthropometric measurements, and a negative association with age. **Conclusion:** Following elderly by the application of the MNA®-SF is an important strategy to reduce its score as a mean of preventing or treating malnutrition and its consequences. This assessment showed to be effective for this purpose when compared to isolated anthropometric measures.

KEYWORDS: Aging; Body Mass Index; Calf Circumference; Handgrip Strength; Mini Nutritional Assessment.

I. INTRODUCTION

Aging is a global phenomenon that occurs at an accelerated pace and more intensely in developing countries [1]. In Brazil, the declining fertility combined with mortality reduction has been resulted in a population aging significantly faster [2].

There are several factors that influence health in aging. There are intrinsic factors, such as sex, age and genetics and, mainly, extrinsic factors that are associated with lifestyle related to dietary patterns, social interaction, leisure and work activities that, according to the World Health Organization, are the components that have a strong impact in aging process [3,4,5].

In this regard, physiological changes during aging are recurrent and can cause natural losses that make the elderly vulnerable to the disease process [6]. This phenomenon, also named 'senescence', is due to its heterogeneous character, once the lifestyle adopted in childhood, adolescence and adulthood will determine different results in the ways of aging.

Elderly are more susceptible to changes in nutritional status than younger subjetcs. Inflammatory status, genetic predisposition, physical inactivity and comorbidities frequently associated are preponderant factors. In fact, comorbidities can be cause of nutritional problems or their consequence [7]. In addition, there is a greater predisposition in developing sarcopenia, with a consequent increased risk of falls. Multiprofessional teams should be considered in prevention of falls in this population [8,9].

In Brazil, the risk of death from malnutrition in the elderly has grown and is related to social problems and inequalities in access to healthy food, income, basic sanitation and psychosocial factors. In addition to the association with physiological changes, malnutrition is directly associated to diseases that lead to inappetence and dysgeusia. Another aggravating factor is polypharmacy, which is very common in the elderly.

The drug interaction and greater fragility of the gastrointestinal tract can contribute to the worsening of malnutrition [9,10].

Thus, nutritional assessment has been considered an important and necessary component for the diagnosis of malnutrition and primary care, contributing to quality of life and preventing morbidity and mortality, especially in early intervention [11]. The mini-nutritional assessment (MNA®) is an excellent tool for identifying malnutrition or its risk, internationally validated [12,13]. Its short form (MNA®-SF) has high sensitivity (96%), specificity (98%) and prognostic value for malnutrition of 97%. It is a practical, non-invasive, low-cost method, with simple measurements, quick questions and indicated for non-institutionalized elderly [14, 15].

Some parameters can be used isolated in clinical practice to assess nutritional status and functionality, but also in conjunction with other measurements. Among them is the calf circumference (CC), a sensitive indicator of muscle changes [13]. Another important measure is the handgrip strength (HGS), which plays an essential role in the assessment of muscle strength and power [16].

The world population is currently experiencing the phenomenon of nutritional transition, which consists of changing patterns of eutrophy and malnutrition to a pattern of overweight and obesity due to the consumption of high energy density food, combined with a sedentary lifestyle [17,18]. Weight gain considerably increases the development of non-communicable diseases (NCDs) which, if not controlled, increase the risk of mortality from various causes, making it a delicate issue for both the elderly, family and the health system [19]. The aim of this study was to detect the presence of nutritional risk in elderly during a social action in a city of Brazilian Northeast countryside, using the MNA®-SF and its association with age, body mass index (BMI), CC and HGS.

II. METHODS

Descriptive study with 16 elderly assisted in a social action in a city of Brazilian Northeast countryside. Before the assessment, participants signed the Informed Consent Form, authorizing the publication of the data collected.

Initially, personal informations were collected, such as age and sex. After that, body weight was obtained using a Geratherm® digital scale with a capacity of 180 Kg and body stature measurement using a portable Sanny® stadiometer. With both results, body mass index (BMI) was calculated and the nutritional status was established according to the Pan-American Health Organization (PAHO) [20].

Sequentially, the MNA®-SF was applied, with the following score for detecting nutritional risk: 'malnourished' (0 to 7 points); ‘At risk of malnutrition’ (8 to 11 points) and ‘normal nutritional status’ (12 to 14 points). Others measurements were obtained: CC in the left lower limb, following the positioning protocol, considering a 31cm cutoff [12,21]. The HGS was performed in the dominant upper limb, with the subject seated down, following a protocol previously described for a digital Takey® dynamometer [22], considering an one-time measurement using maximum strength. The results were classified according to Bohannon et al., ranging from regular to excellent [23].

Collected data were analyzed using descriptive statistics with Microsoft Office Excel® software, version 2010, which included mean, standard deviation and amplitude. Afterwards, Pearson correlation coefficient between variables was performed using RStudio System® software, version 1. The following criteria were adopted for correlation coefficient (r) [24]: -1.0 (negative and perfect association); -0.8 (negative and strong); -0.5 (negative and moderate); -0.2 (negative and weak); 0.0 (no association); +0.2 (positive and weak); +0.5 (positive and moderate); +0.8 (positive and strong) and +1.0 (positive and perfect).

III. RESULTS AND DISCUSSION

When analyzing preliminary data, there was a prevalence of young elderly (less than 80 years old) and the prevalence of females, corroborating the feminization of aging [25,26]. Regarding the nutritional status from BMI results, only one subject was classified with underweight, while there was a predominance of normal weight, followed by risk of obesity and installed obesity. Results from both CC and HGS showed wide variation, by mostly adequate for CC and regular for HGS (table 1).

Although most of the sample was with adequate BMI (normal weight), the MNA®-SF score demonstrated that 37.5% of the subjects were at risk of malnutrition and 12.5% were already malnourished (table 1), suggesting limitations for BMI when considering the risk of malnutrition in the elderly.

When interpreting Pearson correlation coefficient, the MNA®-SF score pointed a positive association from moderate to strong for BMI, CC and HGS. Thus, the higher the score and the higher

the values of other variables, better are nutritional status, strength and functionality. The opposite was observed in relation to age, which the younger the elderly, the higher the score and the lower the risk of malnutrition (table 2).

The chance of verifying overweight and obese elderly is greater in non-institutionalized subjects than in hospitalized and institucionalized patients. When determining the nutritional status using only the BMI, data from the present study corroborate the results of Souza et al. [27], but differ from the findings of Monteiro [28]. On the other hand, Salmaso et al. [29] found underweight in 10% of their sample and overweight/obesity in 54%, data higher than the present investigation.

More specifically, it is demonstrated here that by the use of MNA®-SF, 37.5% were at risk of malnutrition, while 12.5% were already malnourished. Some studies have detected malnutrition rates above 50% in non-dependent elderly [30,31].

Although we had found CC levels lower than the cutoff in only one subject, its positive and strong association with the MNA®-SF shows that, as this measure reduces, the lower the MNA®-SF score, increasing the risk of malnutrition. This same association was seen by Mello et al. [32]. In other study, similar positive associations were found among MNA®-SF, BMI and CC, and negative were observed among MNA®-SF and age [29]. Martin et al. [15] detected a positive and strong association between MNA®-SF and HGS in their sample, corroborating the present findings.

IV. CONCLUSION

When analyzing BMI, the majority of the elderly were shown to be eutrophic, however, when comparing to MNA®-SF scores, the subjects with normal nutritional status and the amount of malnourished and at risk of malnutrition are equivalent. Thus, it reinforces the idea that BMI should not be the only predictor of nutritional status, especially the elderly who tend to malnutrition and sarcopenia, the last one also possible in obesity. HGS varied widely, despite the sample being relatively homogeneous in relation to BMI, sex and age. The amplitude of this variable may have been due to the test's single attempt protocol.

When it is seen the positive association between MNA®-SF and CC, it is pointed that this measure eventually can be used independently, due to its sensitive in identifying muscle changes in the elderly. The same can be applied to HGS, a strong indicator of functionality. The lower the nutritional risk, the higher the values of all three variables. However, the association with age was negative and moderate, suggesting a tendency for a declining score while age advances.

We reinforce the need for monitoring aging with regard to reducing the score of MNA®-SF to prevent malnutrition and its consequences, which are often irreversible. On the other hand, preventing comorbidities secondary to weight gain should not be neglected, as well as multiprofessional intervention to prevent or treat both malnutrition and obesity.

The limitations of this study include the sample size and type, as they are elderly with preserved mobility and cognition who were willing to attend to the social action site.

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Table 1. Preliminary data

Parameters	n	%	Mean (SD)[1]	Amplitude
Age range (years)			71.7 (7.9)	60 - 89
60-79	14	87.5		
≥ 80	2	12.5		
Sex				
Female	13	81.25		
Male	3	18.75		
Stature (m)			1.50 (0.05)	1.42 - 1.62
BMI[2] (Kg/m^2)			26.7 (3.7)	18.7 - 35.2
Underweight	1	6.25		
Normal weight	10	62.5		
Overweight/obesity	5	31.25		
CC[3] (cm)			34.9 (3.5)	27.0 - 41.4
Inadequate	1	6.25		
Adequate	15	93.75		
HGS[4] (Kg/F)			18.8 (5.2)	12.3 - 24.4
Regular	12	75.00		
Good	1	6.25		
Excelent	3	18.75		
MNA®-SF Score			11.2 (2.63)	7.0 - 14.0
Normal nutritional status	8	50		
At risk of malnutrition	6	37.5		
Malnourished	2	12.5		

[1] standard deviation; [2] body mass index; [3] calf circumference; [4] handgrip strength

Table 2. Pearson correlation coefficient among MNA®-SF and age, BMI, CC and HGS

	MNA®-SF (score)	
Variables	**r[1]**	**Association**
Age (years)	-0,40	Negative and moderate
BMI[2] (Kg/m^2)	0,45	Positive and moderate
CC[3] (cm)	0.67	Positive and strong
HGS[4] (Kg/F)	0,46	Positive and moderate

[1]Pearson correlation coefficient; [2]body mass index; [3]calf circumference; [4]handgrip strength