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Geriatryczny wskaźnik ryzyka niedożywienia u pacjentów przygotowywanych do zabiegu operacyjnego – badania wstępne

Geriatric Nutritional Risk Index in patients prepared for surgical treatment – preliminary study

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Streszczenie

Wstęp. *Niedożywienie osób starszych może pogarszać wyniki leczenia wpływając między innymi na: wydłużenie czasu hospitalizacji, zwiększone ryzyko powikłań infekcyjnych oraz na zwiększoną śmiertelność.* ***Cel.*** *Celem badań była analiza możliwości zastosowania geriatrycznego wskaźnika ryzyka niedożywienia u osób starszych przyjętych do leczenia operacyjnego.* ***Materiał i metody.*** *Badania przeprowadzono w Oddziale Chirurgii Ogólnej z Pododdziałem Chirurgii Onkologicznej Wojewódzkiego Szpitala Specjalistycznego w Lublinie im. Stefana Kardynała Wyszyńskiego. Grupę badaną stanowiło 138 pacjentów w wieku 65 i więcej lat. W pracy wykorzystano Geriatric Nutritional Risk Index (GNRI) – geriatryczny wskaźnik ryzyka niedożywienia.* ***Wyniki.*** *Na podstawie poziomu wskaźnika GNRI badanych podzielono na dwie grupy: I grupa - wartości GNRI ≤ 98 (nieprawidłowe wartości) i II grupa > 98 (prawidłowe wartości). Analiza wykazała, że wartości nieprawidłowe występowały u 10,14%, (n = 14) badanych, natomiast prawidłowe u zdecydowanej większości tj. 89,86% (n = 124). Nieprawidłowe wartości GNRI odnotowano najczęściej u pacjentów w przedziale 71-75 lat. Biorąc pod uwagę rozpoznanie kliniczne stwierdzono, że najczęściej wartości nieprawidłowe ≤ 98 wystąpiły u pacjentów z chorobą nowotworową przewodu pokarmowego (15,79%).* ***Wnioski.*** *Geriatric Nutritional Risk Index jest przydatny w ocenie stanu odżywienia, jak również ryzyka ewentualnych powikłań pooperacyjnych, pacjentów poddawanych zabiegowi operacyjnemu. Zdecydowana liczba badanych pacjentów miała prawidłowe wartości GNRI. Wiek badanych oraz płeć nie różnicuje istotnie poziomu GNRI. GNRI prezentuje dużą wartość, zarówno diagnostyczną jak i prognostyczną w identyfikacji osób po 65 roku życia z chorobą nowotworową przewodu pokarmowego, przyjmowanych do planowego leczenia chirurgicznego. (Gerontol Pol 2015, 1, 125-130)*

Słowa kluczowe*: osoby starsze, zabieg operacyjny, Geriatric Nutritional Risk Index*

Abstract

Background. *Malnutrition in the elderly may impair the results of treatment, affecting it, among others, by extending the hospitalisation period, increasing a risk of infectious complications, and elevating mortality rates.* ***Objective.*** *The aim of the study was to analyse the risk of geriatric malnutrition in elderly people submitted to surgical treatment.* ***Material and methods.*** *Studies were conducted in the Department of General Surgery with Surgical Oncology Unit of the Stefan Wyszynski's Provincial Specialist Hospital in Lublin. The research cohort consisted of 138 patients aged 65 and older. Geriatric Nutritional Risk Index (GNRI) was employed in the work.* ***Results.*** *On the basis of the GNRI level of the persons examined, they were divided into two groups: Group 1 – with GNRI ≤ 98 (incorrect values) and Group 2 with GNRI > 98 (correct values). Analysis exhibited incorrect values in 10.14% (n = 14) of the cohort, while a vast majority featured correct values, i.e. u 89.86% (n = 124). Incorrect GNRI values were mostly reported in patients between 71-75 years of age. Taking into account the clinical diagnosis, it was found that most incorrect values ≤ 98 occurred in patients with gastrointestinal cancers (15.79 %).* ***Conclusions.*** *Geriatric Nutritional Risk Index is useful in assessing the nutritional status as well as the risk of potential postoperative complications in patients undergoing surgical treatment. The vast number of patients showed correct GNRI values. Age and gender of patients do not differentiate the GNRI in a significant manner. GNRI is a highly valuable tool, both in the diagnostic and prognostic aspect of identification of persons under 65 years of age with gastrointestinal cancer submitted to scheduled surgical treatment. (Gerontol Pol 2015, 1, 125-130)*

Key words*:elderly, surgery, Geriatric Nutritional Risk Index*

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Introduction

According to the assumptions of the latest forecast for the 2008-2035 period, the process of ageing in the Polish society will be continuously exacerbating. This phenomenon has been also observed in other countries of Western Europe [1]. One of the factors affecting the increase in population of elderly people is the recent advancement of medicine [2]. In the light of this progress, it is to be expected that an increasing number of persons undergoing surgical treatment, not to mention more complex medical procedures, will involve people over the age of 65. The treatment of the elderly is very difficult and elaborate [3]. Nutritional status in this group of patients is a very important prognostic factor [4]. Malnutrition may impair the results of treatment, affecting it among others in the following ways: it may extend the hospitalization period [5], increase the risk of infectious complications [6] and elevate mortality rates [7].

NRI – the Nutritional Risk Index – is one of the indicators used for identifying malnutrition or the risk associated with this status and related complications [8].

This indicator is of limited use in elderly people. It incorporates the usual body weight of a patient, which the majority of the elderly do not control or remember. Bouillanne et al. [9] replaced the usual body weight with an ideal value of it, thus forming a new indicator, called the Geriatric Nutritional Risk Index – GNRI.

None of the parameters or indicators may be considered separately as a golden means for identifying malnourished elderly persons or patients at a risk of malnutrition. However, several indicators or parameters employed simultaneously increase the effectiveness in assessing the nutritional status.

Determining this status is inhibited to a great extent due to various changes occurring in human organism during the process of ageing. In the search for ever newer diagnostic methods or improving the existing ones, what should be taken into account is the fast increase of the proportion of elderly people in our population.

Objectives

The aim of the study was to analyse the Geriatric Nutritional Risk Index in elderly people submitted to surgical treatment.

Material and method

Studies were carried out in the Department of General Surgery with Surgical Oncology Ward at Stefan Wyszynski's Provincial Specialist Hospital in Lublin. The test group consisted of 138 patients aged 65 and older. A detailed description of the research cohort is presented in Table I.

Table I. Characteristics of the research cohort

Gender	Female	54.35	75
	Male	45.65	63
Age	65-70 years	42.03	58
	71-75 years	34.06	47
	76-80 years	23.91	33
Disorder	inguinal hernia	26.09	36
	gallbladder and biliary disorders	32.61	45
	gastrointestinal cancer	41.30	57

Geriatric Nutritional Risk Index (GNRI) was employed in the work. Bouillanne et al. [9] described the GNRI as a nutrition-related prognostic indicator. It was designed for people over 65 years of age in order to identify complications and mortality in respect of pathologies which may at this particular age result from malnutrition, among other factors. The authors of the index claim GNRI is not an indicator of malnutrition, but rather of morbidity and mortality resulting from ill health of the elderly. It is also suggested in their study that ill health may be associated inter alia with malnutrition, whereas GNRI is a tool allowing for identification of patients requiring nutritional treatment. This indicator can therefore be also described as Geriatric Nutritional Risk Index in respect of the risk of morbidity and mortality in elderly patients. GNRI is an adaptation of Nutritional Risk Index (NRI), indicating the risk associated with malnutrition, first described by Buzby et al. [10].

The NRI formula is as follows:

$$NRI = (1.519 \times \text{albumin [g/L]}) + (41.7 \times \text{current weight/usual weight})$$ [11].

Due to difficulties in establishing the "usual weight" for the elderly population, this indicator has a limited scope of application. This is why in this formula Bouillanne et al. [9] replaced "usual weight" with "ideal body weight", calculated according to the formula Lorentz (WLo), creating the new Geriatric Nutritional Risk Index, which is calculated according to the following formula:

$$GNRI = (1.489 \times \text{albumin [g/L]}) + (41.7 \times \text{current weight/ideal body weight})$$

Bouillanne et al. [9] adopted the following values as correct along with their interpretations for GNRI:

- **GNRI > 98 no risk of complications;**
- **GNRI 92-98 low risk of complications;**

- **GNRI 82-92 moderate risk of complications;**
- **GNRI < 82 major risk of complications.**

The 1.519 ratio (Friedmann et al.) [12] from the NRI formula was replaced with 1.489 in the GNRI (Naber et al.) [13].

Ideal body weight (IBW) is calculated according to the Lorentz formula – WLo [14] as follows:

- For women: IBW (kg) = height (cm) - 100 - { (height (cm) - 150) / 2.5}
- For men: IBW (kg) = height (cm) - -100 - { (height (cm) - 150) / 4} [9].

The Lorentz Formula (WLo) takes into account both the age and gender of a patient. It is of use in patients over 18 years of age and of height ranging between 140 (cm) and 220 (cm) [15].

Similarly as in the case of Bouillane et al., the following assumption was adopted in the calculation for the purposes of this work: if the current weight is higher than or equal to the ideal body weight (IBW), it is set as equal to 1; whereas if the current weight is lower than the ideal body weight (IBW), then it is set as equal to the value of the ratio of the current body weight to IBW. Otherwise, a risk of omission of malnutrition in patients with obesity would occur. This does not mean that obesity among the elderly is not associated with an increased risk of complications and mortality, but merely that the risk is much smaller than in people with low BMI values [9].

Olivier Bouillanne, the author of the GNRI, gave his consent to the application of this index in this study.

The results obtained were subjected to a statistical analysis. Values of the measurable parameters were analysed with the use of mean and standard deviation values, whereas the data concerning non-measurable parameters were presented with the use of amount and percentage. The normality distribution of the measurable parameters analysed was assessed by the means of the Shapiro-Wilk test. For a comparison of two independent groups, Student t-test was applied, whereas in the case of more than two groups, analysis of variance and contrast analysis were used. In order to examine the relationship between qualitative variables, the χ^2 test was employed. For examining the existence of quantitative association between two quantitative features, Pearson correlation coefficient was used. A significance level of $p<0.05$ was assumed, which indicates the occurrence of statistically significant differences or relations. Database and statistical tests were carried out with the assistance of STATISTICA 8.0 computer software (StatSoft, Poland).

Results

On the basis of the GNRI level of the persons examined, they were divided into two groups: Group 1 – with GNRI ≤ 98 (incorrect values) and Group 2 with GNRI > 98 (correct values). Analysis exhibited incorrect values in 10.14% (n = 14) of the cohort, while a vast majority featured correct values, i.e. u 89.86% (n = 124).

The study also analysed the GNRI with respect to patients' gender. The data analysis showed incorrect GNRI ≤ 98 to occur in 12.00% of women and 7.94% of men. Differences demonstrated in the analysis were not statistically significant. The data described above are presented in Table II.

Taking into account clinical diagnosis, it was found that most incorrect values of GNRI ≤ 98 were observed in patients with gastrointestinal cancers (15.79%) as compared to other groups. Statistical analysis did not show any significant differences between the groups. The results are presented in Table III.

Upon analysis of the data contained in Table IV, it can be determined that incorrect values of GNRI ≤ 98 were most frequently reported in patients between 71-75 years of age (14.89%), in the age group below 70 it was 6.90%, whereas in the group above 75 years of age it amounted to 9.09%. Differences demonstrated in the analysis were not statistically significant.

Table II. The number and percentage of GNRI with regard to gender

Gender	> 98	≤ 98	Total	Statistical analysis
	n %	n %	n %	
Women	66	9	75	Chi² = 0,62 p = 0,43
	88,00	12,00	100,00	
Men	58	5	63	
	92,06	7,94	100,00	
Total	124	14	138	
	89,86	10,14	100,00	

Table III. The number and percentage of GNRI with regard to diagnosis

Diagnosis	> 98	≤ 98	Total	Statistical analysis
	n %	n %	n %	
Inguinal hernia	33	3	36	$Chi^2 = 3,73$ p = 0,16
	91,67	8,33	100,00	
Gallbladder and biliary disorders	43	2	45	
	95,56	4,44	100,00	
Gastrointestinal cancer	48	9	57	
	84,21	15,79	100,00	
Total	124	14	138	
	89,86	10,14	100,00	

Table IV. The number and percentage of GNRI with regard to age groups

Age	> 98	≤ 98	Total	Statistical analysis
	n %	n %	n %	
65-70 years	54	4	58	Chi2 = 1,87 p = 0,39
	93,10	6,90	100,00	
71-75 years	40	7	47	
	85,11	14,89	100,00	
76-80 years	30	3	33	
	90,91	9,09	100,00	
Total	110	28	138	
	79,71%,	20,29	100,00	

Discussion

There is a risk of multiple complications developing in elderly people submitted to surgical treatment with concomitant status of malnutrition or a risk of malnutrition [16]. Considering the consequences of complications in this group of patients, it is imperative to seek more appropriate and effective methods of identifying patients requiring particular preventive actions. Methods used to identify patients at risk of complications arising from low nutritional status should be simple, both in implementation and interpretation [17].

Presented for the first time by Bouillanne et al. [9] in 2005, the GNRI deserves particular consideration. It is a simple ratio requiring only three measures, and namely albumin, weight and height. During the examination, this indicator requires the involvement of the staff and the patient to a small extent only.

According to the original concept of the authors of GMRI, it is a nutrition-related prognostic indicator, and not an indicator of malnutrition level. It allows to classify patients according to a risk of complications in relation to ill health often associated with malnutrition, and thus to identify those who may benefit from nutritional therapy. It has been demonstrated that GMRI is a useful indicator for identification of people at risk of such complications as infections, pressure ulcers, and mortality [9,18].

However, subsequent research also suggests it can be employed for the purposes of determining the malnutrition level [19,20] or forecasting musculoskeletal dysfunction in elderly persons [21].

Results of the authors' own research in respect of identifying groups of people at risk of complications on the basis of the GNRI values obtain indicate a lack of similarity to the results presented in existing publications [9,18-25]. A study carried out by Bouillanne et al. [9] demonstrated incorrect values in the range of < 82 in 12.2% of patients, values in the range of 82 – 92 in 31.4% of patients, whereas values in the range 92-98 were reported in 29.4% of patients. Values in the correct range > 98 were found in 27.0% of the persons examined. In one of the reports, Cereda et al. [19] also demonstrated the following study results in respect of correct and incorrect GNRI values: < 82 : 3.5%; 82-92: 14.2%; 92-98: 33.8%; > 98: 48.5% .

The reasons for these differences are resulting both from the mode of admission to hospital and the living

environment of the elderly people subject to examination. This is because the authors' own study included patients who were scheduled for admission, living independently on their own or with their spouse or family. The existing research on this index, on the contrary, studied persons with reduced functional capacity, including patients of rehabilitation wards or residing in short-term and long-term care facilities.

What appears to confirm this hypothesis is the reports on an existing relation between the incidence of malnutrition in elderly people and their place of residence. Humańska and Kędziora-Kornatowska [26] showed in their studies that nutritional status could be related to the place of residence. These studies also showed that persons who reside with their family were better nourished than residents of nursing homes.

This thesis is also confirmed by the studies of Kołłajtis-Dołowa et al. [27] and Gazzotti et al. [28] whose research results showed that nutritional status of persons living alone or with their families was better than the one of those residing in nursing homes.

Furthermore, it was alleged that there is a relationship between the incidence of malnutrition and a mode of hospital admission. This was confirmed by the results of studies obtained by Tojek et al. [29], Correia et al. [30] and Kuzu et al. [31], who found that malnutrition occurred significantly more often among patients hospitalised on an ad hoc basis in comparison with patients submitted to hospital in a scheduled mode.

One of the leading causes of malnutrition is cancer. Depending on its location and stage, cancer may be a cause of malnutrition in 5-80% of its cases [29,32].

Patients with gastrointestinal cancer submitted for surgical treatment are particularly vulnerable to consequences of malnutrition [33].

According to literature, cancer is an independent risk factor for malnutrition [34]. Sungurtekin et al. demonstrated an increased incidence of complications in patients with cancer undergoing surgical treatment [35].

With the ageing population, morbidity and mortality caused by cancer is on the rise [36].

The GNRI may presumably have a special value for elderly people over the age of 65 with gastrointestinal cancer. This is confirmed by the results of the authors' own research. Taking into account clinical diagnosis, it was found that most incorrect GNRI ≤ 98 values were observed in patients with gastrointestinal cancers (15.79%) as compared to other groups. Although medium GNRI values fit within the normal limits in patients with gastrointestinal cancers, they were lower than GNRI values in persons with other disorder diagnoses.

Conclusions

1. Geriatric Nutritional Risk Index is useful in assessing nutritional status as well as the risk of potential postoperative complications in patients undergoing surgical treatment.
2. A vast number of patients showed correct values of Geriatric Nutritional Risk Index.
3. Age and gender of patients do not differentiate the GNRI in a significant manner.
4. GNRI is a highly valuable tool, both in the diagnostic and prognostic aspect of identification of persons under 65 years of age with gastrointestinal cancer submitted to a scheduled surgical treatment.

Conflict of interest
None

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