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Study on the correlation between postoperative psychological status and nutritional status in patients with oral malignant tumors

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Abstract: This study aims to investigate the psychological status and nutritional status of patients with OMTs three months post-surgery, as well as their interrelationship. A total of 269 OMTs patients were selected using a convenience sampling method, and STAI and PG-SGA assessments were conducted three months post-surgery. The results showed that the SAI and TAI scores of OMTs patients three months post-surgery were 45.89 ± 12.00 and 44.83 ± 11.70 , respectively, with significant differences in anxiety levels among patients with different types of tumors ($P < 0.05$). In terms of nutritional status, the average PG-SGA score of OMTs patients was 7.14 ± 2.95 , and 84.38% of the patients had varying degrees of malnutrition. There were also significant differences in nutritional status among patients with different types of tumors ($P < 0.05$). Moreover, statistical analysis showed a significant positive correlation between SAI and PG-SGA ($r = 0.462$, $P < 0.001$) as well as between TAI and PG-SGA ($r = 0.426$, $P < 0.001$), with the strongest correlation observed in patients with tongue cancer. The study suggests that the psychological status of OMTs patients is closely related to their nutritional status. Therefore, clinical practice should emphasize comprehensive psychological and nutritional assessments and develop individualized intervention strategies to improve patient prognosis.

Keywords: oral malignant tumors; postoperative; psychological status; nutritional status; correlation

1. Introduction

Oral Malignant Tumors (OMTs) are among the most common head and neck malignancies globally, with both incidence and mortality rates increasing year by year. OMTs, a class of subtypes including tongue cancer, buccal cancer, gingival cancer, and floor-of-mouth cancer, have a complex etiology, for example, they consist of smoking and alcohol consumption, as well as viral infections [1]. The leading methods of treatment of these diseases are surgical resection, radiation therapy, and chemotherapy, the nonspecific factors of which destroy tumor cells [2]. At this point, surgery is the main therapeutic direction, as it allows for the substantial removal of tumor neoplasms and an increase in the patient's lifespan. However, the patient's physical and psychological status is significantly affected after surgical intervention [3]. Thus, patients with OMTs are likely to develop a range of physiological issues postoperatively, such as pain in various areas of the body, deteriorated eating opposed to the bothered swallowing, and a loss of body weight, which not only impair the patient's satisfaction with life but also elevate the psychological load [4].

After surgery, changes in psychological status, especially anxiety and depression are common issues face by OMTs patients. Previous psychological research of 75 oral cancer patients showed that patients had higher depression scores 3 months after discharge, and depression and stress scores increased significantly from the time of diagnosis to 3 months post-discharge [4]. But depression score reduced 6 months after surgery [5]. [E1] There is clearly scientific evidence to indicate that, at least in a subset of patients with OMTs, depression and anxiety also contribute directly to adverse medical outcomes: impeding recovery; potentially compromising immune function during treatment, thus increasing the risk for tumor recurrence [6]. Nutritional status, in the meantime, is a critical influence on the postoperative rehabilitation of OMTs sufferers to directly have an effect on bodily repair and immune features. The OMTs patients suffer from postoperative malnutrition, which will induce weight decrease, muscle wasting and immune dysfunction in eventually leading to poorer efficacy during postoperative treatment and survival outcomes [7]. Some previous researchers have found that the nutritional status of OMTs patients after surgery can weigh heavily on their quality of life and overall prognosis [8]. So, it is important to assess the psychological and nutritional status and the assertion of OMTs patients after surgery. Although previous studies have focused on the postoperative psychological and nutritional status in OMTs patients, limited research has examined this relationship between Chinese populations [9]. Therefore, this study aims to examine the impact of postoperative psychological status on nutritional status in China OMTs patients which could provide a scientific theoretical basis for clinicians by providing individually targeted interventions involving psychotherapy and nutrition support 3 months after surgery so as to improve overall prognosis and quality of life.

2. Method

2.1. Participating

This study utilized a convenience sampling method to select 269 patients with OMTs (including lip cancer but not tongue base cancer) from the Department of Oral and Maxillofacial-Head and Neck Oncology at the Ninth People's Hospital Affiliated with Shanghai Jiao Tong University School of Medicine, from June 2022 to December 2023. Of the participants, 158 were male (58.74%) and 111 were female (41.26%), with an average age of 56.73 ± 11.42 years. In terms of marital status, 242 participants (89.96%) were married, and 27 (10.04%) were single or divorced. Regarding educational background, 82 participants (30.48%) had a junior high school education or below, 95 (35.32%) had a high school or technical secondary school education, and 92 (34.20%) had a college degree or higher. Tumor types included tongue cancer (98 cases, 36.43%), buccal cancer (62 cases, 23.05%), gingival cancer (56 cases, 20.82%), floor-of-mouth cancer (35 cases, 13.01%), and other types (18 cases, 6.69%).

The inclusion criteria for this study were as follows: (1) Adult patients aged ≥ 18 years; (2) pathologically confirmed diagnosis of OMTs (including but not limited to tongue cancer, buccal cancer, gingival cancer, etc. One professional pathologist in the Department of Oral Pathology accomplished the pathological diagnosis at the Ninth People's Hospital Affiliated with Shanghai Jiao Tong University School of Medicine); (3) planned to undergo surgical treatment with no surgical contraindications; (4) had clear consciousness, was able to understand, and completed the relevant scale assessments; (5) was willing to participate in the study

and signed informed consent forms.

The exclusion criteria were as follows: (1) Patients with severe cardiac, hepatic, or renal insufficiency or other severe systemic diseases; (2) patients with a history of mental illness or currently undergoing psychiatric medication treatment; (3) patients who had received other anti-tumor treatments (such as radiotherapy or chemotherapy) within the past 3 months; (4) patients with other malignant tumors in different locations; (5) patients whose cognitive or communication impairments severely affected their ability to complete the questionnaire; (6) patients with an expected survival time of < 3 months; (7) patients unable to complete full follow-up during the study period.

2.2. Material and procedure

Postoperative evaluations were conducted on OMTs patients who met the inclusion criteria at 3 months post-surgery. The specific steps were as follows: (1) Baseline data collection: Collected by trained researchers within 24 h of the patient's hospital admission. This included demographic information (such as age, gender, marital status, education level, etc.) and disease-related information (such as tumor type and stage). (2) Professional assessments: All psychological status assessments were completed by 2 clinical psychologists, and nutritional status assessments were completed by 2 professional nutritionists. The assessors received unified training before data collection, including simulation exercises on standardized scoring operations. During the data collection process, the research leader randomly checked the data every week to ensure the standardization of operations. All assessments were conducted in a quiet and private environment, with each session lasting approximately 30–45 min. Lectures and workshops on SAI, TAI and PG-SGA are conducted by experts. And simulated assessment and inter-rater reliability testing were conducted to ensure scoring consistency. (3) Data collection methods: Data were collected through face-to-face questionnaires at the first follow-up visit 3 months after surgery. For patients unable to complete the questionnaire themselves, researchers assisted to ensure data accuracy and completeness. (4) Quality control: A standardized data management process was established, including dual-person, dual-machine data entry and logical checks, to ensure the reliability of the data. The study strictly adhered to medical ethical principles, protecting patient privacy. A total of 302 questionnaires were distributed, with 269 valid questionnaires returned, yielding an effective response rate of 89.07% (**Figure 1**).

The survey tools used in this study included a general data questionnaire, the State-Trait Anxiety Inventory (STAI), and the Patient-Generated Subjective Global Assessment (PG-SGA). The general data questionnaire, designed by the research team, was used to collect demographic and disease-related information, such as gender, age, and tumor type. The STAI consists of two scales, assessing state anxiety (State Anxiety Inventory, SAI) and trait anxiety (Trait Anxiety Inventory, TAI), with each part containing 20 items [10]. The SAI assesses the level of anxiety at a specific point in time, while the TAI measures general anxiety tendencies over a longer period. The questionnaire has good reliability and validity and is suitable for measuring anxiety symptoms in clinical and research settings. Each item is scored using a 4-point Likert scale (1 = not at all, 2 = sometimes, 3 = often, 4 = always), with total scores ranging from 20 to 80. Higher scores indicate more severe anxiety. The reliability and validity of the STAI have been validated in multiple studies, with a Cronbach's α coefficient of 0.863, making it suitable for assessing the psychological status of perioperative patients [11]. The PG-SGA is a tool specifically designed for

assessing the nutritional status of cancer patients [12]. It consists of two parts: self-assessment by the patient and evaluation by medical staff. The assessment includes seven components: weight, food intake, symptoms, activity and physical function, comorbidities, stress, and physical examination. The first four components are self-assessed by the patient, while the last three are evaluated by medical staff. Based on the PG-SGA score, the nutritional status of cancer patients is classified into four categories: (1) Well-nourished (0–1 points): No intervention is needed, and regular follow-up and evaluation are maintained during treatment. (2) Suspected or mild malnutrition (2–3 points): Patient or family education is provided by a dietitian, nurse, or doctor, and medication interventions may be offered based on symptoms and laboratory results. (3) Moderate malnutrition (4–8 points): Intervention by a dietitian is required, and nutritional intervention may be conducted in collaboration with doctors, pharmacists, and nurses depending on the severity of symptoms. (4) Severe malnutrition (≥ 9 points): Urgent symptom improvement and/or nutritional intervention are required. The PG-SGA scale has been widely used and validated among cancer patients in China, with good reliability and validity, and a Cronbach's α coefficient of 0.707 [13].

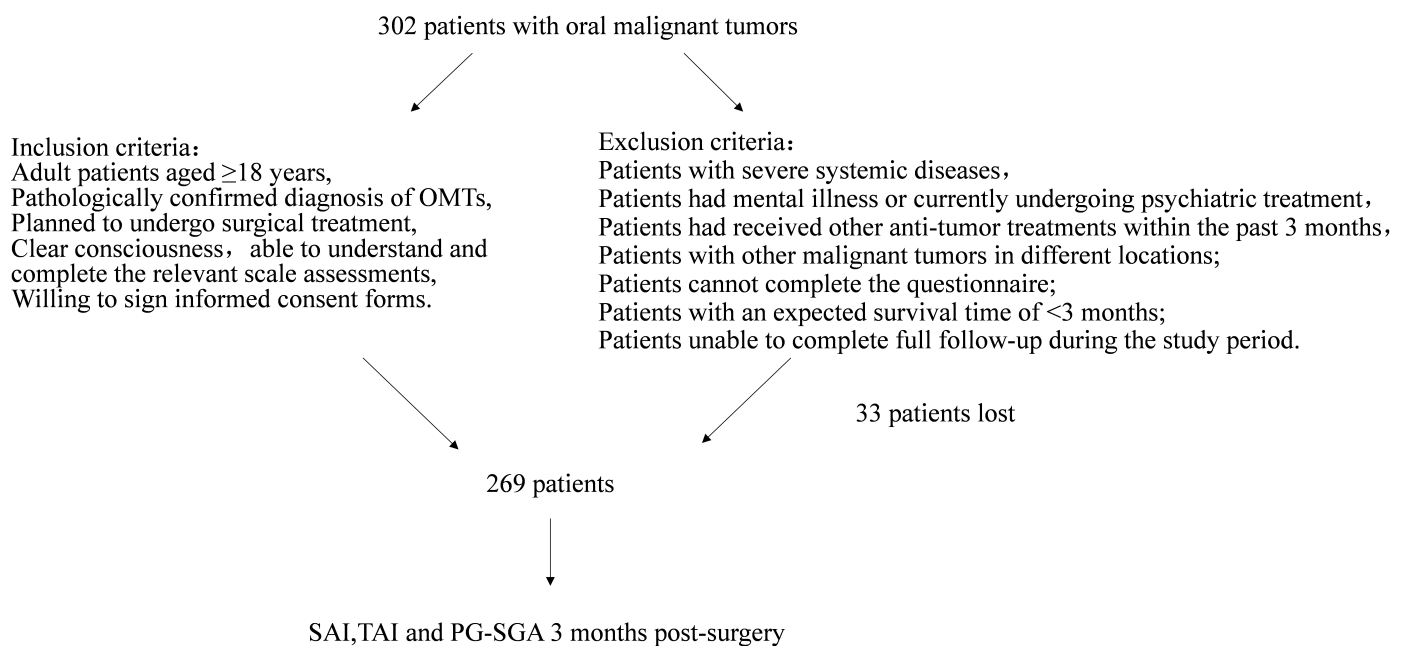


Figure 1. Patients screening process.

2.3. Data analysis

Data analysis for this study was performed using SPSS version 26.0. All statistical tests were two-sided, with $P < 0.05$ indicating statistical significance. The specific statistical methods used were as follows: (1) Descriptive statistics: For continuous variables (e.g., age, STAI scores, PG-SGA scores), the mean $\pm$ standard deviation (SD) was used for description. For categorical variables (e.g., gender, marital status, tumor type), the number and percentage [n (%)] were used. (2) Between-group comparisons: For continuous variables, the Shapiro-Wilk test was first used to assess whether they conformed to a normal distribution. If they followed a normal distribution, one-way analysis of variance (ANOVA) was used to compare STAI and PG-SGA scores across different tumor types. If the variables did not conform to a normal distribution, the Kruskal-Wallis H test was employed.

For categorical variables, the Chi-square test or Fisher's exact test was used to compare differences in PG-SGA classifications among different tumor types. (3) Correlation analysis: Pearson correlation analysis was used to explore the relationship between STAI scores and PG-SGA scores at 3 months post-surgery. An absolute value of the correlation coefficient < 0.3 was considered weak, $0.3 \leq |r| < 0.5$ was considered moderate, and $|r| \geq 0.5$ was considered strong. Correlation analysis was first performed on the overall patient group, followed by stratified analysis by tumor type. 95% CI is calculated by Fisher's z transformation. (4) Missing data processing: During data processing, the research team conducted missing value analysis for all data. The results show that the missing data pattern was completely at random (Little's MCAR test, $P > 0.05$). Therefore, multivariate imputation by chained equations (MICE) was conducted to generate five imputed datasets, incorporating age, gender, SAI, TAI, and PG-SGA. The mean values from the imputed datasets were then used for statistical analysis.

3. Results

3.1. Psychological status of OMTs patients 3 months post-surgery

The anxiety levels of 269 OMTs patients were assessed 3 months after surgery, with the results shown in **Table 1**. Significant differences were observed in both SAI and TAI scores across different cancer types ($P < 0.05$). Overall, the mean SAI score for OMTs patients 3 months post-surgery was 45.89 ± 12.00 , and the mean TAI score was 44.83 ± 11.70 . Among these, tongue cancer patients exhibited the highest anxiety levels, with an SAI score of 48.23 ± 12.34 and a TAI score of 46.12 ± 11.67 .

Table 1. STAI and PG-SGA evaluation results of patients 3 months post-surgery ($n = 269$).

Tumor type	SAI $\bar{X} \pm S$	TAI $\bar{X} \pm S$	PG-SGA score $\bar{X} \pm S$	PG-SGA classification (n/%)			
				Well-nourished	Suspected or mild malnutrition	Moderate malnutrition	Severe malnutrition
Tongue cancer ($n = 98$)	48.23 ± 12.34	46.12 ± 11.67	7.45 ± 2.89	12 (12.24%)	24 (24.49%)	40 (40.82%)	22 (22.45%)
Floor of mouth cancer ($n = 35$)	46.89 ± 11.78	45.30 ± 12.03	7.23 ± 3.01	5 (14.29%)	10 (28.57%)	14 (40.00%)	6 (17.14%)
Gingival cancer ($n = 56$)	45.56 ± 13.22	44.67 ± 11.45	6.87 ± 2.78	10 (17.86%)	15 (26.79%)	25 (44.64%)	6 (10.71%)
Buccal cancer ($n = 62$)	44.12 ± 12.01	43.54 ± 11.89	6.45 ± 3.22	11 (17.74%)	18 (29.03%)	28 (45.16%)	5 (8.06%)
Others ($n = 18$)	46.78 ± 11.45	45.91 ± 12.10	6.78 ± 2.85	4 (22.22%)	3 (16.67%)	8 (44.44%)	3 (16.67%)
Total ($n = 269$)	45.89 ± 12.00	44.83 ± 11.70	7.14 ± 2.95	42 (15.61%)	70 (26.02%)	115 (42.75%)	42 (15.61%)
F/X^2	3.271	2.987	3.156	18.523			
P	< 0.05	< 0.05	< 0.05	< 0.05			

3.2. Nutritional status of OMTs patients 3 months post-surgery

The nutritional status of 269 OMTs patients was assessed 3 months after surgery, with the results shown in **Table 1**. Significant differences were observed in both PG-

SGA scores and nutritional status classifications across different tumor types ($P < 0.05$). Overall, the mean PG-SGA score for OMTs patients 3 months post-surgery was 7.14 ± 2.95 . In terms of nutritional status classification, 42 patients (15.61%) were well-nourished, 70 patients (26.02%) had suspected or mild malnutrition, 115 patients (42.75%) had moderate malnutrition, and 42 patients (15.61%) had severe malnutrition. In addition, the PG-SGA score of patients with tongue cancer is significantly higher than that of patients with other types of cancer, and more patients suffer from severe malnutrition.

3.3. Correlation between psychological status and nutritional status of OMTs patients 3 months post-surgery

The Shapiro-Wilk test showed that SAI, TAI and PG-SGA scores were normally distributed. Pearson correlation analysis was used to explore the relationship between the psychological status and nutritional status of OMTs patients 3 months post-surgery, with the results shown in **Table 2**. Overall analysis revealed a significant moderate positive correlation between SAI and PG-SGA ($r = 0.462$, $P < 0.001$), as well as between TAI and PG-SGA ($r = 0.426$, $P < 0.001$).

Table 2. Correlation between STAI and PG-SGA in patients 3 months post-surgery ($n = 269$).

Correlation	<i>r</i>	<i>P</i>
SAI and PG-SGA	0.462	< 0.001
TAI and PG-SGA	0.426	< 0.001

Further analysis of different tumor types, as shown in **Table 3**, indicated that SAI and TAI scores were significantly and moderately positively correlated with PG-SGA scores across all OMTs types ($P < 0.001$), with the strongest correlation observed in tongue cancer patients.

Table 3. Correlation between STAI and PG-SGA in patients 3 months post-surgery ($n = 269$).

Tumor type	SAI and PG-SGA			TAI and PG-SGA		
	<i>r</i>	<i>P</i>	95% CI	<i>r</i>	<i>P</i>	95% CI
Tongue cancer ($n = 98$)	0.478	< 0.001	0.306~0.620	0.452	< 0.001	0.305~0.613
Floor of mouth cancer ($n = 35$)	0.454	< 0.001	0.142~0.684	0.429	< 0.001	0.111~0.667
Gingival cancer ($n = 56$)	0.443	< 0.001	0.204~0.632	0.426	< 0.001	0.183~0.618
Buccal cancer ($n = 62$)	0.412	< 0.001	0.181~0.599	0.399	< 0.001	0.165~0.589
Others ($n = 18$)	0.396	< 0.001	0.095~0.924	0.381	< 0.001	0.135~0.719

4. Discussion

4.1. Analysis of the psychological status of OMTs patients 3 months post-surgery

The results of this study show that the SAI and TAI scores of OMTs patients 3 months post-surgery were at moderate levels, with mean scores of 45.89 ± 12.00 and 44.83 ± 11.70 , respectively. These findings are generally consistent with previous research [14,15], indicating that OMTs patients continue to experience significant

psychological stress even long after surgery. Several factors may contribute to this phenomenon: First, OMTs surgery often involves extensive removal and reconstruction of facial tissues, which may result in changes to a patient's appearance, speech, and swallowing functions [16]. These physiological changes not only affect daily life but can also lead to a decrease in self-esteem, social difficulties, and psychological issues, further exacerbating anxiety. Second, OMTs patients face a continuous threat of recurrence and metastasis, with regular check-ups and follow-ups potentially becoming major sources of anxiety [17]. Especially in the early postoperative period, the uncertainty surrounding prognosis can heighten anxiety levels. It may also affect the occupational performance, roles and places of social living; thereby leading to a cost in terms of money and household courses [18]. These sociopsychological factors together may increase the duration of anxiety. There was significant heterogeneity among the different OMTs with regard to anxiety in this study, as patients who had undergone tongue cancer surgery represented those most anxious. A possible reason for the general trend of higher scores among patients suffering from tongue cancer may be that the surgery applied to cure this type of tumor causes more profound speech and swallowing problems [19]. The tongue is the most movable muscle in our body as we use it to talk, taste food and swallow. Patients with tongue cancer may have defects or restricted motion of the tongue after surgery, which can significantly impair their communication and eating ability; subsequently these patients are more likely to experience intense anxiety [20]. Considering the possible impact of psychological state on people's normal lives, we analyzed the nutritional status of patients after surgery.

4.2. Analysis of nutritional status in OMTs patients 3 months post-surgery

The results of this study indicate that the nutritional status of OMTs patients 3 months after surgery is generally poor, with an average PG-SGA score of 7.14 ± 2.95 , and 84.38% of patients experiencing varying degrees of malnutrition. This finding is consistent with previous studies [21,22], reflecting the serious nutritional challenges faced by OMTs patients post-surgery. There are several potential causes of this finding. First, the OMTs surgery itself may be impacting how well patients can eat. Surgical resection and reconstruction may cause changes in oral cavity structure and function, including differences with chewing or swallowing, which can be primary determinants of an individual's food intake [23]. Second, incidences of pain, dry mouth and taste changes following OMTs in this patient group are common postoperative complications that may limit appetite and intake [24]. Such symptoms may continue for months and thereby, limit the patients' intake of nutrition. Furthermore, if OMTs patient needs an adjuvant therapy in the form of radiotherapy or chemotherapy it can also impact nutritional status [25]. For instance, radiotherapy may lead to oral mucositis and chemotherapy can trigger nausea and vomiting; both conditions contribute to dynamic dysphagia as they impair food intake/nutrient absorption. The psychosocial factors also influence the nutritional status of OMTs patient [26]. Anxiety and depression were factors as well, which led to decreased appetite (and subsequently nutrient intake). A critical finding of this study was that significant nutritional status discrepancies were found among various OMTs and patients with tongue cancer had the largest proportion in severe degree [27]. That might be because surgery for tongue cancer is likely to have a more detrimental effect on eating functions. Tongue cancer surgery can leave patients with tongue deformities or functional limitations that make it difficult to chew food, which in turn will lead to malnutrition [23]. A similar trend of psychological state post-surgery showed a

possible correlation between the psychological and nutritional status in OMT patients, especially tongue cancer

4.3. Analysis of the correlation between psychological status and nutritional status in OMTs patients 3 months post-surgery

The results of this study show a significant positive correlation between the psychological status and nutritional status of OMTs patients 3 months post-surgery. Both SAI and PG-SGA, as well as TAI and PG-SGA, demonstrated moderate positive correlations. The discovery of the interdependence between postoperative psychological health and nutritional status in OMTs patients leads to new views on integrated patient-oriented strategies. It is possible that there could be a two-way relationship between psychological state and influence on nutritional status as well. Anxiety, on the one hand, may impact nutritional status through multiple pathways. Increased anxiety may result in decreased appetite, changes to eating habits and even gastrointestinal symptoms (e.g., nausea, abdominal pain), all of which can interfere with food intake [28]. Longstanding anxiety, moreover, may call into question the self-management of patients and adherence to medical advice and nutritional interventions [29]. In return, anxiety can trigger malnutrition. Malnutrition can cause those symptoms and any or all of them may concern the prognosis, exacerbating anxiety levels [30]. In addition, malnutrition can alter the synthesis and metabolism of neurotransmitters in the brain directly affecting emotional regulation [31]. Previous studies on abdominal tumors have found that nutritional rehabilitation models can help maintain better physical and mental states [32]. This study discovered the difference in psychological status accompanied with nutritional status in different types among OMTs and tongue cancer patients had the strongest association. This possibly reflects the greater consequence of a surgery for tongue cancer on speech and eating functionalities [33]. For patients with tongue cancer, taking responsibility or adapting to new lifestyles and impairments after treatment leads not only to more severe functional deterioration but also to rebuilding social relationships; the cycle of psychological stress with nutrition problems will be a reinforcing factor [34]. This suggests that we should pay special attention to the psychological condition of tongue cancer patients in clinical work. On the one hand, early screening should be carried out to identify patients with a high risk of psychological disorders. On the other hand, a dual intervention strategy of psychological support intervention treatment and nutritional therapy should be tried to optimize the postoperative recovery process.

In fact, oral cancer patients commonly experience destructive dysphagia dysfunction after surgery. Considering the links between nutritional status and mental health, we recommend implementing multidisciplinary intervention plans—including nutrition, psychology, surgery, and nursing—as well as personalized nutritional support to prevent psychological decline caused by depression. Assessments should be conducted at key time points, such as the day of surgery, 3 months, and 6 months postoperatively, with psychological and nutritional interventions dynamically adjusted based on the patient's body.

5. Limitations and future research directions

There are several limitations of this study: Firstly, as a cross-sectional study, it cannot directly confirm the causal relationship between psychological status and nutritional status; longitudinal designs monitoring patients over time from before surgery to multiple postoperative points may provide an enhanced perspective regarding how these two factors interact. Second, the present study was conducted

only in one medical center, which presents a limitation for generalizing this sample. However, follow-up research can transition into utilizing multi-center studies to improve generalizability. Third, cultural and healthcare system factors in China may have influenced our findings. For example, traditional dietary habits might contribute to postoperative malnutrition, while mental health awareness remains limited in oncology care, potentially leading to an underestimation of psychological distress. Future research should incorporate cross-cultural comparisons, using methods such as qualitative interviews or patient-reported data, to explore how psychological and nutritional recovery patterns differ across different cultural backgrounds. Diet relates to life quality. In future studies, the extension of psychosocial factors such as quality of life, comorbidities, and depression should also be exposed to assess an overall picture about OMTs patients psychological health as clinical practice implications for mental health treatment.

6. Conclusion

In conclusion, this study has preliminarily confirmed a significant correlation between the postoperative psychological status and nutritional status of OMTs patients and revealed differences between various types of OMTs in these aspects. Future research should further explore the mechanisms underlying this relationship and develop more effective intervention strategies to comprehensively improve the prognosis and quality of life of OMTs patients. The dynamic changes of this two-way relationship can also be further verified through longitudinal studies, and multidimensional intervention trials (such as combining psychological support and nutritional supplements) can be designed for patients with different tumor types to explore the potential role of comprehensive intervention in patient recovery.

Author contributions: Conceptualization, JZ and ND; methodology, ND; software, JZ and LY; validation, JZ, NL and LY; formal analysis, JZ; investigation, JZ and NL; resources, JZ and ND; data curation, JZ; writing—original draft preparation, JZ; writing—review and editing, JZ and ND; visualization, NL; supervision, ND; project administration, ND; funding acquisition, ND. All authors have read and agreed to the published version of the manuscript.

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Institutional review board statement: This study protocol was reviewed and approved by the hospital's Ethics Committee (Approval No.: SH9H-2023-T75-1), and all participants signed informed consent forms. The study strictly adhered to the relevant provisions of the Declaration of Helsinki, ensuring the protection of patient privacy and respect for patient autonomy.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Conflict of interest: The authors declare no conflict of interest.

References

1. Pingili S, Ahmed J, Sujir N, et al. Evaluation of Malnutrition and Quality of Life in Patients Treated for Oral and Oropharyngeal Cancer. Chlubek D, ed. The Scientific World Journal. 2021; 2021: 1-6. doi: 10.1155/2021/9936715
2. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality

- Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer Journal for Clinicians*. 2021; 71(3): 209-249. doi: 10.3322/caac.21660
3. Britton B, Baker A, Clover K, et al. Heads Up: a pilot trial of a psychological intervention to improve nutrition in head and neck cancer patients undergoing radiotherapy. *Eur J Cancer Care (Engl)*. 2017; 26(4). doi: 10.1111/ecc.12502
4. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer Journal for Clinicians*. 2021; 71(3): 209-249. doi: 10.3322/caac.21660
5. Wu YS, Lin PY, Chien CY, et al. Anxiety and depression in patients with head and neck cancer: 6-month follow-up study. *Neuropsychiatric Disease and Treatment*. Published online April 2016: 1029. doi: 10.2147/ndt.s103203
6. Yuan L, Pan B, Wang W, et al. Prevalence and predictors of anxiety and depressive symptoms among patients diagnosed with oral cancer in China: a cross-sectional study. *BMC Psychiatry*. 2020; 20(1). doi: 10.1186/s12888-020-02796-6
7. Gellrich NC, Handschel J, Holtmann H, Krüskemper G. Oral cancer malnutrition impacts weight and quality of life. *Nutrients*. 2015; 7(4): 2145-2160. doi: 10.3390/nu7042145
8. Tsai KY, Liao SF, Chen KL, et al. Effect of early interventions with manual lymphatic drainage and rehabilitation exercise on morbidity and lymphedema in patients with oral cavity cancer. *Medicine*. 2022; 101(42): e30910. doi: 10.1097/md.00000000000030910
9. Gosak M, Gradišar K, Rotovnik Kozjek N, et al. Psychological distress and nutritional status in head and neck cancer patients: a pilot study. *European Archives of Oto-Rhino-Laryngology*. 2020; 277(4): 1211-1217. doi: 10.1007/s00405-020-05798-y
10. Yıldırım D, Çiriş Yıldız C. The Effect of Mindfulness-Based Breathing and Music Therapy Practice on Nurses' Stress, Work-Related Strain, and Psychological Well-being During the COVID-19 Pandemic. *Holistic Nursing Practice*. 2022; 36(3): 156-165. doi: 10.1097/hnp.0000000000000511
11. Mohammadpourhodki R, Sargolzaei MS, Basirinezhad MH. Evaluating the effect of massage based on slow stroke back massage on the anxiety of candidates for cataract surgery. *Romanian journal of ophthalmology*. 2019; 63(2): 146-152. doi: 10.22336/rjo.2019.22
12. Ottery FD. Rethinking nutritional support of the cancer patient: the new field of nutritional oncology. *Semin Oncol*. 1994; 21(6): 770-778.
13. Qiu Y, You J, Wang K, et al. Effect of whole-course nutrition management on patients with esophageal cancer undergoing concurrent chemoradiotherapy: A randomized control trial. *Nutrition*. 2020; 69: 110558. doi: 10.1016/j.nut.2019.110558
14. Wang TF, Wu YT, Tseng CF, et al. Associations between dental anxiety and postoperative pain following extraction of horizontally impacted wisdom teeth. *Medicine*. 2017; 96(47): e8665. doi: 10.1097/md.00000000000008665
15. Meng L, Jiang X, Liang J, et al. Postoperative psychological stress and expression of stress-related factors HSP70 and IFN- γ in patients with early lung cancer. *Minerva Medica*. 2023; 114(1). doi: 10.23736/s0026-4806.20.06658-6
16. Gong ZJ, Ren ZH, Wang K, et al. Reconstruction design before tumour resection: A new concept of through-and-through cheek defect reconstruction. *Oral Oncology*. 2017; 74: 123-129. doi: 10.1016/j.oraloncology.2017.09.023
17. D'Ambrosio L, Palesandro E, Boccone P, et al. Impact of a risk-based follow-up in patients affected by gastrointestinal stromal tumour. *European Journal of Cancer*. 2017; 78: 122-132. doi: 10.1016/j.ejca.2017.03.025
18. Yosef B, Woldegerima Berhe Y, Yilkal Fentie D, et al. Occupational Stress among Operation Room Clinicians at Ethiopian University Hospitals. Deiana G, ed. *Journal of Environmental and Public Health*. 2022; 2022(1). doi: 10.1155/2022/2077317
19. Ji YB, Cho YH, Song CM, et al. Long-term functional outcomes after resection of tongue cancer: determining the optimal reconstruction method. *European Archives of Oto-Rhino-Laryngology*. 2017; 274(10): 3751-3756. doi: 10.1007/s00405-017-4683-8
20. Nguyen KA, Bui TX, Van Nguyen H, et al. Progressive functional improvement in hemiglossectomy defects reconstructed with radial forearm free flap at 6-months. *American Journal of Otolaryngology*. 2018; 39(3): 317-320. doi: 10.1016/j.amjoto.2018.03.021
21. Karin M, Bogut A, Hojsak I, et al. Nutritional status and its effect on complications in patients with colorectal cancer. *Wien Klin Wochenschr*. 2020; 132(15-16): 431-437. doi: 10.1007/s00508-020-01671-4
22. Zhang L, Wang S, Gao X, et al. Poor Pre-operative Nutritional Status Is a Risk Factor of Post-operative Infections in Patients with Gastrointestinal Cancer—A Multicenter Prospective Cohort Study. *Frontiers in Nutrition*. 2022; 9. doi: 10.3389/fnut.2022.850063

23. Ohkoshi A, Ogawa T, Nakanome A, et al. Predictors of chewing and swallowing disorders after surgery for locally advanced oral cancer with free flap reconstruction: A prospective, observational study. *Surg Oncol.* 2018; 27(3): 490-494. doi: 10.1016/j.suronc.2018.05.029
24. Ihara Y, Tashimo Y, Nozue S, et al. Changes in Oral Function and Quality of Life in Tongue Cancer Patients Based on Resected Area. *Asian Pacific Journal of Cancer Prevention.* 2021; 22(8): 2549-2557. doi: 10.31557/apjcp.2021.22.8.2549
25. Ni W, Yu S, Zhang W, et al. A phase-II/III randomized controlled trial of adjuvant radiotherapy or concurrent chemoradiotherapy after surgery versus surgery alone in patients with stage-IIB/III esophageal squamous cell carcinoma. *BMC Cancer.* 2020; 20(1). doi: 10.1186/s12885-020-6592-2
26. Pleplé A, Lalanne C, Huas C, et al. Nutritional status and anxious and depressive symptoms in anorexia nervosa: a prospective study. *Scientific Reports.* 2021; 11(1). doi: 10.1038/s41598-020-79410-y
27. Caburet C, Farigon N, Mulliez A, et al. Impact of nutritional status at the outset of assessment on postoperative complications in head and neck cancer. *European Annals of Otorhinolaryngology, Head and Neck Diseases.* 2020; 137(5): 393-398. doi: 10.1016/j.anorl.2019.12.005
28. Lindqvist C, Slinde F, Majeed A, et al. Nutrition impact symptoms are related to malnutrition and quality of life – A cross-sectional study of patients with chronic liver disease. *Clinical Nutrition.* 2020; 39(6): 1840-1848. doi: 10.1016/j.clnu.2019.07.024
29. Huang L, Zhang L, Jiang S, et al. Association of the Coronavirus Disease 2019 Outbreak on the Diabetes Self-Management in Chinese Patients: An Analytical Cross-Sectional Study. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy.* 2022; 15: 1413-1422. doi: 10.2147/dmso.s351823
30. Chen RY, Mostafa I, Hibberd MC, et al. A Microbiota-Directed Food Intervention for Undernourished Children. *N Engl J Med.* 2021; 384(16): 1517-1528. doi: 10.1056/NEJMoa2023294
31. Bleker LS, de Rooij SR, Roseboom TJ. Malnutrition and depression in pregnancy and associations with child behaviour and cognitive function: a review of recent evidence on unique and joint effects 1. *Can J Physiol Pharmacol.* 2019; 97(3): 158-173. doi: 10.1139/cjpp-2018-0381
32. Wang SA, Gu J, Chen X, et al. Gastrointestinal cancer surgery in the elderly: The effects of preoperative oral nutritional supplements—A retrospective study. *Asia Pac J Clin Nutr.* 2024; 33(4): 581-588. doi: 10.6133/apjcn.202412_33(4).0013
33. Balbinot J, Real CS, Melo CC de, et al. Quality of life in tongue cancer treated patients before and after speech therapy: a randomized clinical trial. *Brazilian Journal of Otorhinolaryngology.* 2022; 88(4): 491-496. doi: 10.1016/j.bjorl.2020.10.005
34. Depeyre A, Pereira B, Pham-Dang N, et al. Impairments in Food Oral Processing in Patients Treated for Tongue Cancer. *Dysphagia.* 2019; 35(3): 494-502. doi: 10.1007/s00455-019-10054-5