



# Quality of Life of Patients with Oral Squamous Cell Carcinoma

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## Abstract

**Background:** Oral squamous cell carcinoma (OSCC) has numerous physical, psychosocial and financial implications, which significantly affect patients' quality of life. We aimed to determine the health-related quality of life (HRQoL) and identify quality of life (QoL) predictors in patients with OSCC.

**Methods:** We included 64 consecutive patients aged 40 to 80 yr treated for OSCC from Jan to Dec 2021. Health-related QoL was evaluated using the 30-item Cancer Quality of Life Questionnaire (QLQ-C30) and the 35-item Head and Neck Cancer-Quality of Life Questionnaire (QLQ-H&N35). The demographic questionnaire and clinical parameters were also presented.

**Results:** The functioning scale in the QLQ-C30 questionnaire with the lowest average score was Global health status. The mean QLQ-C30 summary score ( $80.92 \pm 10.4$ ) was higher than the Global health status score ( $50.5 \pm 22.2$ ). In the QLQ-H&N35 questionnaire, the symptoms with highest scores were weight loss, dry mouth, and social eating. Linear regression analysis demonstrated that Global health status score was associated with education level [ $\beta$ -coefficient = 19.33 (95% CI: 10.7-24.9,  $P=0.004$ ), alcohol consumption [ $\beta$ -coefficient=10.04 (95% CI: 4.5-14.8),  $P=0.023$ ] and invasive surgical procedure [ $\beta$ -coefficient=22.75 (95% CI: 15.0-30.5),  $P=0.002$ ]. The QLQ-C30 summary score was associated with living alone [ $\beta$ -coefficient= -20.05 (95% CI: -29.91-(-10.21),  $P=0.018$ ), smoking status [ $\beta$ -coefficient=4.35 (95% CI: 1.8-6.91),  $P=0.043$ ] and alcohol consumption [ $\beta$ -coefficient = 4.59 (95% CI: 1.99-7.19),  $P=0.037$ ].

**Conclusion:** We found several significant predictors of worse perception of HRQoL among patients with OSCC, which may be useful for specific prevention and treatment in order to achieve better QoL.

**Keywords:** Mouth neoplasms; Oral squamous cell carcinoma; Health-related quality of life; Questionnaires and surveys

## Introduction

Head and neck cancer represent the 6<sup>th</sup> most common malignancy worldwide, accounting for 6% of cancer incidence and 2% of cancer-related

deaths (1). Cancer of the oral cavity is one of the most common malignancies worldwide, especially in developing countries. The average annual inci-



dence rate for cancer of oral cavity is 1.2% among men and 0.5% among women with an increase in average annual death in both genders (2).

The oral squamous cell carcinoma (OSCC) is the most frequent neoplasms among all oral cancers (3). OSCC has many physical, psychosocial and financial implications, what makes significant impact on the quality of life of the patient. Quality of life parameters are considered as one of the most important in the diagnosis and post-treatment follow-up in oral cancer patients. The clinical manifestations of OSCC as well as the effects of treatment can cause social isolation, emotional and psychological distress. Patients may experience significant dysfunction in talking, mastication, sensory damage and chronic pain (4-7).

The most commonly used instruments to assess Health Related Quality of Life (HRQoL) of patients with head and neck cancer are the 30-item Cancer-Quality of Life Questionnaire (QLQ-C30) and 35-item Head and Neck Cancer-Quality of Life Questionnaire module (QLQ-H&N35), developed by the European Organization for Research and Treatment of Cancer (EORTC). The EORTC QLQ-C30 and the module QLQ-H&N35 instruments has been translated into many languages, including Serbian, and they are reliable and valid measure of the QoL of cancer patients in multicultural clinical research settings (8). Recently, EORTC Quality of Life Group has developed and recommended the QLQ-C30 summary score as superior instrument of assessment for overall HRQoL (9).

We aimed to determine the HRQoL of patients with OSCC and to identify important QoL predictors by analyzing a number of demographic and clinical factors.

## Materials and Methods

### *Study Design and Participants*

The descriptive cross-sectional study included 64 consecutive patients (mean age  $63.8 \pm 8.6$  yr, diagnosed with and treated for OSCC (C00-C06) at

the Clinic for Maxillofacial Surgery, School of Dental Medicine, University of Belgrade, Serbia. The study was assessed during the period from Jan to Dec 2021. Eligibility criteria of patients comprised: surgically treated and pathologically proven OSCC, treatment completed 6 months prior to being included in the present study and completion of the self-reported questionnaire. Patients with recurrent disease, mental and behavioral disorders and uncooperative patients were excluded from the study. Ten participants were removed from the initial sample ( $n=74$ ), 6 (8.1%) refused to participate and 4 (5.4%) because of uncompleted questionnaire.

The study was approved by the Ethical Committee of the School of Dental Medicine, University of Belgrade (No. 36/13) and conducted in accordance with the Declaration of Helsinki. All patients provided written information consent to participate in this study.

### *Instruments*

Patients' HRQoL was assessed individually using the valid and reliable questionnaires EORTC QLQ-C30 (version 3.0) and QLQ-H&N35 (10, 11). The Serbian version was provided by the EORTC group.

The EORTC QLQ-C30 contains 30 one-week time frame questions and includes a single General health/QoL scale scored on a seven-point Likert scale, five functional scales (physical, role, emotional, cognitive, and social), three symptom domains (fatigue, nausea/vomiting, pain) and six single items (dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties) scored on a four-point Likert scale (from 'not at all' to very much').

The QLQ-C30 summary score is calculated as the mean of the combined 13 QLQ-C30 scale and item scores (excluding Global QoL and financial impact), with a higher score indicating a better HRQoL (9). The summary score was only calculated when all of the required 13 scale and item scores were available.

The QLQ-H&N35, the head and neck cancer-specific module questionnaire consists of 35 questions about the symptoms and side effects of

the treatment. It includes seven scales (pain, swallowing, senses, speech, social eating, social contact, and sexuality) and 11 single items (problems with teeth, problems opening the mouth, dry mouth, sticky saliva, cough, feeling ill, pain killers use, nutritional supplements, feeding tube, weight loss and weight gain). Items 1-30 are scored on a four-point Likert scale while items 31-35 use a 'yes' and 'no' response format.

Scoring was done according to the EORTC scoring manual (12). During the scoring procedure, raw EORTC QLQ-C30 and QLQ-H&N35 scores were linearly transformed into 0-100 scales. In QLQ-C30 questionnaire, for Global health status and the five functioning scales, a high score corresponded to a high HRQoL. For a symptom scale/item a higher score implied maximum difficulty or symptom burden. In QLQ-H&N35 questionnaire for all scales that assess symptoms, higher scores corresponded to lower quality of life. The Cronbach's alpha coefficients of all scales for both questionnaires were  $\geq 0.70$ . Demographic questionnaire was used to collect information on sex, age, marital status, education level, employment status, place of living, living with and health-related habit (smoking and alcohol consumption). The participants filled out questionnaires by themselves. It took 25-40 min for each participant to answer the questionnaires. Clinical parameters were taken from hospital records. They included the following: tumor location, tumor stage according to the TNM classification, treatment and surgical procedure.

### *Statistical Analysis*

We used several different methods: descriptive summary statistics for the demographic and clinical characteristics and QLQ-C30 and QLQ-H&N35 scores; parametric (t-test, one-way analysis of variance (ANOVA)) and non-parametric statistic tests ( $\chi^2$  and Fisher exact test) for comparison analyses; non-parametric statistics (Mann-Whitney test); regressive multivariable analysis (linear regression) to identify the predictors of the Global health status score and a

QLQ-C30 summary score. We evaluated the adjusted associations of these two dependent variables in linear regression analysis with independent variables: demographic data (sex, age, marital status, education level, employment status, place of living, living with and health-related habits: smoking and alcohol consumption) and clinical data (tumor location, tumor stage, type of treatment and surgical procedure). A statistical significance was set at  $P < 0.05$ . Software package SPSS ver. 22 was used for the analyses (IBM Corp., Armonk, NY, USA).

## **Results**

Demographic and clinical parameters for the 64 patients with OSCC are presented in Table 1. The average score value of different scales for EORTC QLQ-C30 and QLQ-H&N35 are given in Table 2. The functioning scale with the lowest average score was Global health status, whereas the functioning scales with the highest scores were observed in the physical, social and cognitive domains. The symptom with the highest average score in the QLQ-C30 questionnaire was financial difficulties, followed by appetite loss and fatigue. The mean QLQ-C30 summary score was  $80.92 \pm 10.4$ . In the QLQ-H&N35 questionnaire, the symptoms with highest scores were weight loss, dry mouth, and social eating (Table 2).

The impact of demographic and clinical characteristics of Global health status score and EORTC QLQ-C30 summary score are presented in Table 3. The Global health status score was lowest in unemployed, patients from rural area, with tumor localized on palate and after total maxillectomy ( $P=0.046$ ,  $P=0.036$ ,  $P<0.001$ ,  $P<0.001$ , respectively). The highest value for EORTC QLQ-C30 summary score had patients married, live with family or partner and with tumor stage I ( $P<0.001$ ,  $P<0.001$ ,  $P=0.006$ , respectively).

**Table 1:** Demographic and clinical characteristics of patients with OSCC

<i>Characteristics</i>	<i>Patients (n = 64)</i>
Sex, n (%)	
Male	30 (46.9)
Female	34 (53.1)
Age (yr), median (min-max)	63.8 (40-80)
Marital status, n (%)	
Married/partner	50 (78.1)
Divorced	4 (6.3)
Widowed	10 (15.6)
Education level, n (%)	
No formal education	6 (9.4)
Primary school	18 (28.1)
Secondary school	32 (50.0)
University	8 (12.5)
Employment status, n (%)	
Employed	8 (12.5)
Unemployed	4 (6.3)
Retired	52 (81.2)
Place of living, n (%)	
Rural	32 (50.0)
Urban	32 (50.0)
Living with, n (%)	
Family/Partner	60 (93.8)
Alone	4 (6.2)
Smoking status, n (%)	
Smoker	20 (31.2)
Non smoker	20 (31.2)
Ex-smoker	24 (37.6)
Alcohol consumption, n (%)	
Yes	6 (9.4)
No	30 (46.9)
Periodically	18 (28.1)
Ex-alcoholic	10 (15.6)
Tumor location, n (%)	
Tongue	4 (6.3)
The palate	32 (50.0)
Procesus alveolaris	28 (43.7)
Tumor stage, n (%)	
Stage I	12 (18.8)
Stage II	26 (40.6)
Stage III	26 (40.6)
Treatment, n (%)	
Surgery only	38 (59.4)
Surgery + radiotherapy	26 (40.6)
Surgical procedure, n (%)	
Total maxillectomy	28 (43.8)
Subtotal maxillectomy	32 (50.0)
Subtotal resection of lower jaw	4 (6.2)

**Table 2:** Calculated scores of EORTC QLQ-C30 and QLQ-H&N35 of patients with OSSC

	<i>Variable</i>	<i>Mean (SD)</i>
EORTC QLQ-C30	Global health status/QoL	50.5 (22.2)
	Physical Functioning	83.9 (14.6)
	Role Functioning	71.3 (21.7)
	Emotional Functioning	61.5 (21.8)
	Cognitive Functioning	75.8 (25.8)
	Social Functioning	77.9 (22.1)
	Fatigue	24.6 (20.1)
	Nausea/vomiting	3.1 (8.9)
	Pain	17.2 (20.5)
	Dyspnea	5.2 (20.9)
	Insomnia	18.7 (25.3)
	Appetite loss	28.1 (33.0)
	Constipation	12.5 (18.4)
	Diarrhea	10.4 (15.7)
	Financial difficulties	39.6 (36.3)
	Pain	19.3 (2.0)
	Swallowing	26.8 (3.0)
	Senses Problems	22.9 (5.5)
	Speech Problems	25.7 (3.1)
	Social eating	38.8 (3.8)
Social contact	30.6 (3.2)	
Sexuality	30.2 (7.0)	
Teeth	20.8 (4.6)	
Opening mouth	28.1 (5.6)	
Dry mouth	45.8 (7.4)	
Sticky saliva	27.1 (5.5)	
EORTC QLQ-H&N35	Coughing	20.8 (4.7)
	Felt ill	0 (0)
	Pain killer	31.3 (8.3)
	Nutritional supplements	37.5 (8.7)
	Feeding tube	0 (0)
	Weight loss	62.5 (8.7)
	Weight gain	12.5 (5.9)

The average score value of different scales for QLQ-H&N35 according to sex and type of therapy (irradiated *vs* non-irradiated) are given in Table 4. Women felt more pronounced symptoms as social eating and social contact ( $P=0.009$ ,  $P=0.002$ , respectively). Irradiated patients had more pronounced symptoms such as problems

opening mouth, dry mouth and sticky saliva compare to non-irradiated patients ( $P=0.048$ ,  $P=0.032$ , respectively). Other demographic and clinical parameters did not show statistical significance regarding QLQ-H&N35 scale symptoms ( $P>0.05$ ) (data are not shown).

**Table 3:** The impact of demographic and clinical characteristics of Global health status score and EORTC QLQ-C30 summary score (n = 64)

<i>Variables</i>	<i>Global health status score</i>			<i>EORTC QLQ-C30 summary score</i>		
	Mean (SD)	F	P	Mean (SD)	F	P
Sex	48.3 (22.1)	0.5	0.460	80.0 (11.8)	2.0	0.159
Male	52.5 (22.0)			82.6 (8.8)		
Female						
Age	55.4 (23.4)	2.1	0.436	65.2 (22.4)	53.5	1.6
<60	46.6 (22.1)			(26.3)		
>60						
Marital status	50.0 (23.3)	2.3	0.115	84.3 (9.3)	10.5	<0.001
Married/partner	33.3 (0.0)			60.8 (7.6)		
Divorced	60.0 (14.1)			82.2 (8.4)		
Widowed						
Education level	38.9 (11.4)	2.6	0.062	78.0 (14.0)	1.4	0.240
No formal education	43.5 (15.0)			84.7 (5.4)		
Primary school	53.1 (25.2)			78.9 (9.3)		
Secondary school	64.6 (20.3)			82.4 (17.5)		
University						
Employment status	66.7 (38.5)	3.2	0.046	73.5 (7.2)	1.5	0.232
Employed	35.4 (11.6)			78.4 (11.9)		
Unemployed	51.6 (22.0)			81.9 (10.2)		
Retired						
Place of living	56.3 (23.3)	4.6	0.036	79.9 (11.5)	0.6	0.441
Rural	44.8 (19.4)			81.9 (9.1)		
Urban						
Living with	51.9 (21.9)	4.2	0.444	82.1 (9.3)	14.2	<0.001
Family/Partner	29.2 (4.8)			63.7 (20.9)		
Alone						
Smoking status	58.4 (27.6)	2.1	0.138	76.8 (10.5)	3.3	0.054
Smoker	45.0 (19.6)			80.7 (12.6)		
Non smoker	48.6 (17.3)			84.5 (6.6)		
Ex-smoker						
Alcohol consumption		1.2	0.303		1.5	0.228
Yes	38.9 (11.4)			73.7 (13.2)		
No	52.8 (24.5)			80.5 (10.3)		
Periodically	54.6 (10.8)			83.7 (8.6)		
Ex-alcoholic	43.4 (31.1)			81.6 (10.9)		
Tumor location	70.8 (14.4)	12.3	<0.001	84.6 (0.5)	1.7	0.193
Tongue	39.1 (15.5)			78.6 (10.8)		
The palate	60.7 (22.5)			83.1 (10.1)		
Procesus alveolaris						
Tumor stage						
Stage I	59.7 (22.7)	1.8	0.177	84.9 (10.0)	5.5	0.006
Stage II	45.5 (25.1)			80.3 (8.1)		
Stage III	51.3 (17.3)			73.7 (11.9)		
Treatment	50.0 (22.3)	0.5	0.821	81.8 (9.1)	0.7	0.409
Surgery only	51.3 (22.1)			79.6 (12.0)		
Surgery + radiotherapy						
Surgical procedure		15.8	<0.001		2.1	0.128
Total maxillectomy	36.3 (13.1)			77.9 (11.5)		
Subtotal maxillectomy	60.4 (21.9)			83.0 (9.3)		
Subtotal resection of lower jaw	70.8 (14.4)			84.6 (0.5)		

**Table 4:** The average score value of QLQ-H&N35 according to age and treatment

EORTC H&N35 Scale/items	QLQ	Gender			Treatment		
		Male	Female	P	Irradiated	Non- irradiated	P
		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Pain in the mouth		25.4 (19.2)	28.5 (20.1)	0.142	22.0 (14.6)	20.2 (13.9)	0.127
Swallowing		23.1 (22.3)	24.7 (18.2)	0.537	16.7 (15.7)	6.0 (4.5)	0.014
Senses problems		17.4 (20.3)	17.2 (23.3)	0.739	47.7 (27.4)	21.3 (17.6)	0.006
Speech problems		24.5 (25.2)	26.1 (22.6)	0.325	34.1 (26.8)	31.8 (19.4)	0.348
Social eating		26.4 (21.8)	42.5 (27.2)	0.009	25.8 (23.8)	21.0 (18.5)	0.252
Social contact		28.2 (33.5)	46.3 (34.6)	0.002	18.9 (15.7)	12.7 (10.9)	0.583
Sexuality		34.6 (26.6)	29.3 (16.7)	0.537	16.6 (10.5)	11.7 (7.9)	0.515
Problems with teeth		25.6 (22.5)	34.8 (28.6)	0.137	19.9 (14.8)	21.4 (26.1)	0.247
Problems opening mouth		18.2 (20.6)	23.6 (31.3)	0.238	34.8 (25.7)	19.4 (17.4)	0.048
Dry mouth and sticky saliva		25.7 (27.2)	28.8 (26.9)	0.514	33.4 (26.6)	17.7 (10.3)	0.032
Coughing		17.4 (15.5)	18.0 (10.6)	0.653	13.7 (7.8)	8.3 (10.8)	0.572
Felt ill		28.5 (27.0)	27.3 (25.9)	0.782	26.8 (19.6)	18.3 (15.1)	0.221
Nutritional supple- ments		1.8 (2.4)	7.3 (8.3)	0.135	8.9 (6.4)	10.9 (9.3)	0.419
Feeding tube		8.2 (10.6)	12.4 (10.6)	0.428	19.3 (17.3)	14.6 (12.4)	0.302
Weight loss		26.5 (23.9)	19.7 (20.7)	0.253	36.3 (26.9)	24.3 (23.6)	0.085
Weight gain		25.6 (24.2)	20.6 (20.9)	0.318	27.3 (21.6)	25.2 (20.7)	0.238

Table 5 shows the results of linear regressions of the possible demographic and clinical predictors of quality of life as represented by Global health status and QLQ-C30 summary score. Linear regressions model for demographic predictors were statistically significant for Global health status ( $F=3.058$ ;  $P=0.015$ ) and QLQ-C30 summary score ( $F=2.437$ ;  $P=0.041$ ). Linear regression for Global health status for clinical predictors was statistically significant ( $F=4.146$ ;  $P=0.010$ ). The linear regression of the possible clinical predictors of QLQ-C30 summary score was not statistically significant ( $F=1.267$ ;  $P=0.307$ ). The results of the linear regression analysis indicate that the

statistically significant predictors in the adjusted model for Global health status score were lower education level [ $\beta$ -coefficient= $19.33$  (95% CI:  $10.7-24.9$ ),  $P=0.004$ ], alcohol consumption [ $\beta$ -coefficient= $10.04$  (95% CI:  $4.5-14.8$ ),  $P=0.023$ ] and invasive surgical procedure [ $\beta$ -coefficient= $22.75$  (95% CI:  $15.0-30.5$ ),  $P=0.002$ ], while the statically significant predictors for QLQ-C30 summary score were living alone [ $\beta$ -coefficient= $-20.05$  (95% CI:  $-29.91-(-10.21)$ ),  $P=0.018$ ], smoking [ $\beta$ -coefficient= $4.35$  (95% CI:  $1.8-6.91$ ),  $P=0.043$ ] and alcohol consumption [ $\beta$ -coefficient= $4.59$  (95% CI:  $1.99-7.19$ ),  $P=0.037$ ].

**Table 5:** Results of linear regression to identify demographic and clinical predictors of Global health status score and EORTC QLQ-C30 summary score (n = 64)

Demographic predictors	<i>Global health status score</i>				<i>EORTC QLQ-C30 summary score</i>			
	$\beta$	SE	<i>t</i>	<i>P</i>	$\beta$	SE	<i>t</i>	<i>P</i>
Sex	18.10	8.74	2.07	0.051	2.37	4.38	0.54	0.594
Age	0.160	1.52	0.10	0.917	0.76	0.76	0.99	0.329
Marital status	-0.56	3.33	-0.16	0.868	0.75	1.67	0.08	0.655
Education level	19.33	5.91	3.26	0.004	2.25	2.96	0.17	0.455
Employment status	1.71	4.22	0.40	0.689	1.05	2.11	0.10	0.623
Place of living	-10.79	6.49	-1.66	0.112	0.58	3.25	0.02	0.859
Living with	-7.20	15.57	-0.46	0.649	-20.05	7.80	-0.47	0.018
Smoking status	-3.81	4.03	-0.94	0.355	4.35	2.02	0.35	0.043
Alcohol consumption	10.04	4.10	2.44	0.023	4.59	2.05	0.38	0.037
Clinical predictors								
Tumor location	7.67	5.36	1.43	0.164	4.18	1.98	2.11	0.139
Tumor stage	1.41	5.23	0.27	0.789	3.89	1.93	2.01	0.148
Surgical procedure	22.75	5.69	3.99	0.002	5.47	2.11	2.59	0.212
Treatment	-4.87	7.21	-0.67	0.505	-4.02	2.67	-1.50	0.138

$\beta$  - Unstandardized Coefficients B; SE- Standard error; p- statistical significance; Adjusted R Square=0.511 in the model for Global health status score for demographic predictors; Adjusted R Square=0.450 in the model for EORTC QLQ-C30 summary score for demographic predictors; Adjusted R Square=0.339 in the model for Global health status score for clinical predictors; Adjusted R Square=0.101 in the model for EORTC QLQ-C30 summary score for clinical predictors

## Discussion

In our study, the Global health status had lower score compared to others functioning scale which is similar to previous research in head and neck cancer (13, 14). Healthy levels of functioning in this study were observed in the physical, social and cognitive domains, which are in line with previous oral cancer studies (15, 16).

Among the presented patients in our study, general symptoms with the highest mean score were financial difficulties, appetite loss and fatigue. Previous researches have already reported similar results in patient with oral cancer (15, 16). Some of them reported significant impact of sleep disorders (13, 15), also pronounced in our study (fourth in a row). The reason for the occurrence of financial difficulties in OSCC patients may not

depend so much on the clinical characteristics as social and material conditions of the environment in which patient lives.

QLQ-C30 summary score exhibits equal or better validity compared to the Global health status and other individual QLQ-C30 scales, which is in agreement with our results (9, 17, 18).

Analyzing the severity of symptoms by QLQ-H&N35 questionnaires, the most common specific symptoms were weight loss and dry mouth, also reported in the study with head and neck carcinoma (14, 15). Unlike others, we found that social eating was a pronounced problem in our respondents, especially in female, explained by the higher representation of life with family and lack of privacy. On the other side, patients who do not live with a partner or in family have worse prognosis, caused by absence of social support,



poorer hygienic habits and delayed diagnosis (19). Our study also recognized living alone as a significant predictor for worsen quality of life.

Our results suggest that the global health status score was lowest in unemployed, patients from rural area, with tumor localized on palate and after total maxillectomy, but the significant predictor was lower education level, which is in agreement with the results of others (20, 21).

Patients with tobacco habit have worse score of social, emotional, role functioning, and more pronounced symptoms (15). We also showed that smoking habit represents a significant predictor for worsen quality of life, which is in accordance with the aforementioned study.

Although, alcohol consumption in patient with oral cancer is closely linked to increased recurrence, mortality rates and decreased cognitive functions, this habit is not considered as a significant predictor of quality of life, and it is even associated with better physical and role function and less pronounced oral symptoms (4, 22). Unlike them, our results showed alcohol abuse as significant predictor for Global health status score and QLQ-C30 summary score, and the reason may be the lower alcohol consumption frequency in our patients.

Results of our study suggest that irradiated patients had more pronounced symptoms such as problems opening mouth, dry mouth and sticky saliva compare to non-irradiated patients, while type of treatment it was not recognized as a predictor of a worse perception of QoL, unlike others (23, 24).

Radical surgical bone excision is the most significant factor responsible for post-surgery QoL deterioration in oral cancer patient and that patients with more extensive resection had numerous orofacial and psychological problems, which significantly affected their well-being, confirmed by the results of our research (25-27).

There are some limitations and possible biases of the study that should be acknowledged. First, the sample size was relatively small. The survey was carried out in one single center, and therefore could not be considered nationally representative. The disadvantage of this ecological research is

ecological fallacy and lack of correlation between the group and individual results. Second, in this study, we measured the QoL in OSCC patient at a time point, not prospectively, which did not allow monitoring of changes in quality of life during recovery. We plan to expand the sample size and network of institutions, and to monitor QoL over time in a follow-up manner for further verification.

## Conclusion

We found several predictors of worse perception of HRQoL in the observed population. These predictors should be the focus for specific prevention activities, social intervention and treatment in order to achieve a better HRQoL of this population.

## Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## Conflict of interest

The authors declare that there is no conflict of interests.

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