Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

Validity assessment of the nutrition screening initiative checklist in older adults

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SUMMARY

Objective: To ascertain whether the NSI (Nutrition Screening Initiative Checklist) is a valid screening instrument for diagnosing nutritional risk in an older population from a medium-size city in the south of Brazil.
Methods: The study population comprised individuals aged 60 years or older selected from a population-based cross-sectional survey. Data collection was carried out at two different timepoints: first, the NSI (instrument under test) was applied and later a dietary recall (gold standard) based on the previous day. Validity analyses were performed based on sensitivity and specificity as well as the Receiver Operating Characteristic Curve.
Results: A total of 183 older adults were studied. Agreement between the dietary recall and the NSI for positive and negative results was 54.6%.The sensitivity and specificity values were low for all cut-off points of the instrument. The area under the curve was 0.52 (95%CI: 0.44−0.62) for the cut-off point ≥6.
Conclusion: Based on sensitivity and specificity values, the NSI proved ineffective for application in the population studied.

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1. Introduction

The demographic transition has led to an increase in the older population, prompting the scientific community to investigate this age group further [1]. Aging, although a natural process, submits the organism to alterations, causing a range of functional changes that negatively impact health status, particularly nutritional [2]. Older adults have a greater risk of nutritional deficit than adults, requiring heightened awareness for early detection and management [3].

The purpose of nutritional screening is to allow early identification of individuals at risk of malnutrition that require intervention [4]. To this end, a number of specific instruments have been developed for use in the older population [5]. However, there is no consensus on which is the best screening instrument available. All the instruments reported in the literature have inherent specificities, limitations, advantages and disadvantages when used in specific populations [5].

One of these instruments, the Nutrition Screening Initiative Checklist (NSI), also known as DETERMINE, was published in 1991 in the United States. This constitutes a checklist comprising ten questions, originally devised and validated for American older adults [6] and later adapted for use in Australian older adults [7]. The questions included in the NSI reflect common risk factors for malnutrition, encompassing dietary assessment (number of daily meals, food and alcohol intake, independence for preparing meals), general assessment (health status, use of medications, oral health and weight loss) and social assessment (economic difficulties and reduced social interaction) [6]. The recall period differs for each question, having a maximum period of six months. Scoring for each questions ranges from 0 to 4 points and total score for the instrument is calculated by summing the values attributed to each of the participant's answers, and ranges from 0 to 21 points. Based on the resultant score, older adults are classified into one of three different nutritional risk groups. Individuals whose total score lies between zero and two are classified as having low nutritional risk; those attaining three to five points as moderate nutritional risk; and

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those with six or more points are considered high nutritional risk [6].

The NSI has been widely used internationally to identify older adults at nutritional risk for its simplicity and because it can be self-administered or applied to the elder by health professionals or family members and used in health services of different levels of complexity [8—13]. Use of the instrument in Brazil has been limited because the instrument's validity for application in the Brazilian population has not yet been determined [14,15].

Thus, given the marked growth in the older population in Brazil and the greater nutritional vulnerability inherent to this age group [2,3,16]. it is important to adequately identify older adults at nutritional risk thereby allowing interventions to be implemented as early as possible. Therefore, the objective of the present study was to ascertain whether the NSI is a valid screening instrument for diagnosing nutritional risk in an older population from a medium-size city in the south of Brazil.

2. Methods

2.1. Sample

A population-based cross-sectional study [23] assessing the health of an older population living in Pelotas, a medium-sized city situated in the south of Brazil with a population of 328,275 persons according to the 2010 demographic census, was carried out between January and August 2014 [1,17]. The study involving a sample of 1451 individuals aged 60 years or older selected for a population-based study was run by the research consortium of the Post-Graduate Program in Epidemiology of the Federal University of Pelotas [17] and assessed the health of the older adults from the city of Pelotas.

2.2. Main study sample

The older adults were selected using a two-stage sampling process. In the first stage, 469 census sectors of the city were ranked by mean income according to the Brazilian Institute of Geography and Statistics (IBGE) classification. Subsequently, 133 census sectors were randomly selected and 31 households systematically selected from each sector, commencing with a randomly selected household, to give a total of 3745 households and 1649 individuals (sample size was defined to encompass all the studies of the research consortium).

2.3. Sub-study sample

The validation study of the NSI was based on a subsample of this survey. The sampling process of the sub-study was conducted weekly, based on the flow of the interviews carried out in the main study. Older adults who reported a birth date that fell in March or September were invited to take part in the validation study.

Sample size was calculated according to the method proposed by Willett [18], which recommends that the sample for a validation study should number between 100 and 200 individuals. According to the author, the inclusion of over 200 subjects provides very little additional accuracy whereas the use of under 30 participants yields inaccurate results for this type of study. Therefore study recruitment was concluded upon reaching a sample of 200 older adults.

2.4. Data collect

The methodology employed in this study was the same used in the original investigation published by Posner et al. [6], comparing NSI results to dietary data obtained by dietary recall for the previous day, collected by trained nutritionists at the homes of the older adults or at a clinic set-up especially for the study. The maximum time interval between application of the NSI and the recall was 15 days. The dietary recall was not applied on days following a Sunday or public holidays due to potential changes in usual dietary intake. The nutritionists applying the recall were blinded to the results of the older adults on the NSI. The data obtained using the dietary recall were converted in amount of macro and micronutrients consumed.

2.5. Outcome definition

Older adults who had inadequate intake of three or more of the nutrients: protein, calcium, vitamin B1 (thiamine), C and A (retinol), were classified as at nutritional risk.

2.6. Recalls analysis

All the information on the foods consumed were recorded in household measures and subsequently converted into grams or milliliters with the aid of an appropriate table for this purpose [19]. Calculations quantifying the intake of nutrients were performed with the software tool ADS Nutri - Sistema Nutricional — 9th version, which uses the Brazilian Food Composition Table (TACO) [20] to calculate the nutritional composition of the foods and also the US food composition reference database (USDA) [21]. The assessment of adequacy of nutrient intake was performed based on the Dietary Reference Intakes - DRI, published by the Institute of Medicine (IOM). The reference values used in this study were based on the recommended daily intake value to meet the requirements of 50% of the population — EAR (Estimated Average Requirement) according to age and sex [22,23].

2.7. Back translation

In order to test the validity of the NSI in Brazil, all of the questions were translated into Portuguese by a bilingual translator. This Portuguese version was than back-translated into English by another bilingual professional [24]. The resultant English version was then compared against the original in English and the necessary adjustments made to produce an appropriate version of the instrument in Portuguese ensuring equivalence of meaning. This technique guarantees an accurate and reliable translation of the research instrument [24].

2.8. Exposures definition

The sample characteristics were determined by collecting socioeconomic, demographic and behavioral data, including the following variables: sex (male/female), age in years (60—69, 70—79 and 80 or older), skin color (white/non-white), schooling in years (0—3, 4 to 10 and 11 or more), economic level classified according to the criteria defined by the National Association of Research Companies (ABEP) (A or B, C and D or E, with A being the highest level) [25], marital status (with or without partner) and self-perceived health (very good or good/normal/poor or very poor).

2.9. Validation analysis

Combining information gathered by applying the NSI together with data on intake adequacy of five nutrients, the validation analysis included the calculation of sensitivity (proportion of individuals at nutritional risk, according to the gold standard, correctly identified as such by the NSI), specificity (proportion of individuals not at nutritional risk, according to the gold standard,