THE ROLE OF THE NUTRITIONAL STATUS OF GERIATRIC PATIENTS WITH GASTROINTESTINAL CANCER IN DEVELOPING POSTOPERATIVE COMPLICATIONS

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SUMMARY

Background: *Many studies have shown that geriatric patients with altered nutritional status are at higher risk of developing complications during medical treatment. Our study aimed to examine the role of preoperative nutritional status in developing postoperative complications and the length of hospital stay in geriatric patients who suffer from cancer and undergo major abdominal surgery.*

Methods: *Prospective research was conducted at the Oncology Institute of Vojvodina from January 2020 until April 2021. This study included 82 patients over 65 years old, who were admitted to have radical surgery for gastrointestinal cancer performed. There were 6 patients excluded from the study. Nutritional status analysis was performed using BMI (Body mass index), preoperative serum albumin level, MNA-SF (Mini nutritional assessment- short form), and GNRI (Geriatric nutritional risk index). The classification of surgical complications was done using the Clavien-Dindo classification scale.*

Results: *Of the total number of patients, 57 of them (75%) developed at least one surgical complication. Nonsurgical complications have been recognized in 28 patients (36.84%). Overweight patients, according to BMI, had a greater chance of developing grade I ($p < 0.01$) and grade II ($p < 0.05$) surgical complications of the Clavien-Dindo classification. Patients with normal serum albumin levels had a significantly lower chance of developing surgical complications of any grade ($p = 0.00$). BMI and MNA- SF were the most important predictors of delirium. Patients without GNRI risk (GNRI: >98) had a significantly lower chance of developing nonsurgical complications regarding comorbidity exacerbation ($p = 0.03$), and delirium ($p = 0.00$).*

Conclusion: *None of the nutritional assessment tools used in our study were better or more efficient than the others in our sample of patients. Precise nutritional status assessment is complex and we cannot use only one scoring system or scale to get accurate results.*

Key words: *nutritional status, diagnosis, malnutrition, geriatric*

INTRODUCTION

Older age is often followed by a reduced quality of nutrition, which leads to altered nutritional status. Many reasons cause malnutrition in people over 65: chronic diseases, polymedication, loss of appetite, metabolism changes, and decline in the organ and organic systems function. According to research, the prevalence of malnutrition in the geriatric population is 22.8%, and in hospitalized geriatric population the percent is even higher, 38.7% (1). Studies have shown that geriatric patients with altered nutritional status are at greater risk of developing complications during medical treatment, have a longer hospital stay, and also have higher morbidity and mortality rates than well-nourished patients (2,3). The prevalence of malnutrition is even higher in geriatric patients who suffer from cancer (4). Having a gastrointestinal malignancy additionally increases nutritional risk, especially if patients have symptoms like anorexia, nausea, dysphagia, diarrhea, constipation, malabsorption, and pain.

Considering that altered nutritional status is one of the poor prognostic factors for treatment outcomes in cancer patients (5,6), it is highly necessary to perform the nutritional screening of these patients, so that their nutritional status can be improved, and they could get better treatment outcomes.

Mini Nutritional Assessment is a fast method for evaluating the nutritional status of geriatric patients in hospital settings and nursing homes (7,8,9). Mini Nutritional Assessment Short Form (MNA-SF) is a shorter version of the same form which is a reliable method for the screening of geriatric population and which keeps the accuracy and validity of MNA (10,11,12).

The Geriatric Nutritional Risk Index (GNRI) is a prognostic nutritional index that is simple to use, and often used in clinical practice. It requires only patient height, weight, and serum albumin level data (13).

Our study aimed to examine the role of the preoperative nutritional status in developing postoperative complications and the length of hospital stay of geriatric patients with cancer who undergo major abdominal surgery.

MATERIALS AND METHODS

Prospective research that has been approved by the Ethical Committee of the Oncology Institute of Vojvodina was conducted from January 2020 until April 2021. This study included 82 patients over 65 years old, who were admitted to have radical surgery for gastrointestinal cancer performed (colo-rectal surgery, gastrectomy, hepatic resection). There were 6 patients excluded from the study because of the intraoperative finding of cancer progression (metastasis, peritoneal carcinosis, infiltration of other organs). After being admitted to the Operative Oncology Clinic of the Oncology Institute of Vojvodina the day before the surgery, patients were in-

formed of the method and aim of the study. All the patients included in the study gave their written consent.
Detailed patient history was taken preoperatively, with additional attention paid to nutritional status. Anesthesiologists performed a physical exam of every patient and studied the complete medical history. The data that was included in the individual study protocol was sex, age, comorbidities, ASA physical status classification, and preoperative serum albumin level. After that, the basic anthropometric measures were taken, such as weight, height, upper arm circumference, and BMI was calculated. Next, MNA-SF and GNRI were used to evaluate the nutritional status, which were all included in the individual study protocol.
According to BMI values (kg/m^2), they were categorized into one of the following groups: underweight (< 18.5), normal (18.5-24.9), overweight (25.0-29.9), and obese (>30.0) (14).
Preoperative hypoalbuminemia was defined by serum albumin level < 35 g/l.
MNA-SF includes six questions about reduced food intake, weight loss, mobility, psychological distress or acute illness, neuropsychological disorders, and BMI (10). The maximal score on MNA-SF was 14, and values ≥ 12 have been considered a normal nutritional status. Values that were ≤ 11 or ≥ 8 suggested the risk of malnutrition, while the values ≤ 7 were considered as malnutrition.
The values obtained from GNRI were used to categorize the patients into 4 groups: high-risk (GNRI: <82), moderate-risk (GNRI: 82-92), low-risk (GNRI: 92-98), and no-risk group (GNRI: >98). A formula that has been used for GNRI calculation was: [1.489 x albumin (g/l) + 41.7 weight/ideal weight (PBW/IBW)= 1.489 x albumin (g/l) + 41.7 x BMI/22] (13).
After surgery, the patients were admitted into the intensive care unit (ICU). The length of stay in the ICU depended on the type of surgery performed and postoperative recovery. The patients were monitored from the day of surgery until discharge. All surgical and nonsurgical complications were noted. The classification of surgical complications was done using the Clavien-Dindo (CD) classification scale (15). All nonsurgical complications were noted too, such as exacerbation of pre-existing comorbidities (cardiovascular, diabetes, pulmonary diseases, etc.), new onset of cardiovascular and respiratory complications, infections, and neurocognitive complications (delirium) which was assessed by using the Confusion Assessment Method for the ICU.
The statistical analysis of data was performed using the SPSS software system (SPSS 21.0 for Windows, Inc., Chicago, Ill., USA). The statistical methods that were used were descriptive statistics, χ^2 test, and binomial logistic regression. The statistical significance was assumed at $\alpha = 0.05$.

RESULTS

Out of a total of 76 patients, 45 were males, and 31 were females. The median age of patients was 73.24 years. The age structure of patients is shown in Figure 1. Among these patients, 42 of them (55.3%) had ASA 2 preoperative status, while 34 patients (44.7%) had ASA 3 status. The average hospital stay was 9.48 days and the average stay in the ICU was 2.98 days. Out of the total number of patients, 57 of them (75%) developed at least one surgical postoperative complication. The highest percentage of them (40.78%) developed CD class I complications which imply any deviation of the postoperative course without the need for pharmacological, surgical, endoscopic, and radiological interventions. Class II of CD complications (that require pharmacological treatment with drugs other than antiemetics, antipyretics, analgetics, diuretics, electrolytes, and physiotherapy; blood transfusions and total parenteral nutrition) were noted in 23.68% of patients. A total of 4 patients (5.26%) developed class III CD complications. Two of them were in class IIIa and had required surgical, endoscopic, or radiological intervention, and the other 2 were in class IIIb and had intervention under general anesthesia.

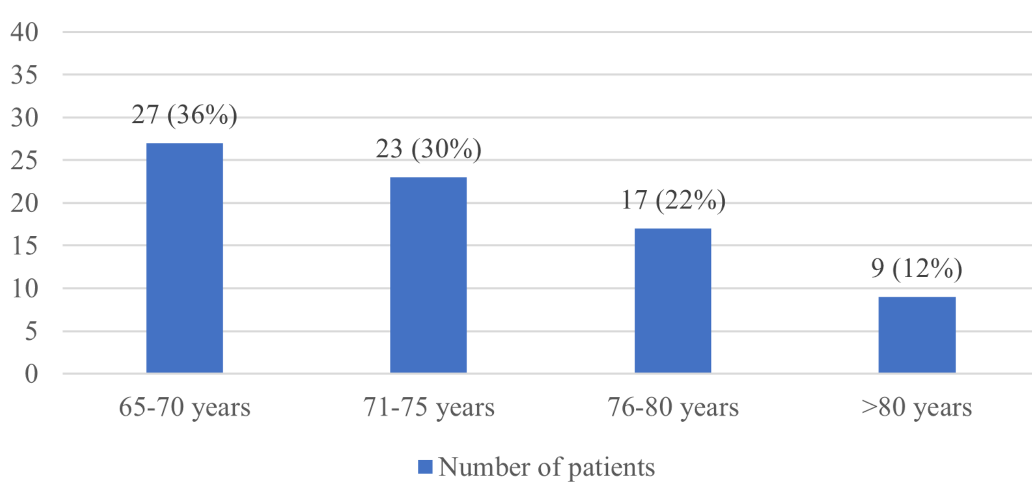

Figure 1. Age structure of patients.

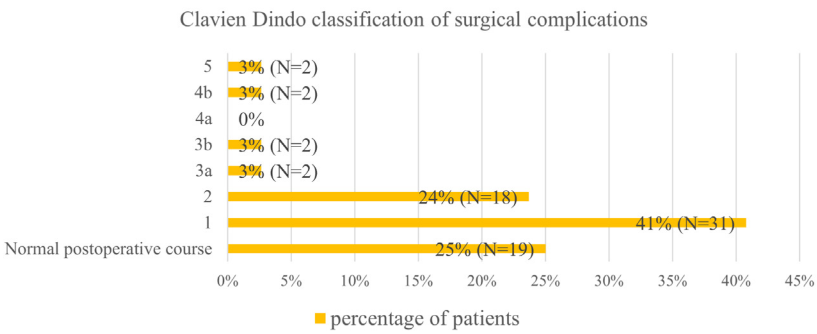

Figure 2. Distribution of patients on the Clavien-Dindo scale of surgical complications.

Preoperative serum albumin levels	CLAVIEN-DINDO CLASS					
	No complications	I	II	III	IV	V
Hypoalbuminemia (N)	0 (0%)	1 (1.4%)	4 (5.4%)	0 (0%)	2 (2.7%)	*0 (0%)*
Normal albumin levels (N)	19 (25.7%)	30 (40.5%)	14 (18.9%)	2 (2.7%)	0 (0%)	*2 (2.7%)*
χ^2(df = 1)	19.00**	27.13**	5.56*	2.00	2.00	*2.00*
Total differences:	χ^2 = 26.38, df = 5, p = .00					

Table 1. The influence of preoperative serum albumin levels on the development of surgical complications.

GNRI	Cognitive complications		Worsening of comorbidities	
	NO	YES	NO	YES
No risk (N)	58 (76.3%)	3 (3.9%)	55 (72.4%)	6 (7.9%)
Low risk(N)	9 (11.8%)	1 (1.3%)	8 (10.5%)	2 (2.6%)
Moderate risk(N)	3 (3.9%)	1 (1.3%)	4 (5.3%)	0 (0%)
High risk(N)	0 (0%)	1 (1.3%)	0 (0%)	1 (1.3%)
	χ^2 = 14.03, df = 3, p = 0.00		**χ^2 = 8.85, df = 3, p = 0.03**	

Table 2. The influence of GNRI on the development of cognitive complications and worsening of comorbidities in the postoperative period.

Multiorgan dysfunction, that is class IVb complication was developed by 2 patients (2.63%), and the same number of patients had fatal outcomes (class V) (Figure 2). Nonsurgical complications developed in 28 patients (36.84%). The exacerbation of pre-existing comorbidities was noticed in 11.84% of patients, respiratory complications were developed in 13.6% of them, and cardiovascular in 18.42%. Delirium was noticed in 7.89% of patients.

By assessing BMI, malnutrition was detected in one patient (1.32%), and as many as 32 patients (42.1%) were overweight. A significant difference was found in the category of overweight patients (BMI 25.0-29.9) who had a higher probability of developing surgical complications of class I (χ^2(df) = 12.12(3), p < 0.01) and class II (χ^2(df) = 10.00 (3), p < 0.05) of CD scale. Among 40.78% of patients who developed CD class I complications, 18.42% of them were overweight, and 9.21% were obese. 23.68% of the patients had CD class II complications, out of which 11.84% were overweight, and 3.95% were obese. No significance was found in evaluating the BMI effect on developing nonsurgical complications by using the χ^2 test.

Hypoalbuminemia was found preoperatively in 7 patients (9.21%). In the results of binomial logistic regression, normal albumin levels significantly contributed so that the patients did not develop any postoperative complication (OR = 88.12, 95%CI = 1.23 – 6338.83). The patients with normal albumin levels had significantly less surgical (χ^2 (df) = 26.38(5), p = 0.00) and nonsurgical (χ^2 (df) = 7.91(1), p = 0.01) complications. Class I and II complications of the CD scale developed significantly less frequently in these patients (Table 1). The patients with normal albumin levels developed delirium (χ^2 (df) = 4.53(1), p = 0.03) and exacerbation of pre-existing comorbidities (χ^2 (df) = 7.10(1), p = 0.01) less frequently.

By applying MNA-SF, malnutrition was detected in 7 patients (9.21%), while the risk of malnutrition was found in 23 patients (30.26%). Using the χ^2 test for independent samples it was established that there was no correlation between the preoperative estimated nutritional status by applying MNA-SF and the development of postoperative surgical or nonsurgical complications in these patients. According to the results of binomial logistic regression, BMI and MNA-SF proved to be the most significant predictors of delirium. Higher BMI values (OR = 1.43, 95%CI = 1.01 – 2.01) and lower MNA-SF values (OR = 0.70, 95%CI = 0.49 – 0.98) are associated with delirium.

A high risk of perioperative complications according to GNRI was found in one patient (1.31%) while 4 patients had a medium risk (5.26%), and 10 patients had a low risk (13.16%). Using the χ^2 test for independent samples, no significant correlation between preoperative estimated GNRI and postoperative surgical complications was found. In the case of nonsurgical complications, significance was found in the group of patients who did not have GNRI risk (GNRI>98), and there were 61 such patients (80.26%). These patients had significantly fewer complications which imply comorbidity exacerbation (χ^2 (df) = 8.85(3), p = 0.03) as well as delirium (χ^2 (df) = 14.03(3), p = 0.00), which is shown in Table 2. In the case of other nonsurgical complications, GNRI did not show a significant connection

DISCUSSION

According to BMI, malnutrition has been detected only in one patient (1.39%), while 32 patients were overweight (42.1%). In predicting the occurrence of surgical complications measured by the CD scale, statistical significance was obtained in the group of overweight patients, since they had a greater probability of deviation from the normal postoperative course. Out of 40.78% of patients who developed complications of CD class I, 18.42% of them were overweight and 3.95% were obese. In the study of Bjorn et al. 33.9% of obese and 28.7% of overweight patients who had rectal cancer surgery had postoperative surgical complications, but this study included geriatric and non-geriatric patients (16). In our study, hypoalbuminemia (<3.5 g/

dL) was detected in 9.21% of patients, which is significantly less than in the Akirov et al. study and Vincent et al. meta-analysis where it had been detected in 29% and 21% of cases (17,18). These studies also included non-oncological patients, with the fact that it was stated that hypoalbuminemia was in most cases noted in old and oncological patients. Our study has shown that patients with preoperative normal serum albumin levels had significantly less comorbidity exacerbation ($p = 0.01$), delirium ($p = 0.03$) and more often did not develop any postoperative complication ($p = 0.01$) in comparison with those with hypoalbuminemia. According to MNA-SF, the percentage of malnourished patients was 9.3%, and the patients at risk of malnutrition 29.8%. Similar results have been published in Soysal's et al. study, with 6.8% of malnourished patients, and 33% at risk of malnutrition (19). Lilamand's et al. study (20) as well as the aforementioned study showed that MNA-SF is an effective and valid screening tool for the detection of malnutrition in old people. The analysis of our data did not show the correlation between nutritional status assessed by MNA-SF and postoperative complications, but MNA-SF had successfully identified the malnourished patients, at a higher rate than other methods. The patients who had not developed postoperative complications in our study were identified as having a normal nutritional status by using MNA-SF. Zhao et al. have published that MNA-SF successfully predicted postoperative delirium, the same as in our study (21). The results of binomial logistic regression analysis identified MNA-SF as an important predictor of delirium, which implied that those with lower scores on MNA-SF will be more prone to developing delirium. Kushiyama's et al. study (22) examined the correlation between preoperative GNRI and postoperative complications in geriatric patients who underwent total gastrostomy as a treatment for gastric cancer. They concluded that the low result of GNRI was an independent predictor of postoperative complications. Our study did not match these results, mostly because only one patient was in a high-risk group, and had low GNRI. The previous study also showed that the patients with normal GNRI did not develop postoperative delirium, which correlates with our results where patients with normal GNRI values had developed significantly less delirium ($p= 0.00$). Our study has some limitations. A relatively small sample of patients that were included in the study would be the first, followed by the fact that it was carried out in only one health facility.

None of the nutritional assessment tools used in our study were better or more efficient than the others in our sample of patients. The patients that are overweight according to BMI had a higher probability of developing surgical complications of class I and II of the CD scale. The preoperative serum albumin level >35 g/l was the most important predictor of not developing any postoperative complications. Research suggests that mortality is higher in the patients with high, moderate, and low risk of malnutrition according to GNRI, in comparison to the patients without these risks (19). Our study failed to show that low GNRI values (GNRI<82) tend to heighten the risk of developing surgical and nonsurgical postoperative complications, but it managed to show that the patients with GNRI >98 had significantly less nonsurgical complications, as well as comorbidity exacerbation and delirium. This indicates that precise nutritional status assessment is complex and that we cannot use only one scoring system or scale to get accurate results, especially in specific groups of patients such as geriatric patients with cancer. Only routine preoperative assessments of nutritional status, utilizing various evaluation tools, can enable us to identify patients at nutritional risk. Consequently, we can provide treatment to enhance their preoperative nutritional status, thus potentially leading to improved outcomes. This study aimed to emphasize preoperative nutritional assessment, which is highly available and minimally time-consuming, and it can be added to standard preoperative evaluation and preparation. Using these methods, we could identify high-risk groups of patients and improve their nutritional status before they undergo surgery.

Declaration of Interests

The authors declare no conflicts of interest.

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