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ORIGINAL PAPER

NUTRITIONAL STATUS OF HOSPITALIZED ELDERLY WITH CORONARY HEART DISEASE

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Abstract

Aim: The quantitative study aimed to assess nutritional status of elderly patients with coronary heart disease using two standardized tools. *Design*: A quantitative study. *Methods:* Data were obtained with the Mini Nutritional Assessment (MNA) and Malnutrition Universal Screening Tool (MUST). In addition, sociodemographic data were collected and the Barthel Index of Activities of Daily Living was used to assess patients' functional independence. The sample comprised 103 patients staying on a cardiovascular ward between April and September 2018. *Results:* Based on assessment with MNA and MUST, malnutrition or the risk of malnutrition was revealed in approximately 37% and 26% of participants, respectively. Comparison of the two tools revealed significant statistical asymmetry between the results ($p = 0.028$). Full agreement was observed in 75.7% of participants, with a kappa coefficient of 0.44; this may be interpreted as "average" statistically significant agreement ($p < 0.001$). The study revealed statistically significant relationships between functional independence and nutritional status assessed with both the MNA ($p < 0.001$) and MUST ($p = 0.001$). There was also a statistically significant relationship between age and nutritional status assessed with both tools ($p = 0.038$). *Conclusion:* Over a third of elderly patients diagnosed with coronary heart disease staying on a cardiovascular ward suffered from malnutrition. Therefore, more attention should be paid to nutritional status of cardiac patients.

Keywords: coronary heart disease, Malnutrition Universal Screening Tool, Mini Nutritional Assessment, nutritional status, elderly.

Introduction

The process of aging is associated with many changes in body composition. These mainly include loss of skeletal muscle mass and its gradual replacement with adipose tissue caused by decreases in resting and total energy expenditures (Sobotka, 2010). Apart from lean body mass loss, total body water is also considerably reduced (Kalvach et al., 2004). Therefore, it is essential to maintain adequate nutrition and physical activity in the elderly (Sobotka, 2010). They are at a particularly high risk for developing nutrition disorders and malnutrition. The risk of malnutrition increases with age. The scientific literature also points to the fact that data on the incidence of malnutrition in the elderly vary. Some authors claim that the incidence of malnutrition ranges from 40% to 60% in the elderly staying in hospitals or nursing homes (Kasper et al., 2015). Others report that generally, 30% to 60% of hospital inpatients suffer from malnutrition, with most of them already being malnourished on admission. Early detection of malnutrition may prevent functional status impairment, various health problems, etc. (Kozáková et al., 2011b). In 2017, the National Association of Clinical Nurse Specialists (NACNS) Malnutrition Task Group published data on malnutrition in hospitals, stating that malnutrition was generally prevalent in 20% to 50% of inpatiens (Smith et al., 2017).

In cardiovascular diseases, nutrition plays a vital role. It may be a non-pharmacological therapeutic option as well as a preventive or risk factor for numerous diseases (Štejfa et al., 2007). Cardiovascular disease are the most common cause of death globally. Cardiovascular mortality accounts for approximately 50% to 55% of total mortality, with coronary heart diseases being responsible for approximately half of the deaths (Špinar et al., 2003). According to 2015 data from the Czech Statistical Office, cardiovascular diseases continue to be the most common cause of death in the Czech Republic. Cardiovascular death rates are approximately 41.9% in males and 49.9% in females. Coronary heart disease is the most common cause of death in the cardiovascular disease category (Báčová, 2016).

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Aim

The study aimed to assess nutritional status of elderly patients diagnosed with coronary heart disease staying on a cardiovascular ward using two standardized tools, the Mini Nutritional Assessment and Malnutrition Universal Screening Tool.

Methods

Design

A quantitative study.

Sample

The sample comprised a total of 103 patients aged 65 years or older, diagnosed with coronary heart disease and staying on a cardiovascular ward between April and September 2018. The gender distribution was equal; there were 52 males (50.49%) and 51 females (49.51%). The participants' mean age was 75.98 ± 8.64 years, with the youngest and oldest persons being 65 and 92 years old, respectively. The largest group were young-elderly patients aged 65 to 74 years (n = 50; 48.54%), followed by old-elderly individuals aged 75 to 84 years (n = 28; 27.18%) and very old patients, that is, those aged 85 years or older (n = 25; 24.27%). Based on the Barthel Index, approximately 46% of participants were independent. Only 5% were severely dependent. The last two categories, moderately and severely dependent persons, were analyzed as one subgroup. The mean number of cardiovascular ward readmissions was 3.

Data collection

Data were obtained through a questionnaire survey using the standardized tools Mini Nutritional Assessment (MNA) and Malnutrition Universal Screening Tool (MUST). In addition, sociodemographic data and the numbers of cardiovascular ward readmissions were collected. Finally, the Barthel Index of Activities of Daily Living (ADLs) was used to assess patients' functional independence.

The MNA is a standardized screening tool for assessing nutritional status. The tool includes anthropometric measurements, a dietary questionnaire, global and subjective assessment. In the full MNA, anthropometric measurements consist of four questions on the body height, weight, mid-arm and calf circumference. The dietary questionnaire contains six questions on the number of full meals per day, types of food eaten, amount of fluid consumed and need for assistance with eating. The global assessment comprises six questions on the patient's independence, prescription drugs, mobility, psychological problems, skin changes and acute disease in the past three months. The subjective assessment is concerned with the patient's self-view of their own health and nutrition. At present, the Mini Nutritional Assessment – Short Form (MNA-SF) is recommended for use. If pathology is suspected based on MNA-SF screening, assessment with the full MNA should be performed. These recommendations were taken into account in the present study. The MNA-SF asks six questions about decrease in food intake, weight loss during the last three months, mobility, psychological stress or acute disease, neuropsychological problems and Body Mass Index (BMI). The MNA-SF maximum score is 14 points; patients with 12–14 points have normal nutritional status. Those with 11 points or less need to be assessed with the full MNA. Patients with the full MNA score of 24–30 points have normal nutritional status. Those with 17–23.5 points are at risk for malnutrition and scores of less than 17 points are suggestive of malnutrition (Guigoz et al., 1994; Topinková, 2003; Topinková, 2005).

The MUST is composed of five steps. It also provides instructions that may be used when planning care for the screened patient. The tool assesses three clinical parameters: BMI, weight loss in last three to six months and acute disease effect. If the patient's score is 0, their overall risk of malnutrition is low. A score of 1 means a medium risk and 2 or more is associated with a high risk (Elia, 2003).

Data analysis

Data were processed with Microsoft Office Excel and Stata 13. Descriptive statistics were used to describe the sample. Nutritional status assessment tool results were compared using the symmetry test and kappa coefficient. Further, the chi-square test and, where the conditions for its use were not met, Fisher's exact test and Spearman's correlation coefficient were used. The level of statistical significance was set at 0.05 (5%).

Results

Nutritional status assessment with the MNA was conducted in accordance with current recommendations for its use. First, the MNA-SF version was used. In patients with MNA-SF scores of 11 points or less, detailed assessment with the full MNA was carried out. The MNA-SF showed normal nutritional status in approximately 36% of participants; nearly 64% were reassessed with the full MNA. Both the MNA-SF and full MNA showed normal nutritional status in 63% of participants; 27% were at risk for malnutrition and 9.7% were considered malnourished. For further analyses,

the latter two categories were fused into a single subgroup.

Nutritional status was also assessed with the MUST. The tool found a low, medium or high risk of malnutrition in 74%, 22% and 4% of participants, respectively.

Comparing MNA and MUST results

For the analyses, the MNA malnutrition and at risk for malnutrition categories were fused into a single one and so were the MUST medium and high risk of malnutrition categories. The symmetry test revealed statistically significant asymmetry between the results ($p = 0.028$). Full agreement was observed in 75.7% of participants, with a kappa coefficient of 0.44; this may be interpreted as "average" statistically significant agreement ($p < 0.001$). The results are summarized in Table 1. There was agreement on normal nutritional status in 56% of results and on malnutrition / risk of malnutrition in 19%. Seven percent of participants were found to have a low risk of malnutrition with the MUST but to be malnourished / at risk for malnutrition with the MNA. In contrast, 17% of patients were considered as having normal nutritional status when assessed with the MNA but a medium/high risk of malnutrition based on the MUST assessment.

Table 1 Agreement between MNA and MUST results

MNA	Normal nutritional status	Malnutrition / risk of malnutrition	Total
	n (%)	n (%)	n (%)
MUST			
Low risk of malnutrition	58 (56.3)	7 (6.8)	65 (63.1)
Medium/high risk of malnutrition	18 (17.5)	20 (19.4)	38 (36.9)
Total	76 (73.8)	27 (26.2)	103 (100.0)

n – absolute frequency, % – relative frequency

Relationship between nutritional status and independence assessed with the Barthel Index

Fisher's exact test revealed a statistically significant relationship between nutritional status assessed with the MNA and functional independence assessed with the Barthel Index ($p < 0.001$). While 58% of elderly patients with normal nutritional status were independent, 60% of those diagnosed with malnutrition were dependent (see Table 2). The relationship may also be expressed as Spearman's correlation coefficient $r_s = 0.292$ ($p = 0.0028$).

Similarly, there was a statistically significant relationship between nutritional status assessed with the MUST and functional independence assessed with the Barthel Index ($p = 0.001$), as shown in Table 3. While 55% of participants at a low risk of malnutrition were independent, 50% of those at a high of malnutrition were dependent. The relationship may also be expressed as Spearman's correlation coefficient $r_s = 0.387$ ($p = 0.001$).

Relationship between nutritional status and age

Assessment with both tools showed a relationship between nutritional status and age. Fisher's exact test revealed a statistically significant relationship between nutritional status assessed with the MNA and age ($p = 0.038$), as shown in Table 4. Among elderly patients with normal nutritional status, 63% were aged 65-74 years. Forty percent of those identified as malnourished with the MNA were 85 years old or older. The relationship may also be expressed as Spearman's correlation coefficient $r_s = 0.392$ ($p < 0.001$).

Table 2 Relationship between nutritional status (MNA) and independence (Barthel Index)

Barthel Index	Independence	Slight dependence	Moderate / severe dependence	Total
	n (%)	n (%)	n (%)	n (%)
MNA				
Normal nutritional status	38 (58)	24 (37)	3 (5)	65 (100)
Risk of malnutrition	7 (25)	9 (32)	12 (43)	28 (100)
Malnutrition	2 (20)	2 (20)	6 (60)	10 (100)
Total	47 (46)	35 (34)	21 (20)	103 (100)

n – absolute frequency, % – relative frequency

Table 3 Relationship between nutritional status (MUST) and independence (Barthel Index)

Barthel Index	Independence	Slight dependence	Moderate / severe dependence	Total
	n (%)	n (%)	n (%)	n (%)
MUST				
Low risk of malnutrition	42 (55)	25 (33)	9 (12)	76 (100)
Medium risk of malnutrition	4 (17)	9 (39)	10 (43)	23 (100)
High risk of malnutrition	1 (25)	1 (25)	2 (50)	4 (100)
Total	47 (46)	35 (34)	21 (20)	103 (100)

n – absolute frequency, % – relative frequency

Table 4 Relationship between nutritional status (MNA) and age

Age	65–74 years	75–84 years	85 years or more	Total
	n (%)	n (%)	n (%)	n (%)
MNA				
Normal nutritional status	41 (63)	12 (18)	12 (18)	65 (100)
Risk of malnutrition	7 (25)	12 (43)	9 (32)	28 (100)
Malnutrition	2 (20)	4 (40)	4 (40)	10 (100)
Total	50 (49)	28 (27)	25 (24)	103 (100)

n – absolute frequency, % – relative frequency

There was also a statistically significant relationship between nutritional status assessed with the MUST and age ($p = 0.038$). Among participants at a low risk of malnutrition, 55% were aged 65–74 years. Thirty-nine percent of those at a medium risk of malnutrition were 85 years old or older. The relationship may also be expressed as Spearman's correlation coefficient $r_s = 0.239$ ($p = 0.015$). When analyzing the MUST medium and high risk categories together, 41% of participants were 85 years old or older. The chi-square test was used ($p = 0.032$). The results are summarized in Table 5.

Table 5 Relationship between nutritional status (MUST) and age

Age	65–74 years	75–84 years	85 years or more	Total
	n (%)	n (%)	n (%)	n (%)
MUST				
Low risk of malnutrition	42 (55)	20 (26)	14 (18)	76 (100)
Medium risk of malnutrition	6 (26)	8 (35)	9 (39)	23 (100)
High risk of malnutrition	2 (50)	0 (0)	2 (50)	4 (100)
Total	50 (49)	35 (34)	25 (24)	103 (100)

n – absolute frequency, % – relative frequency

Discussion

The study aimed to assess nutritional status of elderly patients diagnosed with coronary heart disease staying on a cardiovascular ward using the standardized tools MNA and MUST. Assessment with the MNA was conducted in accordance with current recommendations. The MNA-SF version was used. In patients with scores of 11 points or less, detailed assessment with the full MNA was carried out. Guigoz (2006) reported that the validity of the MNA-SF is equal to that of the full MNA. With a sensitivity of 86% to 96%, this two-step screening process was found usable by health professionals.

In the present study, the MNA-SF showed normal nutritional status in approximately 36% of participants. Thus, nearly 64% had to be reassessed with the full MNA. Both the MNA-SF and full MNA showed normal nutritional status in 63% of participants; 27% were at risk for malnutrition and 9.7% were considered malnourished. For further analyses, the latter two categories were fused into a single subgroup. Taken together, the MNA revealed that 36.7% of participants either were at risk for or suffered from malnutrition, as compared with only 26% identified with the MUST. The MUST found a low, medium or high risk of malnutrition in 74%, 22% and 4% of patients.

As already mentioned, literature data on the incidence of malnutrition in hospital patients vary. In their systematic review and meta-analysis, Cereda et al. (2016) also pointed to variations depending on

the type of healthcare setting. A review by Kozáková et al. (2011b) reported that according to the literature, between 30% and 60% of hospital inpatients generally suffer from malnutrition. Data from the NACNS Malnutrition Task Group showed that malnutrition was present in 20% to 50% of patients staying in hospitals (Smith et al., 2017). Similarly, there are variations in the prevalence of malnutrition in hospitalized elderly as reported in the literature. In the Czech Republic, malnutrition was observed in 20% to 40% (Topinková, 2005) as well as in 36% to 65% of elderly patients in hospitals (Šenkyřík, 2015). Kasper et al. (2015) state that there is a consensus among experts that 40% to 60% of hospitalized elderly are malnourished.

A review by Guigoz (2006) that included 36 studies assessing nutritional status in hospitalize elderly with the two-step MNA tool revealed an overall prevalence of malnutrition of approximately 23%, with 46% of patients being at risk for developing malnutrition. Kozáková and Adamčíková (2013) used the MNA to investigate nutritional status in 121 patients staying in a geronto-psychiatric ward. They found that 46% of patients were at risk for malnutrition and 23% were malnourished. Nutritional status in 200 elderly persons receiving institutional care was studied by Lukšová and Vrublová (2014). The MNA revealed the risk of malnutrition or malnutrition in 38% and 30% of them, respectively.

A study by Stratton et al. (2006) used the MUST to assess nutritional status in 150 individuals aged 85 years. The results showed malnutrition in 58% of participants. This was the first study to show that the MUST predicts clinical outcome in hospitalized elderly. In their cross-sectional study with a randomly selected sample, Castro-Vega et al. (2017) stated that the prevalence of disease-related malnutrition depended on the population studied and the methods used for screening, nutritional assessment and the diagnostic criteria employed. The study used the MUST to determine the prevalence of nutritional risk and malnutrition as well as the type and degree of malnutrition in outpatient, hospitalized and institutionalized populations. The MUST revealed nutritional risk in 28.8% of hospitalized individuals. The study, however, was not limited to the elderly. Doundoulakis et al. (2018) conducted an observational study of 2,970 patients in 34 Greek hospitals assessing their nutritional status with the Nutritional Risk Screening 2002 (NRS 2002), MUST and MNA-SF. The sample comprised adult patients, not the elderly. Using the NRS 2002, MUST and MNA-SF, malnutrition was found in 23.5%, 22.9% and 60.5% of patients. The MNA-SF results are similar to those in the present study. In nearly 64% participants in the present study, detailed assessment with the full MNA had to be performed as their short form scores were 11 points or less. This would have suggested malnutrition or the risk of malnutrition if the full version had not been used.

The above studies confirm what has already been said about different data on the prevalence of malnutrition. The fact than results of the present study differ from those in some of the above studies may be explained mainly by differences in age distribution, specific underlying disease and, generally, specific studied population, one of the present study's limitations. The aforementioned studies by Guigoz (2006), Kozáková and Adamčíková (2013) and Lukšová and Vrublová (2014) using the MNA are older, possibly one of the reasons explaining the different results. According to the present study conducted in 2018, the MUST was able to detect nutritional risk in 26% of elderly. This is consistent with findings in more recent studies by Castro-Vega et al. (2017) and Doundoulakis et al. (2018).

In the present study, comparison of the two tools revealed statistically significant asymmetry between the results ($p = 0.028$). Full agreement was observed in 75.7% of participants, with a kappa coefficient, a measure of agreement, of 0.44; this may be interpreted as "average" statistically significant agreement ($p < 0.001$). In their study of 246 older nursing home residents, Donini et al. (2016) investigated agreement between nutritional status assessments made with the MNA, MNA-SF, MUST and NRS 2002. Agreement between the MNA and MUST or NRS 2002 was classified as "fair" ($k = 0.270$ and $k = 0.291$, respectively; $p < 0.001$). Three years earlier, Diekmann et al. (2013) carried out a study including residents from two nursing homes in Germany. It showed poor agreement between the NRS 2002 and MUST on the one hand and the MNA on the other. Pathirana et al. (2014) assessed nutritional status in patients admitted to a cardiology unit. They used internationally recommended screening tools for nutritional assessment including the MNA and MUST and found wide variations in results obtained with different tools. Kozáková et al. (2011a) conducted their research in elderly clients staying in two medical institutions for long-term ill. Once again, there were considerable differences in MNA and MUST results.

The present study revealed a statistically significant relationship between nutritional status assessed with the MNA and functional independence assessed with the Barthel Index ($p < 0.001$). Similarly, there was

a statistically significant relationship between nutritional status assessed with the MUST and independence assessed with the Barthel Index ($p = 0.001$). In their study carried out in a geronto-psychiatric ward, Kozáková and Adamčíková (2013) investigated, among other things, the relationship between nutritional status assessed with the MNA and independence based on ADLs and instrumental ADLs. Unlike the present study, however, they failed to show a statistically significant relationship. This may be explained by different characteristics of the populations. A Japanese study by Furuta et al. (2013) included 286 persons aged 60 years or older living at home and receiving home care services due to physical disabilities. The authors examined direct and indirect relationships between oral health, swallowing function, cognitive ability and ADLs and showed that poor oral health and cognitive impairment had a direct effect on denture wearing, with consequent dysphagia being positively associated with malnutrition. Cognitive impairment, dysphagia and malnutrition directly limited ADLs, that, the participants' independence. Valentini et al. (2018) studied the relationship between nutritional status evaluated using the MNA and frailty in elderly hospital patients. Among others, they assessed ADLs. The study confirmed that malnutrition contributed to the development of frailty. The MNA may provide important information that aids in identifying the frail elderly who are more dependent. No other studies concerned with the direct relationship between nutritional status and independence were identified.

In addition, the present study focused on the association between nutritional status and age. There were statistically significant relationships between age and nutritional status assessed with both the MNA ($p = 0.038$) and MUST ($p = 0.038$). The aforementioned observational study by Doundoulakis et al. (2018) assessing nutritional status with the NRS 2002, MUST and MNA-SF found, consistently with the present study, that nutritional risk increases with age. Patients aged 80 years or older were found to be at a very high risk for developing malnutrition. Similarly, Miao et al. (2019) recruited 420 patients aged 70 years or more to assess their malnutrition risk with the NRS 2002 and MNA. The authors concluded that results obtained with both tools were significantly correlated with age, BMI and laboratory parameters ($p < 0.001$). Unlike the present study, however, they did not use the MUST.

There are certain limitations to the findings of the present study. One limitation may be the sample size as only 103 elderly patients were included in the study. Another limitation is the setting, with data being collected in a single hospital. Therefore, the results cannot be generalized without further research. However, they provide valuable information about nutritional status of elderly patients staying on a cardiovascular ward in a selected healthcare facility. Despite the above limitations, the study results may be beneficial for nursing practice.

Conclusion

The study found differences in nutritional status depending on the assessment tool. There was a relationship between nutritional status assessed with both tools and functional independence assessed with the Barthel Index, with malnutrition being more common in dependent individuals. Another relationship was demonstrated between nutritional status assessed with both tools and age. Participants aged 85 years and older were more malnourished. Approximately 37% of elderly persons diagnosed with coronary heart disease suffered from malnutrition. Therefore, more attention should be paid to nutritional status of cardiac patients. The study results suggest that the MNA two-step screening process seems to be a more appropriate tool for use in elderly patients with cardiovascular disease.

Ethical aspects and conflict of interest

Data were collected after written permission was obtained from the hospital administration. The senior nursing officer and ward sister were informed about the survey. Patients gave consent to participate and their anonymity was assured. Standard ethical principles were followed. The authors are not aware of any conflict of interest.

Author contributions

Concept and design (KB, HL), data collection (KB), data analysis and interpretation (KB), preparation of the manuscript (KB), critical revision of the manuscript (KB, HL), final revision of the manuscript (KB, HL).

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