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Original Article

Application of Nutritional Risk Score-2002 Questionnaire and Other Nutritional Status Parameters Among Hospitalized Elderly

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SUMMARY

Background: Proper nutritional status is an important factor of successful aging and wellbeing of elderly patients. Screening and then treatment of malnutrition should be one of the main focuses of public health. The main aim of this study is to evaluate the usefulness of Nutritional Risk Score-2002 (NRS-2002), and the anthropometric and biochemical parameters in the context of nutritional status.
Methods: Total of 1100 patient records from September 2012 to December 2014 were analyzed in terms of nutritional status assessment. The following were included for the analysis: NRS questionnaire, Body Mass Index (BMI), arm (AC) and calf circumference (CC), and concentration of albumin.
Results: Mean age was 80.5 ± 7.3 years. The most frequent NRS-2002 score was indicating "risk of malnutrition" and its value increased with age. Mean albumin concentration was 3.49 ± 0.53 g/dl. Significant correlations between albumin concentration and arm and calf circumferences were found ($p < 0.0001$).
Conclusions: Percentage of patients at nutritional risk determined with NRS was 18.8%. This result was significantly lower than in other studies. With accordance to results of other researchers, values of the NRS increased with age. Results regarding the relationship between the NRS values and albumin concentration, AC and CC (negative correlations) and albumin concentration with CC and AC (positive correlations) were consistent with the results of other researchers. In the assessment of the nutritional status of hospitalized elderly, the NRS-2002 should be combined with basic anthropometric measurements.

1. Introduction

The impact of nutritional status on health and the overall proper functioning in the elderly is very strong. Malnutrition, as one of the nutrition-related problems, is common and can lead to severe health issues.[1] Hospital malnutrition, according to many studies, may range from 20% to even 60% of hospitalized patients. It is associated with increased morbidity, mortality, hospital stay, costs, and higher rates of complications.[2] Many actions are taken to prevent, detect, and cure hospital malnutrition, but still the occurrence of nutritional deficiencies is very common.[3]

According to the regulation from 1 January 2012 of the Polish Minister of Health, which is consistent with the European Society for Clinical Nutrition and Metabolism (ESPEN) recommendations from 2003,[4] each hospitalized patient must be assessed with nutritional status using one of two tests: Nutritional Risk Score (NRS-2002) or Subjective Global Assessment (SGA). The most commonly used screening test, recommended by ESPEN, is the NRS-2002, which was developed on the basis of intervention studies.[5] This test is specific for identification of patients at nutritional risk and thus extends the time of hospitalization needed for nutritional treatment significantly.[6] Moreover, a longer hospitalization time is necessary to establish an adequate health care plan by the medical team and for effective usage of hospital resources.[7]

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Nutritional changes can be detected by many anthropometric and biochemical parameters, such as body weight, BMI, thickness of skinfolds, body circumferences, concentration of albumin, prealbumin, transferrin, and many more.[8] Blood concentration of albumin is a common marking made in hospitalized geriatric patients. Results indicating reduced levels of albumin are frequent due to multiple factors, such as reduced albumin synthesis, intensified catabolism, or loss of albumin. These losses are further worsened by infections, inflammation, or a surgery.[9] Hypoalbuminemia is associated with frailty and is also a recognized predictor of morbidity and mortality, especially among elderly patients.[10,11] Moreover, albumin concentration can serve as a muscle mass-related parameter. In this way, low albumin values can indicate sarcopenia, a common elderly problem.[12] The need to measure this blood parameter is therefore justified, especially because hypoalbuminemia affects approximately 20% of all acute hospital admissions.[13] Calf and arm circumferences are also parameters related to the patient's nutritional status included in screening scales or they can be analyzed independently.[14]

The main aim of this study is to define whether the NRS-2002 questionnaire is an efficient test for the evaluation of nutritional status of hospitalized elderly patients and to determine its relation with other nutritional status parameters, such as arm and calf circumference and albumin concentration.

2. Methods

In this study, records of patients hospitalized from September 2012 to December 2014 in the Department and Clinic of Geriatrics, Jurasz University Hospital No.1 in Bydgoszcz, Poland were analyzed. The average hospital stay was five days. Applied inclusion criteria to the study were as follows: age ≥65, no vastly severe illness, performed on the first day of hospitalization and present in patient record NRS questionnaire together with at least two anthropometric measurements (weight, height, arm or calf circumference) or albumin concentration. With the approval of the local bioethics committee 1446 patient records were analyzed, of which 346 were excluded from the study due to re-hospitalization (50), age less than 65 years (171), death (65), missing required data (the NRS questionnaire, 32), severe swelling affecting body weight (18), severe cancer (7), and amputation of the lower limb (3). Overall, 1100 community-living elderly were included in the analysis.

During the first day of hospitalization, after conversation with a patient, dietitian was completing the NRS-2002 questionnaire, evaluating the nutritional risk and indicating patients who might benefit from nutritional intervention. Used in the Clinic version of the NRS-2002 questionnaire takes into account maximum 3 points for the impairment of the nutritional status and another 3 points for the severity of the disease. This gives a total of maximum 6 points. In this version of the questionnaire, the point added for age above 70 years is not taken into account. Old age is included in the section defining the severity of the disease where the patient can be given 2 points due to older age. If the patient obtains ≥3 points, it is advisable to implement nutritional therapy to the treatment schedule. However, if the patient obtains <3 points, it is advisable to implement a conservative treatment and the test should be repeated in the next week of hospitalization. Usually, a nurse or a physiotherapist took height (cm) and weight (kg) measurements using anthropometer and electronic scale chair. BMI was then calculated in kg/m^2. If possible, a clinical physiotherapist took AC (cm) and CC (cm) measurements using an anthropometric tape. Some patients (n = 306) were recumbent, not able or not willing to stand up and perform the height and weight measurements. Moreover, AC and CC assessments were not made for all patients due to the short time of hospitalization, and frequently among recumbent patients, in which, instead of circumferences assessment albumin concentration was determined.

The statistical analysis was performed using STATISTICA Data Miner + QC + SAL version 12.5. Means and their standard deviation (SD) values are presented for normal distributed data and medians are presented for abnormal distributed data. Nutritional status, defined by the NRS-2002 result, was compared in women and men with Mann-Whitney and Pearson chi-square tests. The relationship between age and the result of NRS-2002 test was analyzed with Spearman's rank correlation and Anova Kruskal-Wallis tests. The correlation between albumin concentration, NRS-2002, and arm and calf circumference was analyzed with Spearman's rank correlation test.

3. Results

Mean age of the study participants was 80.5 ± 7.3 (min-max: 61.3–100.2). As many as 75% of the study participants were no more than 85.5 years old (Table 1). From NRS-2002 test, study participants could obtain from 0 to 6 points. Estimated nutritional status of the study group was 2.11 ± 0.61. Half of the study participants had NRS-2002 values not exceeding 2 and the maximum value was 5 points. No statistically significant difference between NRS values among men and women was shown. The most common NRS score among women (73%) and men (67%) was 2. The prevalence of patients at nutritional risk with the NRS-2002 (≥3 points) was 18.8% (20.4% men, 18% women).

Descriptive statistics on age were presented in 6 groups of study participants according to NRS-2002 score (0–5 points). Age of respondents differed in designated 6 groups ($p < 0.0001$). Along with increasing age, patients obtained higher values of NRS-2002. This relationship was statistically significant ($p < 0.0001$), but the correlation of these two variables was relatively weak ($R = 0.34$). A clear upward trend for the age of the elderly was observed among subjects achieving 1, 2, 3, and 4 points. Respondents with a score of

Table 1
General characteristic of the patients.

Variables	Group	Males	Females
	n = 1100	n = 367	n = 733
Percentage of participants (%)	–	33.4	66.6
Age (years ± SD)	80.5 ± 7.3	78.9 ± 7.5	81.4 ± 7.1
Place of residence (n; %)			
Village	151 (13.7)	57 (15.5)	94 (12.8)
Country town (<50th citizens)	83 (7.5)	27 (7.4)	55 (7.5)
Small town (50–100th citizens)	4 (0.4)	1 (0.3)	3 (0.4)
Big town (>100th citizens)	862 (78.4)	282 (76.8)	581 (79.3)
NRS (n; %)			
0–2 points, low nutritional risk	893 (81.2)	292 (79.6)	601 (82.0)
3–5 points, high nutritional risk	207 (18.8)	75 (20.4)	132 (18.0)
Calf circumference (n = 734; n; %)			
<31 cm, malnourished	205 (27.9)	50 (21.7)	155 (30.8)
>31 cm, well-nourished	529 (72.1)	180 (78.3)	349 (69.2)
Arm circumference (n = 720; n; %)			
<24 cm, malnourished	165 (22.9)	41 (18.3)	124 (25.0)
>24 cm, well-nourished	555 (77.1)	183 (81.7)	372 (75.0)
Albumin concentration (n = 696; n; %)			
<3.4 g/dl	241 (34.6)	87 (38.0)	154 (33.0)
BMI (n = 794; n; %)			
<22 kg/m^2, malnourished	115 (14.5)	34 (12.8)	81 (15.3)
22–27 kg/m^2, eutrophic	241 (30.4)	88 (33.2)	153 (28.9)
27–32 kg/m^2, overweight	258 (32.5)	100 (37.8)	158 (29.9)
>32 kg/m^2, obese	180 (22.6)	43 (16.2)	137 (25.9)
Recumbent patients (n; %)	306 (27.8)	112 (30.5)	194 (26.5)
BMI (without recumbent patients, n = 794) [kg/m^2 ± SD]	28.1 ± 5.9	27.5 ± 5.0	28.4 ± 6.4

SD–standard deviation.