Nutritional Status and Quality of Life in Patients with Oral Squamous Cell Carcinoma Before and After Surgical Oncological Treatment: A Single-Center Retrospective Study

Background: Oral squamous cell carcinoma (OSCC) is the most common of head and neck malignancies in well-developed countries. In most cases, patients with OSCC experience a degree of nutritional status disturbances and decreased quality of life (QoL). This study aimed to compare nutritional status and QoL in 51 patients before and after surgery for OSCC.

Material/Methods: Fifty-one eligible patients with OSCC were followed during a 3-year period (2019-2022). For all patients, we determined body mass index (BMI), serum albumin (ALB), prognostic nutritional index, and nutritional risk index before and after treatment. Also, all patients completed a standardized QoL questionnaire before and after treatment. The obtained data were compared between the groups by using the t test and multivariate Cox regression.

Results: The values of BMI and NRI were statistically significantly different between the preoperative and postoperative measurements (24.1 kg/m$^2$ vs 21.1 kg/m$^2$, and 103 vs 100.1, respectively, $P=0.001$), while values of ALB and prognostic nutritional index did not differ significantly (41.35 g/L vs 39.1 g/L, and 48.5 vs 46.2, respectively). Dysphagia ($P=0.03$) and chewing problems ($P=0.04$) were found to be the 2 most important factors decreasing the QoL of patients.

Conclusions: Based on our results, BMI and NRI were the most sensitive parameters of nutritional status. Dysphagia and chewing problems were the 2 most important factors affecting the QoL in patients with OSCC.

Keywords: Squamous Cell Carcinoma of Head and Neck • Body Mass Index • Serum Albumin • Nutritional Status • Quality of Life

Full-text PDF: https://www.medscimonit.com/abstract/index/idArt/943844
Introduction

Oral squamous cell carcinoma (OSCC) has the highest incidence of head and neck malignancies, which has been consistently increasing in prevalence, particularly in well-developed countries [1,2]. According to the available data, OSCC makes up more than 90% of oropharyngeal cancers [3]. OSCC has an unpredictable prognosis, with reported 5-year survival rates of approximately 50% [1]. There are 2 types of OSCC: the first type is caused by human papillomavirus infection, while the second is mainly due to tobacco smoking and alcohol use. The diagnosis of OSCC is made based on biopsy results of the affected tissue. Treatment involves surgery, radiotherapy, chemotherapy, or a combination of these therapies [3].

In most cases, patients with OSCC already on their first clinical presentation experience a degree of nutritional status disturbances and weight loss [4]. These are determined by the anatomical location and extent of the tumor process, with impaired functions of swallowing and chewing. Therefore, almost half of patients with OSCC have a degree of malnutrition at the time of first examination [5]. Some studies have confirmed a direct association between malnutrition and survival rates [6]. In general, the tumor process and surgical and oncological therapy, as standard treatments of OSCC, contribute to malnutrition, with body mass and albumin losses [7], which leads to nutritional status impairment, weakened immunity, and increased incidence of post-treatment complications.

Patients with OSCC, as already known, have a decreased quality of life (QoL) at the time of presentation, above all in the sense of impaired swallowing, speech, chewing, and presence of pain. Additional surgical oncological treatment leads to further aggravation of these QoL parameters.

The patients affected with oral carcinoma represent an especially vulnerable population because the presence of the tumor usually leads to difficulties in eating, both before and after surgical and oncological treatment. Consequently, the risk of malnutrition is increased, which represents an additional risk factor for the successful recovery by causing susceptibility to infections and complications during treatment [8]. The problem of malnutrition in patients with cancer is not sufficiently addressed in clinical facilities, and the metabolic changes that occur because of malnourishment are not often properly treated. The reduced food intake leads to the loss of weight and muscle mass and the activation of a catabolic metabolic state, which together increase the risk of postoperative complications and prolonged recovery time [9]. However, the patients’ personal traits, diminished QoL, psychological state, and fear for the future should also be considered, as they significantly influence the recovery process [10].

Earlier studies have confirmed that the most frequently used parameters of nutritional status assessment in cancer patients are body mass index (BMI) and serum albumin (ALB), including patients with OSCC, rectal cancer, and others [11,12]. In more recent studies, the following 2 new parameters, the prognostic nutritional index (PNI) and nutritional risk index (NRI), have been proposed [1]. The PNI combines ALB with lymphocyte counts, while the NRI combines body mass, height, and ALB.

This questionnaire-based retrospective study from a single center aimed to compare nutritional status and QoL in 51 patients before and after surgery for OSCC.

Material and Methods

This study was approved by the Ethics Committee of the Clinic for Dental Medicine (number 146/5-2 EO, 14/12-2019-2 EO). All patients included in the study signed the informed consent. The study lasted for 3 years, from 2019 to 2022, during which we evaluated 51 eligible patients with OSCC at the Department of Maxillofacial Surgery, Clinic for Dental Medicine, Niš, Serbia.

Inclusion and Exclusion Criteria

We examined the nutritional status and QoL of 51 eligible patients with OSCC and subsequently treated surgically and with adjuvant radiation or chemoradiation therapy, as established by the European Association for Cranio-Maxillofacial Surgery algorithm for patients with OSCC. The inclusion and exclusion criteria were in accordance with the study by Pingili et al [13]. We included patients who were older than 18 years, diagnosed with OSCC (confirmed by histopathology), and underwent surgical and oncological treatment. Exclusion criteria were patients with distant metastases and T4 stage of disease, patients with biopsy only (without surgical therapy), patients with oropharyngeal carcinoma, patients who failed to complete the treatment, and those with complex surgical reconstructions.

Nutritional Status and QoL Parameters

The following patient information was collected: sex, age, height, weight, tumor anatomical site, tumor-node-metastasis (TNM) classification of the tumor, ALB, and lymphocyte count (pre- and post-treatment values). All patients were asked to complete a QoL questionnaire before and after treatment (European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, Core Module [QLQ-C30] and Head and Neck Module [QLQ-H&N35]) [10]. The mean time from surgery to treatment completion (radiation or chemoradiation) was no longer than 4 months. The serological parameters were obtained at the Center for Medical and Clinical Biochemistry of the University Clinical Center in Niš, Serbia.
Before and after treatment completion, BMI, PNI, and NRI were calculated as follows:

\[ \text{BMI} = \frac{\text{weight in kg}}{\text{height in m}^2} \]

\[ \text{PNI} = \text{albumin (g/L)} + 0.005 \times \text{lymphocytes (count/µL)} \]

\[ \text{NRI} = (1.519 \times \text{albumin, g/L}) + (41.7 \times \text{present/ideal body mass}) \] [1].

**Statistical Analysis**

The results are presented as frequencies and percentages or as means within intervals. The data were collected and presented in the form of tables (MS Office Excel, Microsoft Corp, Redmond, WA, USA). Descriptive statistical analyses were done using the software package SPSS, v. 20.0 (IBM Corp, Armonk, NY, USA).

BMI, ALB, PNI, NRI, and QLQ pre- and post-treatment values were compared using the \( t \) test, and \( P<0.05 \) indicated statistical significance. For all nutritional indexes, multivariate Cox regression was used to examine potential collinearity.

**Results**

**Demographic and Clinical Characteristics**

The study enrolled 51 patients over 3 years. Patient ages ranged from 23 to 85 years (average 54), with 35 men and 16 women (2.19: 1 male-to-female ratio).

The tongue was the most affected site by cancer (26 cases, 51%), followed by the mouth floor (7 cases, 15%). Both anatomical sites were simultaneously involved in 13 cases (26%). According to TNM classification, 23 patients (45%) had T2N1M0 disease, while 15 patients (30%) had T2N0M0 disease. Basic demographic and clinical patient characteristics are presented in Table 1.

**Nutritional Status Parameters**

The pretreatment mean value of BMI was 24.1 kg/m\(^2\) (16.65-31.65 kg/m\(^2\)) and ALB was 41.35 g/L (30.5-46.4 g/L). The post-treatment mean value of BMI was 21.1 kg/m\(^2\) (14.30-27.48 kg/m\(^2\)), and ALB was 39.1 g/L (32.2-49.3 g/L). PNI and NRI pretreatment values were 48.5 (40.5-57.5) and 103 (90.9-116), while their post-treatment values were 46.2 and 100.1, respectively.

Following the WHO definition, BMI <20, ALB <40g/L, PNI <49.3, and NRI <97.5 were used to identify patients with malnourishment. Regarding nutritional status, 13 patients (25.5%) were malnourished according to their pretreatment BMI, while 17 patients (33.3%) were normally nourished, and 21 patients (42%) had obesity. According to their post-treatment BMI, 23 patients (45%) were malnourished, 8 patients (14.5%) were normally nourished, and 10 patients (20%) had obesity.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>54.40±17.11</td>
<td>23-85</td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>68.62</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>31.37</td>
</tr>
<tr>
<td>Tumor site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tongue</td>
<td>26</td>
<td>51.0</td>
</tr>
<tr>
<td>Mouth floor</td>
<td>7</td>
<td>15.0</td>
</tr>
<tr>
<td>Both localizations</td>
<td>13</td>
<td>26.0</td>
</tr>
<tr>
<td>TNM classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>38</td>
<td>75.0</td>
</tr>
<tr>
<td>T3</td>
<td>13</td>
<td>25.0</td>
</tr>
<tr>
<td>N0</td>
<td>26</td>
<td>50.0</td>
</tr>
<tr>
<td>N1</td>
<td>26</td>
<td>50.0</td>
</tr>
</tbody>
</table>
| M0             | 51     | 100.0

Table 1. Basic demographic and clinical characteristics of patients.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pretreatment</th>
<th>Post-treatment</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>24.10</td>
<td>21.1</td>
<td>0.001*</td>
</tr>
<tr>
<td>ALB</td>
<td>41.35</td>
<td>39.1</td>
<td>0.185</td>
</tr>
<tr>
<td>PNI</td>
<td>48.5</td>
<td>46.2</td>
<td>0.265</td>
</tr>
<tr>
<td>NRI</td>
<td>90.9-116</td>
<td>87.5-112</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

Table 2. Pre- and post-treatment body mass index (BMI), serum albumin (ALB), prognostic nutritional index (PNI), and nutritional risk index (NRI) values.

\( P<0.05 \) indicates a statistically significant difference between the 2 measurements.

In the studied period, the values of BMI and NRI statistically significantly changed from before to after treatment \( (P<0.05) \). The values of albumin and PNI did not change statistically significantly between the 2 measurements (Table 2).

From before to after treatment, BMI and NRI values significantly decreased in male and female patients. It was also found that albumin and PNI values did not differ significantly between the 2 measurements.
Table 3. Cox multivariate regression analysis between the examined parameters.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Measurement values (r)</th>
<th>Interconnection</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALB and PNI</td>
<td>0.77</td>
<td>Strong</td>
</tr>
<tr>
<td>ALB and NRI</td>
<td>0.7</td>
<td>Strong</td>
</tr>
<tr>
<td>NRI and BMI</td>
<td>0.73</td>
<td>Weak</td>
</tr>
<tr>
<td>NRI and PNI</td>
<td>0.62</td>
<td>Weak</td>
</tr>
<tr>
<td>ALB and BMI</td>
<td>0.15</td>
<td>Weak</td>
</tr>
<tr>
<td>PNI and BMI</td>
<td>0.2</td>
<td>Weak</td>
</tr>
</tbody>
</table>

BMI – body mass index; ALB – serum albumin; PNI – prognostic nutritional index; NRI – nutritional risk index.

Table 4. Frequency of pretreatment and post-treatment quality of life parameters.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Pretreatment</th>
<th>Post-treatment</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysphagia</td>
<td>82</td>
<td>100</td>
<td>0.03*</td>
</tr>
<tr>
<td>Pain</td>
<td>75</td>
<td>66</td>
<td>0.11</td>
</tr>
<tr>
<td>Chewing</td>
<td>39</td>
<td>67</td>
<td>0.04*</td>
</tr>
<tr>
<td>Social activity</td>
<td>70</td>
<td>97</td>
<td>0.35</td>
</tr>
<tr>
<td>Psychological status</td>
<td>65</td>
<td>66</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Cox multivariate regression demonstrated strong associations between PNI and ALB (r=0.77), NRI and ALB (r=0.70), NRI and BMI (r=0.73), and NRI and PMI (r=0.62). There were weak associations between ALB and BMI (r=0.15) and PNI and BMI (r=0.20) (Table 3).

QoL Parameters

The EORTC QLQ-C30 and H&N35 questionnaires were used to analyze dysphagia, pain, chewing, social activity, and psychological status. The frequency and P values of these parameters in the pretreatment and post-treatment groups are shown in Table 4.

Discussion

The results of our study showed that BMI and NRI values changed significantly from before to after treatment, while the statistical analysis showed no significant difference concerning ALB and PNI at the 2 time points. Dysphagia and chewing were the 2 most common symptoms decreasing QoL in postoperative patients.

Genetic determination and the role of biomarkers in patients with OSCC have been considered in numerous studies [14]. Based on biomarkers, we can recognize malnutrition and its prevalence. The prevalence of malnutrition was 25% before and 45% after treatment in our study, similar to in other studies [4]. In patients with OSCC, malnutrition commonly occurs, due to the tumor site that causes dysphagia, psychological stress, and metabolic changes due to tumor presence and post-treatment complications, as shown in other studies [5,15]. Dysphagia was reported to be one of the most common symptoms of OSCC, as well as the most common cause of malnutrition [16,17].

There is a broad spectrum of nutritional status parameters. However, the problem of their lack of standardization still exists, with some parameters being anthropological in nature (eg, BMI) and some biochemical (eg, ALB). In earlier studies, BMI and ALB have been the most frequently used; with time, PNI and NRI have gained importance, primarily due to their sensitivity in defining nutritional status and malnutrition [1]. We used all 4 parameters in our study (BMI, ALB, PNI, and NRI) to analyze the nutritional status of patients with OSCC. The results confirmed these parameters’ high sensitivity and precision and a significant change in our single-center study.

BMI is the most used parameter for clinical work and for the analysis of the nutritional status of patients with OSCC. Low BMI has been confirmed as a marker of poor prognosis in OSCC, corroborating its value as a nutritional parameter [18]. It was previously reported that surgically treated patients with a BMI loss of >10% had a greater probability of complications [13]. Values of BMI <18.5 kg/m² have been taken as a malnutrition cut-off. The results of our study confirmed, similar to that of other studies, that patients with malnutrition had a poorer prognosis than those with normal nutritional status [19,20].

Usually, patients with OSCC have difficulties chewing and swallowing at the first clinical examination due to tumor localization. Operative trauma leads to an additional reduced intake of nutrients, primarily proteins [4]. Consequently, ALB values are reduced, as confirmed by other studies, whose results are in accordance with our findings [21,22].

The role of immunity in patients with cancer is a much-studied issue. Lymphocytes recognize tumor cells and fight against them through migration, proliferation, and invasion [23,24]. PNI, the parameter that combines ALB with lymphocyte value, has been shown to be appropriate for the study of nutritional status in cancer patients with other involved anatomical sites [25,26]. The results of the present study confirmed PNI sensitivity as a parameter in the study of nutritional status in patients with OSCC and as an indicator of increased risk for poorer prognosis.
Nutritional status and QoL in patients with OSCC

Stojanović M.S. et al.
© Med Sci Monit, 2024; 30: e943844

CLINICAL RESEARCH

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
early and late complications in these patients (infection, flap loss or detachment, fistula, hematoma, and dehiscence) were in accordance with another relevant study [45]. Leung et al analyzed the correlation of nutritional parameters and post-treatment complications, and the results showed that a higher preoperative ALB level was associated with lower rates of postoperative complications and better wound healing. On the other hand, preoperative BMI, hemoglobin level, and absolute lymphocyte count did not have significant associations with postoperative outcome [46]. In the present study, we did not analyze the correlation between the nutritional parameters and post-treatment complications.

For these reasons, an individualized approach is necessary in the analysis of nutritional status and for establishing the need for supportive therapy. The work in this field must be team-based, requiring the involvement of surgeons, anesthesiologists, nutritionists, and psychologists.

In 2017, a team of surgeons, anesthesiologists, nutrition experts, and oncologists recommended enteral and parenteral support therapy in patients with head and neck malignancy [47]. The recommendations are part of the modified enhanced recovery after surgery (ERAS) protocol for head and neck surgery. The first protocols analyzing nutritional status and postoperative supportive therapy are taken from general surgery and have the aim of faster recovery [48]. From all the above, presurgical nutritional analyses and postsurgical nutritional supportive therapy became a standard treatment protocol for patients with OSCC.

One of the main goals is to avoid malnutrition in the preoperative period by adding essential nutrients. Patients with malnutrition need supportive therapy to correct nutritional status, based on adequate caloric intake and time duration. Making the plan for postoperative supportive therapy is very complex. The studies for early per os nutrition are conflicting and limited, showing no difference between early and late per os nutrition in regards to postoperative complications [49,50].

The data from the available literature indicates that the development of postoperative nutritional support therapy must be individualized and multidisciplinary, with the participation of surgeons, anesthesiologists, and dieticians. The generally accepted position is that postoperative nutritional support therapy in patients with head and neck malignancies, and primarily OSCC, involves enteral nutrition through a nasogastric tube. In some rare cases, in which nutritional support is planned for a longer period, the placement of a nutritional gastrostomy is recommended [51]. The use of parenteral nutrition is indicated only in cases in which enteral nutrition is not possible or is contraindicated.

**Limitations of the Study**

The present study had a relatively small sample size (51 patients), lasted for a relatively short time, and was conducted in a single center. In addition, we did not enroll patients in supportive nutritional therapy, which has been suggested in various studies as an effective tool for preventing and managing malnutrition [4]. We plan to do this in future studies because nutritional support, as shown previously, can improve QoL and reduce malnutrition incidence [52,53].

**Conclusions**

The results of our study demonstrated that the combination of BMI and NRI was the most sensitive parameter of nutritional status in postoperative patients with OSCC. Also, the most common symptoms affecting QoL were dysphagia and chewing problems, which in turn can further aggravate malnutrition in patients with OSCC. The results also showed the importance of nutrition in patients with OSCC, one of the essential factors of treatment success and complete rehabilitation of these patients.

Therefore, future studies need to focus on the standardization of analysis of nutritional status for patients with OSCC, identification of the most suitable analysis parameters, and use of a multidisciplinary approach to identify biochemical, surgical, oncological, and psychological complications that this type of cancer can cause. Also, it is important to establish the precise indications for inpatient and outpatient enteral supportive therapy to avoid possible pre- and post-treatment complications and to thoroughly analyze its importance in maintaining or improving the nutritional status of patients with OSCC.

**Department and Institution Where Work Was Performed**

Department of Maxillofacial Surgery, Clinic for Dental Medicine, Niš, Serbia.

**References:**


