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FREQUENCY OF MALNUTRITION IN PATIENTS WITH INTRAORAL CARCINOMA

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Malnutrition, or insufficient or poor nutrition, represents a lack of basic nutrients in a human organism. Being incapable of sufficient intake of nutrients, patients with intraoral carcinomas (ICs) are often affected by malnutrition. One of the most frequently used measures of nutritional status is the body mass index (BMI), an anthropometric parameter. When biochemical parameters are concerned, the level of serum albumin (SA) is the one most commonly employed.

The aim of this study was to analyze the nutritional status of patients with IC by measuring the pre-post-treatment values of BMI and SA and to establish the prevalence of malnutrition in these patients.

In the period from 2015 to 2016, we analyzed the patients with the diagnosis of IC treated at the Department of Maxillofacial Surgery, Clinic of Dental Medicine in Niš. The study sample included 20 patients.

The results of our study support the notion that malnutrition in IC patients should be taken into consideration as one of the key factors of treatment success and complete rehabilitation of IC patients. A multidisciplinary approach and use of nutritional support therapy to correct malnutrition have to become an integral part of everyday practice of all clinics dealing with this pathology.

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Key words: *malnutrition, intraoral carcinoma, body mass index, serum albumin*

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Introduction

Malnutrition, or insufficient or poor nutrition, represents a lack of basic nutrients in a human organism. Being incapable of sufficient intake of nutrients, the patients with intraoral carcinomas (ICs) are often affected by malnutrition. One of the elemental tasks of therapists is to recognize malnutrition and to prevent or correct the condition. Malnutrition, by itself, leads to energy and protein deficiencies and aggravates the process of healing and recovery.

Nearly half of patients with IC have a form of malnutrition at the moment of diagnosis, caused by alcohol consumption or dysphagia caused by the neoplastic process itself (1). In addition to the neoplastic process, surgical intervention and postoperative chemoradiation, as the principal treatment algorithm, lead to malnutrition, followed by weight loss and decreased serum albumin level (2). Therefore, in order to prevent post-treatment complications, malnutrition should be taken into account as one of the essential indices. Several studies have examined the impact of pretreatment nutrition status on post-treatment complication rates (3). A large group of available parameters of nutritional status and diversity of grading surgical complications further complicate the understanding of the association between malnutrition and complications in IC patients (1).

One of the most frequently used measures of nutritional status is the body mass index (BMI), an anthropometric parameter. When biochemical parameters are concerned, the level of serum albumin (SA) is the one most commonly employed.

The aim of this study was to analyze the nutritional status of patients with IC by measuring the values of pre-treatment and post-treatment BMI and SA values and establishing the prevalence of malnutrition in these patients.

Material and Methods

In the period of 2 years, we analyzed the patients with the diagnosis of IC treated at the Department of Maxillofacial Surgery, Clinic of Dental Medicine in Niš. The size of the studied

sample was 20 patients. In accordance with the algorithm of the European Association for Cranio Maxillofacial Surgery (EACMFS) for patients with IC, all the studied cases were first treated surgically, followed by adjuvant radiation or chemoradiation therapy. Similar to the paper by Shruti P. et al. (4), the inclusion and exclusion criteria were defined in our study as follows:

Inclusion criteria:

- patients aged above 18 years treated for IC with a histopathological diagnosis of squamous cell carcinoma

Exclusion criteria:

- Patients with distant metastases and T4 disease stage
- Patients who underwent biopsy only, without any surgical treatment
- Patients with oropharyngeal carcinoma
- Patients who did not complete their treatment.

The following information was collected: patient gender, age, localization/site and TNM classification of the disease, height (h) and body mass (bm) of the patients, and serum albumin pre-treatment and post-treatment values.

Based on body mass and height measures, BMI was calculated according to the formula: BMI = kg/m^2, weight in kilograms/height in meters squared, both before and after completion of their treatment.

Some data were presented as frequencies and percentages, while other data were presented as means within intervals.

The average time from the moment of therapy initiation (surgery) to treatment completion (radiation or chemoradiation therapy) was around 4 months.

All the data were collected and presented as tables using MS Office Excell (Microsoft Corp., Redmond, WA, USA), and descriptive statistical analyses were performed using the statistical software package SPSS, version 20.0 (SPSS, Inc., Chicago, IL, USA).

T-test was used to compare the values of BMI and SA before and after treatment; the value of $p < 0.005$ was considered statistically significant. The following information was collected: patient gender, age, localization/site and TNM classification of the disease, height (h) and body mass (bm) of the patients, and serum albumin pre-treatment and post-treatment values.

Based on body mass and height measures, BMI was calculated according to the formula: BMI = kg/m^2, weight in kilograms/height in meters squared, both before and after completion of their treatment.

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T-test was used to compare the values of BMI and SA before and after treatment; the value of $p < 0.005$ was considered statistically significant.

Results

According to the definition by the World Health Organization (WHO), the values of BMI < 20 and SA < 45 g/l were taken to identify the patients with malnutrition.

Basic patient characteristics are shown in Table 1. The patient age range was 32–85 years, 59.4 years on the average. Pre-treatment mean BMI value was 24.25 kg/m^2 (17.44–32.79 kg/m^2) while the corresponding value for SA was 41.85 g/l (31.4–46 g/l). Post-treatment mean BMI value was 21.4 kg/m^2 (16.75–28.38 kg/m^2), while the corresponding value for SA was 39.9 g/l (33.8–49.5 g/l).

As for the nutritional status, 5 patients (25%) were malnourished according to their pre-treatment BMI and SA values; 6 patients (33.3%) were normally nourished; and 9 patients (42%) were obese. According to their post-treatment BMI and SA values, there were 9 patients (45%) with malnutrition; 7 patients (14.5%) were normally nourished; and 4 patients (20%) were obese.

The most common tumor localization was tongue (11 cases; 55%), followed by mouth floor disease (3 cases; 15%). In 4 patients (25%) both localizations were involved.

As for the gender distribution, there was a male-to-female predominance of 15 vs. 5 cases (75% vs. 25%).

According to the TNM classification, most patients had T2 N1 M0 disease—9 patients (45%), while 6 patients had T2 N0 M0 disease (30%).

Post-operative complications were present in all malnourished patients, while among the normally nourished there was 1 such patient (17%), and among the obese, there were 5 patients (58%) with such complications.

During the following time, the values of the BMI were statistically changed between the two measurements ($p < 0001$). The values of SA were not statistically changed between the two measurements $p = 0.193$) (Table 2, Figure 1).

The results of our study confirm that BMI values were statistically reduced in both male ($p = 0.010$) and female patients ($p = 0.026$) in the two measurements. Also, we found that the values of SA were not statistically changed in male patients ($p = 0.639$), but in female patients the SA values were statistically changed in the two measurements ($p = 0.016$) (Table 3, Figure 2).

Table 1. "General characteristics"

Characteristics	Number	%
Age †	59.40 ± 17.11	32–85
Gender		
Male	15	75.0
Female	5	25.0
Localization		
Tongue	11	55.0
Floor of the mouth	3	15.0
Both localization	4	20.0
Classification		
T2	15	75.0
T3	5	25.0
N0	10	50.0
N1	10	50.0
M0	20	100.0

Table 2. BMI and SA values for the two measurements

	First measurement	Second measurement	p[1]
BMI	24.25 ± 4.62	21.40 ± 3.50	0.001
	17.44–32.79	15.19–28.38	
SA	41.85 ± 4.07	39.90 ± 3.92	0.193
	31.40–47.40	33.20–49.50	

[1] T-test: arithmetic mean ± standard deviation

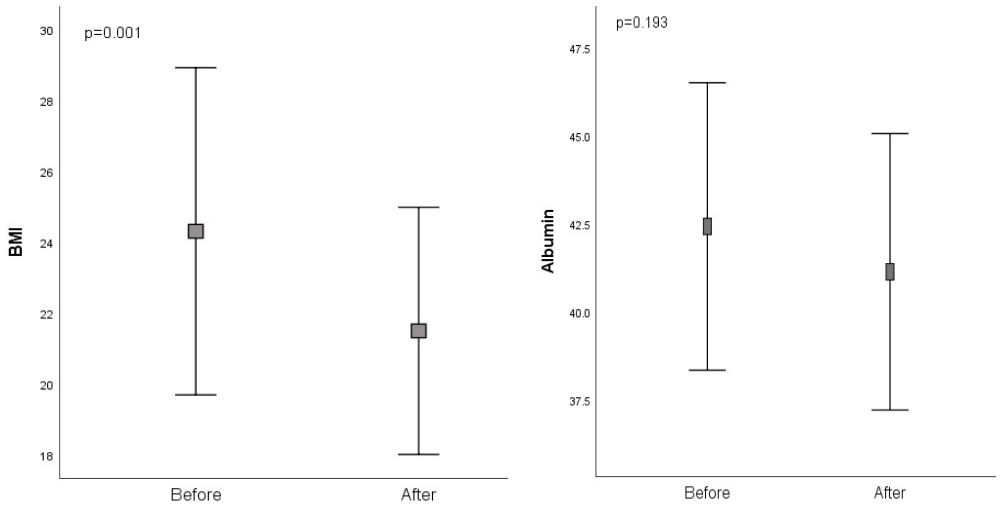

Figure 1. BMI and SA values for the two measurements

Table 3. BMI and SA values for the two measurements concerning gender

		First measurement	Second measurement	p[1]
BMI	Male	23.32 ± 4.39	20.90 ± 3.59	0.010
	Female	27.28 ± 4.37	23.30 ± 2.70	0.026
SA	Male	41.90 ± 4.56	41.33 ± 4.49	0.639
	Female	43.99 ± 1.41	40.58 ± 1.32	0.016

[1] T-test: arithmetic mean ± standard deviation

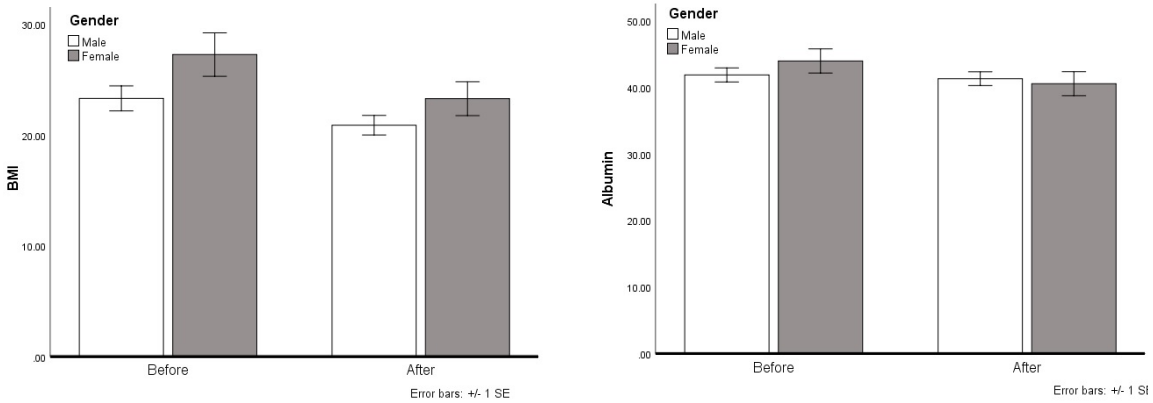

Figure 2. BMI and SA values for two the measurements concerning gender

Discussion

In patients with IC, malnutrition most frequently occurs as the consequence of tumor localization, leading to dysphagia, psychic stress and metabolic changes due to tumor presence and post-treatment complications, as confirmed by the results of a number of studies (1, 5). In the study by Rathod et al., dysphagia has been noted as one of the most common symptoms in patients with IC (6). In the study by Kubrak et al., dysphagia was also identified as the most common cause of malnutrition (7).

Different parameters can be used to define and monitor malnutrition, while in our study BMI was used as an anthropometric and SA as a biochemical parameter. The prevalence of malnutrition was 25% before treatment, and 45% after treatment, which agreed with other studies' results (4). Since there are several methods to establish the nutritional status, there is an unresolved question of their standardization. Nearly all studies agree that in malnourished patients with lower BMI and SA values post-operative complications and longer hospitalization are more common than in normally nourished patients (4, 8). Overall, few studies have investigated the association of malnutrition with post-treatment complications. One of the studies conducted in the Netherlands confirmed that surgically treated patients with a BMI value loss in excess of 10% had a higher probability of complications (4). On the other hand, Matthews et al. could not confirm the association of malnutrition with post-treatment complications and disease stage (9).

The results of our t-test demonstrated a statistically significant difference in p-value between BMI in pre- and post-treatment result groups, but the results of SA demonstrated no statistically significant difference. The values of these parameters in the group of malnourished patients indicated the need for nutritional support prophylactic interventions. Nutritional support therapy is one of the options to remedy malnutrition. Revasco et al. confirmed that malnutrition with body mass loss was more prevalent in the group of patients without supplemental nutritional therapy than in the group receiving such therapy (10). Furthermore, other studies emphasized a positive effect of nutritional support therapy on malnutrition, stressing that such an intervention should be introduced as early as possible (1, 11).

In addition to SA, a systemic inflammation marker, neutrophil/lymphocyte ratio (NLR), is also a haematological parameter associated with malnutrition; it can be a significant indicator of the possibility of occurrence of post-treatment complications in patients with IC (12). Several studies have confirmed the role of NLR as a marker of complications in patients with colorectal carcinoma, cholangiosarcoma and pancreatic carcinoma (13). In the study of Tsai et al. it was shown that this factor had significantly higher values in patients with malnutrition and was not associated with incidence of postoperative complications. In our study, we did not examine NLR values.

In the study by Bao et al. (14), two more nutritional parameters were evaluated: prognostic nutritional index (PNI = albumin + 0.005 x lymphocyte) and nutritional risk index (NRI= 1.519 x albumin + 41.7 x present/ideal body weight). They found that NRI was superior to BMI or SA or PNI. We did not analyse NRI and PNI.

In the study by Peters et al., the factors of age and disease stage have been analyzed. These factors were demonstrated to be significant markers of post-treatment complications (15). The results of our study agree with these findings. On the other hand, Boruk et al. could not demonstrate the association between patient age and post-treatment complications (16). In the study of Linn et al., the association between nutritional status and patient age was analyzed in malnourished and normally nourished patients; it was shown that malnourished and older patients had more complications and greater morbidity than other patients (1). In a large study of 61,740 older IC patients by Genther et al., it was shown that mortality and complications were not associated with more advanced age, but with comorbidities and malnutrition instead (17).

The same findings have been confirmed in some other studies (1). Resulting from the findings of these studies and our own study, preoperative nutritional screening and supportive nutritional therapy represent an essential part of the treatment plan for patients with ICs.

It is necessary to know the nature (type and stage) of the patient's malignancy, the treatment plan (surgical, chemo or radiotherapy), and the expected duration of the disturbance of normal food intake, before starting the nutritional treatment to ensure optimal therapeutic results with minimal morbidity and maximum cost-effectiveness.

The study by Ravasco evaluated nutritional status in cancer patients and found that different cancer types display different nutritional patterns. In clinical practice, oral nutrition is always the first choice. The nutritional plan for every patient should be individualised, and adapted to individual needs (18). Patients with ICs usually have problems with food intake because of tumor localization, and after surgery, they have a nasogastric tube like a normal part of postoperative recovery. In that way, nutritional intake is possible.

The main shortcomings of our study are a relatively small sample (20 patients), a short period of time and the single-centre nature of the study. Furthermore, the study did not involve the patients on supportive nutritional therapy, mentioned in a variety of studies as an effective approach in the prevention and therapy of malnutrition (1, 10, 11), which should be the topic in some of our future studies.

Conclusion

The results of our study support the notion that malnutrition in IC patients should be taken into consideration as one of the key factors of treatment success and complete rehabilitation of IC patients. The obtained results are important for everyday clinical work. A multidisciplinary approach and use of nutritional support therapy to correct malnutrition have to become an integral part of the everyday practice of all clinics dealing with this pathology.

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UČESTALOST MALNUTRICIJE KOD BOLESNIKA SA INTRAORALNIM KARCINOMOM

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Malnutricija ili pothranjenost predstavlja manjak osnovnih hranljivih sastojaka u ljudskom organizmu. Usled nemogućnosti dovoljnog nutritivnog unosa, javlja se kod bolesnika sa intraoralnim karcinomima (IK). Jedan od najčešće korišćenih nutritivnih parametara jeste indeks telesne mase (engl. *body mass index* – BMI), koji spada u antrotopometrijske parametre. Nivo serumskog albumina (SA) najčešće je korišćeni biohemijski parametar.

Cilj ove studije bio je da se analizira nutritivni status bolesnika sa intraoralnim karcinomom, i to merenjem vrednosti pre tretmana i posle tretmana. Analizirani su bolesnici sa dijagnozom intraoralnim karcinomom lečeni na Odeljenju maksilofacijalne hirurgije Klinike za dentalnu medicinu u Nišu u periodu od 2015. do 2016. godine. Istraživanje je obuhvatilo 20 bolesnika.

Rezultati našeg istraživanja govore u prilog tome da se malnutricija kod bolesnika sa IK-om treba razmotriti kao jedan od bitnih faktora uspešnosti tretmana i potpune rehabilitacije bolesnika. Multidisciplinarni pristup i upotreba nutritivne suportivne terapije sa ciljem korekcije malnutricije moraju postati deo svakodnevne prakse svih klinika koje se bave ovom patologijom.

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***Ključne reči**: malnutricija, intraoralni karcinom, indeks telesne mase, serumski albumin*