ORIGINAL PAPER

Comparison of Nutritional Status Between Nursing Home Residents and Community Dwelling Older Adults: a Cross-Sectional Study from Bosnia and Herzegovina

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ABSTRACT

Aim: The aim of the study was to determine the differences in nutritional status and risk for malnutrition between nursing home and community-dwelling residents. **Methods:** Cross-sectional study included 146 nursing home residents and 300 community-dwelling elderly adults from four municipalities in Bosnia and Herzegovina. Anthropometric measurements, biochemical analyses, nutritive, functional and cognitive assessments were carried out. Nutritional status and risk for malnutrition were assessed by Mini Nutritional Assessment (MNA), Seniors in the Community: Risk Evaluation for Eating and Nutrition, version II (Screen II) and the food intake analysis for the past 24 hours. Functional status was assessed by the Lawton scale, the Katz Independence Index, Timed Up and Go test, the Functional Reach Test. Mini Cog test and Six-item cognitive impairment test were used for the evaluation of cognitive functioning. **Results:** The incidence of high nutritive risk by SCREEN II (100%) and being "at risk for malnutrition" by MNA (81.60%) was higher among nursing home residents compared to community-dwellers. Community-dwelling elderly people had higher BMI (27.94 ± 4.73), weight (78.40 ± 13.99), height (167.69 ± 9.74), waist circumference (97.77 ± 12.88), hip circumference (104.61 ± 11.47), mid-arm arm (27.54 ± 3.58), hip (27.54 ± 3.58) and calf circumference (34.02 ± 5.16). Statistical differences in regards to place of living were found in functional status (p<0.001), cognitive functioning (p<0.001) and hand grip strength (p<0.001). **Conclusion**: The frequency of malnutrition and high nutritional risk was higher in respondents who were living in the nursing homes compared to community-dwellers. The results of this study showed that health professionals involved in the care for institutionalized elderly people should implement routine screening of malnutrition within the comprehensive geriatric assessment in their daily practice.

Keywords: malnutrition, nutritional status, elderly, comprehensive geriatric assessment.

1. INTRODUCTION

Malnutrition of the elderly is defined as a disbalance between the needs of the organism and the intake of nutrients, followed by changes in the body weight index and muscle wasting. Aging of the organism is associated with many problems, such as dysphagia, diarrhea, depression, dementia, reduced mobility, ultimately resulting in deterioration of nutritional status. The risk of illness is then increasing, old people become exposed to multiple morbidity, polypharmacy and frequent hospitalization (1). Relevant studies showed that prevalence of malnutrition increases after 65 years of age (2-4). Unless treated, the immunity of the person decreases, susceptibility to infection and acute infections rises, as well as morbidity, with increased costs in healthcare (5, 6). Older persons residing in nursing homes (institutionalized) are more predisposed to malnutrition than those who live in their own home (community-dwelling); due to reduced productivity, self-esteem, social isolation and loneliness (7-10). A few studies have examined differences between elderly people in regards to the place of living and frailty in nutritional status and eating habits (11-13). Although malnutrition of the elderly represents a major, worldwide public health problem, there is very little data for Bosnia and Herzegovina.

To provide a comprehensive insight into the nutritional status, it has been recommended to perform clinical examination, nutritional assessment, anthropometric measurement, laboratory analyses and evaluation of physical/cognitive functioning (10).

2. AIM

The aim of the study was to determine the differences in nutritional status and risk for malnutrition between nursing home and community-dwelling residents older than 65 years of age in Bosnia and Herzegovina.

3. METHODS

Study Sample

The cross-sectional study was carried out in the period from April to September 2018 for older persons in four municipalities of Republic of Srpska: East Sarajevo, Rogatica, Pale and Foca. The sample consisted of 446 respondents of both sexes, divided into two groups depending on their place of residence; 146 participants from nursing homes, and 300 participants who living in the community respondents. Respondents in the community were selected using a register of patients older than 65 years of age in the family medicine services of local health centers. By software, every third person according to specific criteria was included in the study. If the selected person did not meet the criteria for inclusion in the study, inclusion would be the following until a certain number of respondents were received. The criteria for inclusion in the study were orientated to the time, space and faces, and the criteria for excluding were bad general condition, disorientation, the inability to establish cooperation, and the presence of mental illness, dementia, malignant diseases and chronic renal insufficiency. All users of gerontology centers, East Sarajevo, Pale and Rogatica who have fulfilled the inclusion criteria and signed the informed consent are included in the study. Patients with dementia, hearing disorders, cancers, acute illness, uncooperative and hemodialyzed elderly were excluded from the study.

Instruments

A standardized questionnaire was used to collect sociodemographic data on respondents in the study (gender, age of respondents, education, residence, income, social activity and integration, cohabitation, socializing, hobby, use of mobility aids).

Validation of all questionnaires used in the research was carried by pilot study including 70 elderly individuals registered with family physicians in Zvornik and Bijeljina region. The participants for the pilot survey were representatives of older adults to be included in current study. No changes to original questionnaires in English language were made. Internal consistency for each questionnaire was calculated using a Cronbach's alpha coefficient.

Nutritional status assessment

To evaluate the nutritional status, we used several instruments. Nutritional status was investigated using the Mini Nutritional Scale Short Version-MNA-SF, which includes two steps: screening (MNA-SF1) and evaluation (MNA-SF2). The maximum total score for MNA is 30 points (> 23.50–adequate nutritional status, 17–23.49 -risk for malnutrition and <17 points -malnutrition) (14). Cronbach's α coefficient for Bosnian version of MNA was 0.726 (adequate reliability). SCREEN II consisted of 14 items (each with five possible score from 0-4) and ranging from 0 to 64 (≥54 normal nutritional status, 50-54 moderate risk of malnutrition<50 high risk of malnutrition (15). Food intake analysis was carried out by recording meals and types of foods consumed during the past 24 hours (24 hour recall dietary assessment) (16). Cronbach's α coefficient for Bosnian version of SCREEN II was 0.610 (fair).

Functional status assessment

Using the Lawton scale (17), we evaluated the instrumental activities of everyday life. The total number of points ranged from 0 (low function, depending) to 8 (high function, independent). Katz's index analyzed basic activities of daily living (swimming, dressing, hygiene, movement, incontinence and nutrition), and objectively evaluated their performance (2-no need for help, 1-need help, 0-incapable of doing it) (18). Cronbach's α coefficient for Bosnian version of Lawton was 0.953 (excellent) and Katz index 0.874 (good reliability). Timed Up and Go test was performed to assess mobility. A standard chair with support for the spine was used. The participants were required to rise from the chair walk at a normal pace 3 meters to a line on the floor, turn, walk back to the chair, and sit down, without any encouragement from the investigator. In one minute intervals, three tests were completed and measured in seconds (19). The functional Reach test was performed by asking the respondent to give his hand as far as possible without making a step forward. If the patient stretches his arm more than 25 cm, the risk of being born is tired. The test was repeated three times with a break of 30 seconds between (19). The Tinetti test of walking and equilibrium (19) determines the risk of falls in the elderly in the future. The hand grip was measured using a calibrated dynamometer (1-100 kilograms with a resolution of 0.1 kg) in a sitting position and the forearms and wrists were in neutral positions, while the fingers bend as needed for maximum contraction. From the respondents were asked to compress dynamometer as much as possible for 3 seconds (20). Cronbach's α coefficient for Bosnian version of Tinetti test was 0.869 (good reliability).

Cognitive status assessment

The Mini Cog test consists of recalling three objects in combination with a clock drawing test. If a patient can repeat all three objects, and correctly draw a clock, cognitive impairments are not present. Six-item cognitive impairment test (6-CIT) contains 6 questions, and the time required for its performance is 3-4 minutes (a score of 8 and more points indicates a memory disorder) (21). Cronbach's α coefficient for Bosnian version of 6-CIT was 0.827 (good reliability).

Anthropometric measurement

Body height and body weight were measured with a standard weighing scale and a stadiometer. In order to obtain the body mass index (BMI) (kg/m^2), the weight was divided by square height. With a standard non-elastic band, the waist, mid-arm, calf and hip circumference were measured in a standing position on both feet. For the estimation of reproducibility, anthropometric measurements were repeated three times, and the average values were recorded in

centimeters. The thickness of the skin fold is measured on the right side of the body (4DKN–biceps, triceps, subcapsular and suprailicular point). The caliper (GIMA code 27320 Caliper) was used for the measurement, and its branches were constantly pressed. Repeated measurements were always performed by the same person. All measurements were done three times and the mean value was recorded as an indicator for the thickness of the skin fold. The results were converted into total fat percentage (% BF) (20).

Biochemical nutritional markers

Blood markers included albumin, hemoglobin, total cholesterol and ferritin. All parameters were measured according to the protocols of Laboratory for hematological, immunological and biochemical analyses.

Statistical analysis

The processing of the data was done using 22 SPSS packages (SPSS IBM, Inc., Chicago, IL, United States). For the analysis of the collected data, descriptive statistical analysis measures were used. Outputs are described by means of mean values (± SD) for continuous variables and numbers/percentages for categorical variables. Differences were tested using Chi square test for ordinal variables, and t test or ANOVA for numerical variables. As the level of statistical significance of the difference, the usual value of p <0.05 was taken.

E**thical considerations**

The study was approved by the Ethics Committee of the Faculty of Medicine in Foca, University of East Sarajevo, by decision: 01-2-1. All respondents gave written informed consent. The data are presented in a way that conceals the identity of all participants.

4. RESULTS

Table 1 shows the demographic characteristics of the respondents. Among community-dwellers 53.0% were female, among nursing home residents 63.0%. Respondents in nursing homes were generally older than 85 years compared to community-dwellers, mainly belonging to the age group between 65 and 75 years (x^2 = 4.002, p = 0.001). In both groups, majority of respondents had primary education (61.7% community-dwellers, 78.8% nursing home residents). Community-dwellers were mostly married (63.7%), while the respondents in the second group manly were widowed (87.8%). Majority of respondents in both groups liked to socialize with their friends, however, community-dweller reported more frequently having a specific hobby (72.7%). Nursing homes residents had to use mobility aids more frequently (p<0.001). Distribution of respondents according to nutritional status is presented in Figure 1. Nursing home residents more frequently diagnosed with malnutrition (p<0.001) and were found to have higher nutritional risk (p<0.001) compared to the community-dwellers. Significant differences between two groups were also found in regards to dietary habits, such as intake of high-fiber cereals (p<0.001), fish (p<0.001) and desserts (p <0.001). When it comes to fluids drinking on a daily basis, community-dwellers consumed larger amounts, especially juice, iced tea, milk, and even alcoholic beverages and liqueurs (p<0.001) (Table 2).

Table 3 shows the comparison of nutrition status indicators

Variable	Community n(%)	Nursing homes n(%)	x^2	p
Gendermen women	141 (47) 159 (53)	54 (37) 92 (63)	4.002	0.045
Age65-74 75-84 >85	187 (62) 99 (33) 14 (5)	20 (14) 77 (53) 49 (33)	117.793	<0.001
Educationprimary secondary tertiary	185 (62) 96 (32) 19 (6)	115 (79 27 (18) 4 (3)	13.225	<0.001
Maritalstatusyes no	191 (64) 109 (37)	18 (12) 128 (88)	103.942	<0.001
Socialization yes no	295 (98) 5 (2)	131 (90) 15 (10)	16.986	<0.001
Hobby yes no	218 (73) 82 (27)	31 (21) 115 (79)	105.351	<0.001
Use of mobility aidsyes no	16 (5) 284 (95)	118 (81) 28 (19)	266.264	<0.001

Tabela 1.Sociodemographic characteristics of the study participants. MNA–Mini Nutritional Assessment; SCREEN II–Seniors in the Community: Risk Evaluation for Eating and Nutrition, version II' among octogenarians; N – number; *p < 0 .05

Variable	Nursing home (n=146) Mean (SD)	Community (n=300) Mean (SD)	p
Number of meals a day	2.81 (0.533)	2.56 (0.788)	<0.001
Number of portions of fruits and veggies per week	1.74 (0.936)	1.75 (0.862)	0.938
Number of cereal portions per week	0.90 (1.101)	1.75 (0.862)	<0.001
The number of red meat per week	2.49 (1.231)	0.01 (0.166)	0.361
Number of portions of white meat	2.19 (1.221)	2.37 (1.051)	0.006
Fish weekly	0.76 (0.725)	0.17 (0.378)	<0.001
Number of hours spent watching television on a daily basis	3.90 (1.990)	5.10 (1.727)	0.723
Number of deserts per week	2.15 (1.928)	5.20 (2.832)	<0.001
Daily fluid intake: -water	5.55 (2.482)	5.22 (2.609)	0.564
-juice	1.34 (2.179)	1.60 (2.569)	<0.001
-ice tea	1.55 (2.303)	1.50 (2.877)	<0.001
-milk	1.39 (2.057)	2.97 (1.485)	<0.001
-full milk	0.23 (0.622)	0.05 (0.662)	<0.001
-alcohol	0.14 (0.509)	0.10 (0.305)	0.107

Table 2. Differences in the mean values of eating habits between nursing homes and community. N – number; SD – standard deviation; *p < 0 .05

between two groups of respondents. Anthropometric measurements, biochemical markers, physical functioning and cognitive status were lower in nursing home residents compared to

Variable*	Community (n=300)	Nursing home (n=146)	p
BMI	27. 94 (4.73)	25.69 (4.91)	<0.001
MNA	23.58 (2.50)	19.56 (2.75)	<0.001
SCREEN II	26.84 (3.63)	24.58 (3.80)	<0.001
Clock drawing test	4.43 (1.33)	3.86 (0.97)	<0.001
6 CIT	7.06 (5.52)	20.71 (3.82)	<0.001
Tinetti test	21.28 (5.24)	8.58 (4.02)	<0.001
Go and Up test	12.79 (7.76)	28.42 (8.03)	<0.001
Functional Reach Test	30.61 (11.23)	16.20 (6.24)	<0.001
Handgrip strength (left arm)	19. 34 (6.03)	14.79 (6.52)	<0.001
Handgrip strength (right arm)	22.03 (6.91)	19.02 (6.85)	<0.001
Weight	78.40 (13.99)	68.03 (14.77)	<0.001
Height	167.69 (9.74)	162.54 (9.36)	<0.001
Waist circumference	97.77 (12.88)	92.11 (12.82)	<0.001
Hip circumference	104.61 (11.47)	97.31 (9.45)	<0.001
Mid-arm muscle circumference	27.54 (3.58)	25.39 (3.09)	<0.001
Skinfold measurement	16.87 (7.23)	15.25 (2.80)	<0.001
Calf circumference lower leg	44.39 (7.23)	39.63 (5.46)	<0.001
Calf circumference	34.02 (5.16)	29.68 (4.83)	<0.001
Albumin	45.91 (5.46)	43.86 (4.55)	<0.001
Ferritin	143.11 (119.43)	172.56 (138.15)	0.028
Total cholesterol	5.45 (1.07)	4.84 (1.17)	<0.001
Hemoglobin	138.33 (14.57)	124.41 (17.83)	<0.001
Katz index	5.99 (0.08)	3.78 (1.91)	<0.001
Lawton scale	7.97 (0.30)	3.97 (3.00)	<0.001

Tabela 3. Differences in the average values of all parameters used by location. MNA–Mini Nutritional Assessment; SCREEN II–Seniors in the Community: Risk Evaluation for Eating and Nutrition, version II' among octogenarians; 6CIT–Six-Item Cognitive Impairment Test;BMI – Body mass index; *SD – standard deviation; N – number; *p < 0 .05

community-dwelling elderly people (p <0.001).

5. DISCUSSION

A comprehensive geriatric assessment was performed in 446 subjects, with an average age of 75.96 ± 7.41 years. Differences between community-dwellers in nutritive status indicators were examined. According to the data obtained by the MNA (93.2%) and SCREEN II (100%), the respondents who were in the nursing homes had a higher risk of malnutrition or suffered from malnutrition more frequently. Similar results are presented in the research of Donini and et al. (22). Nutritional status might have been affected not only by reduced consumption of fruits and vegetables, but also to the other risk factors, such as poor social status and low incomes. In additions, lack of geriatricians and staff specialized in a field of gerontology in Bosnia and Herzegovina, might have contributed to magnitude of the problem among nursing home residents and neglect of
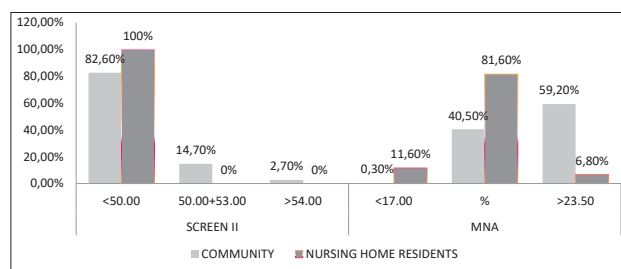

Figure 1. Differences in the average values of all parameters used by location. MNA–Mini Nutritional Assessment; SCREEN II–Seniors in the Community: Risk Evaluation for Eating and Nutrition, version II' among octogenarians; 6CIT–Six-Item Cognitive Impairment Test;BMI – Body mass index; *SD – standard deviation; N – number; *p < 0 .05

nutritional status assessment.

Although BMI values were significantly lower among nursing home residents, in both groups BMI were in range of overweight, what indicates that this marker might not be a good proxy of malnutrition and supports the recommendation to evaluate risk of malnutrition within the context of anthropometric, functional and biochemical indicators (23, 24). Nursing homes residents were generally older and frailer, what could also influence their appetite, chewing problems and body mass composition. Also, they had no access to prepare or buy their own food, and perhaps disliked offered food and meals, despite controlled and more balanced intake of macronutrients (fat, carbohydrates, and proteins). This is in line with the results of other study analyzing factors contributing to food intake among elderly people (26).

In both groups, daily portions of fruits and vegetables consumed were less than 5 as generally recommended, corroborating international results (27). Therefore, nurses and physicians should focus more on teaching elderly adults to adopt healthy eating habits and drink sufficient fluid intake, necessary to prevent nutritional problems and susceptibility to dehydration (28).

Respondents in the nursing homes had a much worse functional status compared to respondents residing in the community-dwelling and required assistance of caregivers and constant supervision in performing basic and instrumental activities of daily living. Similar findings were described by other authors exploring relationship between living setting with physical functioning (29). The optimal nutritional status is an essential premise in the promotion of health, quality of life and maintenance of functional independence in old age. The data of our study warn that every geriatric patient needs to be approached and treated individually and differently. Character structure and great individual differences are also noticeable when it comes to cognitive functions. The analysis of the obtained data shows that respondents who have damaged cognitive status, are more susceptible to and more exposed to many difficulties in performing daily activities, and they are not independent for numerous activities in their everyday life, that is, depending on the help of others, to a large extent. Our results suggest that aging process will impose many issues related to the health and overall well-being, so it is important that they have a very active life and. It is known that physical inactivity is one of the leading health risk factors affecting the elderly and the main cause of poor quality of life, malnutrition and cognitive status disorders (30).

Poor appetite, chewing or swallowing problems, dependence

on nutrition or poor intake, females, constipation, skipping meals and the reduced intake of adequate fluids and dairy products are highly prevalent among nursing home residents (31). Poor nutritional as well as cognitive status was significantly associated with mobility, risk for falls and functional status, which are additional indicators of poor nutritional status (32).

In Bosnia and Herzegovina, the data on malnutrition prevalence among elderly is scarce. The reference cut-off values of indicators are not determined, so they clinical accuracy is unknown. To be clinically usable, each malnutrition marker needs to be precise and reproducible, acceptable to the patient, easy for clinical interpretation, with high sensitivity and specificity to diagnose malnutrition. To our knowledge, this is the first study exploring the difference between nursing home residents and community-dwelling adults. The research will also contribute to understanding the risk of the factors of malnutrition and its consequences. The future study are necessary to analyze if the existing reference values of anthropometric measurements can be applied to the old population as well as to younger adults.

A comprehensive geriatric assessment of vulnerable and chronically ill patients can improve their care and clinical outcomes. Evident studies have shown that elderly people, in particular those who are institutionalized, do not receive sufficient and effective medical services (33). The strength of current study is that malnutrition and risk for malnutrition were found in previously undiagnosed patients, indicating the need to improve the healthcare of the elderly population in primary health care. The health problems of the elderly are complex, multi-factorial, intertwined and often iatrogenic, and the strategy for accessing geriatric patients must be much different from those in younger people.

However, there are several limitations to be considered. The assessment was performed at one point of the time and included several geographical regions. Prospective, longitudinal studies are needed to investigate and confirm the differences in nutritional status in regards to healthcare setting.

6. CONCLUSION

A comprehensive geriatric assessment of 446 subjects showed that the incidence of malnutrition was higher among nursing home residents compared to community-dwelling elderly adults. It is recommended that routine screenings and assessment of malnutrition and nutritive status should be carried out more frequently in older people who are frail. Counselling of all people older than 65 years of age in regards to eating habits and healthy lifestyle, at all levels of healthcare, might prevent development of malnutrition in the future and improve their overall health.

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