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Original Article

Dietary Habits, Ulcer Characteristics, and Preference for Traditional Chinese Medicine as Predictors of Psychological Distress and Impaired OHRQoL in Recurrent Aphthous Stomatitis

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ABSTRACT

Repeated episodes that limit oral function intensify anxiety, depressive symptoms, and declines in oral health–related quality of life (OHRQoL) among individuals with Recurrent Aphthous Stomatitis (RAS). Yet, the precise contributors to these psychological burdens and OHRQoL reductions are still not fully clarified.This study sought to measure psychological distress and OHRQoL impairment in people with RAS and to determine adjustable risk factors underlying these declines to guide focused intervention strategies. A cross-sectional survey was administered to RAS participants using both online and paper formats. Data on demographic and clinical variables, along with anxiety, depression, and OHRQoL scores, were obtained and evaluated. Extended ulcer duration and choosing Traditional Chinese Medicine (TCM) treatments emerged as notable predictors for increased anxiety and depression in RAS patients. Frequent intake of fried foods (OR: 3.88, $p = 0.006$) heightened anxiety risk. Individuals reporting higher fruit consumption (B: 3.42, $p < 0.001$) showed more pronounced anxiety symptoms. Spicy food intake (B: −1.18, $p < 0.001$) was associated with reduced anxiety. Among anxious patients, regular vegetable consumption (B: −4.820, $p < 0.001$) was linked with lower anxiety levels. Larger ulcer size ($B = 2.09$, $p = 0.017$), more frequent recurrences ($B = 4.74$, $p < 0.001$), and greater fried food intake ($B = 2.19$, $p = 0.002$) intensified depressive symptoms. Increased pain severity, frequent fried food intake ($B = 2.68$, $p = 0.004$), moderate fruit consumption ($B = 1.39$, $p = 0.019$), and preference for TCM ($B = 2.08$, $p = 0.022$) were related to poorer OHRQoL. Ulcer-related features, dietary patterns, and TCM preference contributed to elevated psychological distress and diminished OHRQoL in RAS populations. Tailored psychological support may help stabilize mental well-being and OHRQoL, lessen ulcer recurrence, and improve patient outcomes.

Keywords: Dietary habits, Traditional Chinese medicine, OHRQoL, Recurrent Aphthous stomatitis

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Introduction

Recurrent Aphthous Stomatitis (RAS) is a common inflammatory condition of the oral mucosa, marked by recurring painful ulcers that appear at intervals ranging from days to months, affecting nearly 25% of people worldwide [1]. Although the lesions typically resolve spontaneously, their repetitive nature can markedly hinder chewing, speaking, and swallowing, thereby reducing overall quality of life [2, 3]. Current research suggests that RAS arises from a combination of factors—including immune abnormalities, genetic background, psychological stressors, hormonal influences, local irritation, disturbances in the oral microbiome, and dietary triggers [4, 5]. Due to this multifactorial origin, managing RAS remains difficult, and present treatment approaches primarily target symptom control, such as reducing pain, promoting ulcer resolution, and limiting recurrences [6]. Understanding the factors contributing to RAS is

essential for improving etiological insights and guiding individualized prevention and therapy.

Chronic oral conditions are frequently associated with mental health issues [7]. Higher rates of anxiety and depressive symptoms have been identified in disorders such as burning mouth syndrome (BMS) [8, 9] and periodontal disease [10]. Evidence shows a two-way connection between RAS and psychological well-being. Emotional stress is recognized as a precipitating factor for RAS flare-ups [11], and patients with RAS show higher levels of anxiety, stress, and depression than individuals without the condition. These psychological difficulties may stem from limitations in chewing, speaking, swallowing, altered eating habits, social discomfort, and diminished self-esteem, all of which may worsen psychological health [12]. Therefore, early evaluation of psychological status in RAS is crucial.

Dietary elements are also repeatedly implicated in RAS [5]. For instance, a cross-sectional study from China reported an inverse association between fruit consumption—often rich in antioxidants—and RAS incidence [13]. Negative influences of fried or spicy foods [14] and certain allergens [15] have also been described. Meanwhile, dietary patterns rich in vegetables, fruits, legumes, and whole grains are associated with reduced depression risk or improvement in depressive symptoms [16], and plant-forward diets correlate with lower anxiety levels [17]. Yet, limited research has examined how diet affects psychological conditions specifically within the RAS population. Drawing on current evidence, this study incorporated the intake frequency of vegetables, fruits, spicy foods, and fried foods as candidate variables impacting psychological scores in RAS.

Traditional Chinese Medicine (TCM) has long served as an alternative or adjunctive therapy to Western medicine in chronic disease management in China [18]. Because RAS is recurrent, it can induce prolonged physical discomfort and psychological strain, which may elevate anxiety and depression levels [19] and further compromise oral health, leading clinicians and patients to explore complementary treatment options [20]. Evidence shows that topical natural herbal preparations can improve RAS outcomes while limiting adverse effects [21]. Given that many patients attending TCM institutions tend to favor TCM approaches, preference for TCM use was included as another variable in this study.

The evaluation of health-related quality of life (HRQoL) is of major importance in clinical practice and is widely recognized as a primary outcome measure in clinical studies [22]. Considering that oral conditions can markedly influence systemic functioning and general well-being, the assessment of oral health–related quality of life (OHRQoL) has become an essential element in managing oral diseases [23]. Prior research further indicates that individuals with oral lichen planus show substantially reduced OHRQoL relative to healthy individuals, and pharmacologic therapies have been shown to produce measurable improvements in these scores [22]. A prospective investigation with a small sample size (N = 62) reported that RAS sufferers experience much greater adverse impacts on OHRQoL than both healthy controls and those whose ulcers have resolved [24]. Although earlier studies confirm that RAS patients have poorer psychological functioning and significantly diminished OHRQoL, the precise determinants contributing to these impairments are not yet fully delineated. Accordingly, the aims of this study were to:

1. Measure the extent of psychological disturbances and OHRQoL outcomes in RAS patients;
2. Determine principal variables associated with their psychological state and OHRQoL;
3. Provide the first structured analysis of factors shaping the severity of psychological comorbidities, thereby facilitating tailored interventions that enhance clinical results and patient-focused therapeutic planning.

This investigation identified the combined effects of dietary habits, ulcer-related features, pain severity, and inclination toward TCM treatment on psychological well-being and OHRQoL among individuals with RAS. Moreover, the study clarified how these variables differentially influence anxiety and depression severity within this group. The evidence contributes to a clearer understanding of psychological functioning and OHRQoL among RAS populations and supports the design of targeted strategies to reduce RAS-associated impairments. These insights aim to address unique clinical challenges and assist in forming therapeutic approaches that may improve treatment benefits and overall life quality.

Materials and Methods

Participants

This cross-sectional project took place from March 2024 to March 2025. Only adults aged ≥18 years were enrolled, while individuals with psychiatric illnesses, impaired cognition, communication limitations, or illiteracy were excluded. RAS diagnosis required fulfillment of all major criteria alongside at least one

minor criterion, based on validated diagnostic guidelines integrating symptomatology with physical examination findings [25].

Major criteria included:

(i) Ulcer morphology—multiple recurrent, small, oval ulcers with clearly defined erythematous borders and yellow or gray bases;

(ii) Recurrence—an annual average of ≥1 episode with no preference for specific sites;

(iii) Mechanical allodynia—pain intensified by mechanical contact;

(iv) Self-limitation—spontaneous resolution without treatment.

Minor criteria consisted of:

(i) Family history—presence of at least one first-degree relative with confirmed RAS;

(ii) Location—lesions occurring on non-keratinized mucosa;

(iii) Duration—ulcer presence lasting from several days up to two weeks;

(iv) Triggers—stress, local irritation, or infection;

(v) Non-smoking status.

Further exclusions included individuals with localized traumatic causes of oral ulcers or systemic diseases such as hematologic deficiencies, Crohn's disease, Behçet's syndrome, autoinflammatory disorders, endocrine or metabolic dysregulation (e.g., diabetes), and conditions affecting cardiovascular, renal, hepatic, or gastrointestinal systems.

Data collection

Anxiety, depression, and OHRQoL were measured using paper-based or online survey tools. A total of 400 questionnaires were randomly administered. Forty-two cases were excluded: 12 due to psychiatric diagnoses identified during the study period, 24 due to psychosomatic diseases strongly related to psychological status, and 6 because of incomplete data. Based on established methodological recommendations by Peduzzi *et al*. [26] and Concato *et al.* [27], the final sample size fulfilled statistical power requirements. All procedures complied with the Declaration of Helsinki and were approved by the Institutional Review Board and Ethics Committee of Clinical Chinese Medicine at Yangzhou University (REC ref 2024-54). Written informed consent was obtained from every participant.

The first part of the survey gathered essential sociodemographic details from participants, including sex, age, occupation type, education background, income level, and marital category. The second portion addressed clinical features of RAS, asking questions such as: What is the diameter of the largest oral ulcer? Is the yearly recurrence rate fewer than 7 episodes or 7 or more? Does each flare last more than 14 days or under 14 days? Was the decision to visit this clinic influenced by an interest in TCM-based care? How would you score your ulcer-related pain using the Numerical Rating Scale (NRS)? The NRS is a simple patient-reported metric widely adopted for quantifying pain intensity. Individuals assign a score from 0 to 10 based on their subjective pain perception, allowing their symptoms to be converted into measurable clinical information. The 10-point system is interpreted as follows: 0 represents no discomfort; 1–3 denotes mild pain (little to no disruption of daily life or sleep); 4–6 reflects moderate pain (sleep disturbances are common); and 7–10 indicates severe pain (significant sleep interference with notable physical and emotional strain) [28].

The third part examined dietary habits in RAS patients. In alignment with the Dietary Guidelines for Chinese Residents [29] published by the Chinese Nutrition Society, participants were asked about the intake frequency of fruits, vegetables, spicy items, and fried foods. Intake patterns were recorded according to three categories: regular (≥4 times/week), occasional (1–3 times/week), and none or rare consumption.

The fourth portion assessed psychological conditions and quality of life. Anxiety severity during the prior month was measured using the Generalized Anxiety Disorder-7 (GAD-7). This tool comprises 7 questions, each scored from 0 to 3 (0 = not at all; 3 = almost daily), producing total scores between 0 and 21. Higher scores correspond to greater anxiety. Totals of 0–4 reflect non-clinical levels, while scores ≥5 indicate clinically relevant anxiety [30]. Depressive symptoms were evaluated using the Patient Health Questionnaire-9 (PHQ-9), which contains 9 items scored 0–3 and yields a total range of 0–27. Scores of 0–4 indicate normal mood status; values ≥5 suggest clinically significant depression, with higher totals signaling more serious depression [31]. Oral health–related quality of life was measured using the Oral Health Impact Profile-14 (OHIP-14), a scale consisting of 14 questions across seven domains, each offering 5 response categories. Item scores fall between 0 and 4, producing total scores of 0–56, where higher totals correspond to poorer OHRQoL [32].

Statistical analysis

All statistical procedures were conducted with SPSS 27.0 (IBM SPSS Statistics, USA). Continuous variables are presented as mean ± standard deviation (SD), while categorical variables are shown as percentages. Univariate logistic regression models were first applied to detect potential predictors of

psychological stress, using $p < 0.05$ as a screening cutoff. Variables lacking significance were excluded in subsequent multivariate analyses. Multivariate results with $p < 0.05$ were considered significant. Associations were expressed through odds ratios (OR). Multiple linear regression was used to analyze OHIP-14 scores for RAS patients, as well as GAD-7 and PHQ-9 scores among participants exhibiting clinically meaningful anxiety or depression. Beta coefficients and 95% confidence intervals were computed for all models.

Results and Discussion

Of the 400 digital and paper questionnaires distributed to individuals with RAS, 42 were excluded. Baseline demographic and clinical information appears in **Table 1**. Most respondents were within the 35–64 age bracket, and the male-to-female distribution was 148:210. Married participants represented 38.55%, whereas 61.45% were unmarried. Regarding employment, 27.65% worked in state-owned organizations, 27.09% in private companies, 26.26% were self-employed, and 18.99% were retirees. Educationally, 46.65% held a bachelor's degree. Smokers accounted for 18.16%, and alcohol users for 14.80%.

Only 3.63% reported absence of pain, while 80 participants experienced severe discomfort (NRS ≥7). A total of 106 individuals (29.61%) had ulcer diameters greater than 1 cm. Among the group, 55.03% reported ≥7 episodes annually, and 72 participants experienced ulcers lasting ≥14 days. More than half sought treatment involving TCM methods (66.20%).

With respect to diet, 213 respondents (59.49%) consumed fried foods 1–3 times per week. Meanwhile, 55 individuals (15.36%) never consumed spicy foods, 43 (12.01%) avoided vegetables, and 86 (18.16%) consumed fruits ≥4 times weekly. Using a GAD-7 threshold of ≥5, the overall anxiety rate was 49.16% (176/358), including 128 mild, 30 moderate, and 18 severe cases **(Table 2).** For depression (PHQ-9 ≥5), 103 participants (28.77%) met criteria, consisting of 67 mild, 19 moderate, and 17 severe cases. The mean OHIP-14 score for the cohort was 21.06 ± 8.39.

Table 1. Basic demographic details of the study cohort.

Variable	Category	n (%)
Gender	Male	148 (41.34%)
	Female	210 (58.66%)
Age (years)	18–34	100 (27.93%)
	35–64	139 (38.83%)
	≥65	119 (33.24%)
Marital status	Married	138 (38.55%)
	Single	220 (61.45%)
Occupation	State-owned enterprise	99 (27.65%)
	Private enterprise	97 (27.09%)
	Freelance/self-employed	94 (26.26%)
	Retired	68 (18.99%)
Educational attainment	Middle school or below	115 (32.12%)
	Bachelor's degree	167 (46.65%)
	Master's degree or higher	76 (21.23%)
Socioeconomic status	Low	90 (25.14%)
	Middle	104 (29.05%)
	High	164 (45.81%)
Smoking status	Current smoker	65 (18.16%)
Alcohol consumption	Current drinker	53 (14.80%)
Pain intensity (Numerical Rating Scale 0–10)	No pain (NRS = 0)	13 (3.63%)
	Mild pain (NRS 1–3)	126 (35.19%)
	Moderate pain (NRS 4–6)	139 (38.83%)
	Severe pain (NRS 7–10)	80 (22.35%)
Ulcer diameter	≤1 cm	252 (70.39%)
	>1 cm	106 (29.61%)
Annual recurrence frequency	<7 episodes/year	161 (44.97%)
	≥7 episodes/year	197 (55.03%)
Typical ulcer duration	<14 days	286 (79.89%)
	≥14 days	72 (20.11%)
Preference for Traditional Chinese Medicine interventions	Yes	237 (66.20%)

Frequency of fried food consumption	Never/seldom	71 (19.83%)
	Sometimes	213 (59.49%)
	Often	74 (20.67%)
Frequency of spicy food consumption	Never/seldom	55 (15.36%)
	Sometimes	210 (58.66%)
	Often	93 (25.98%)
Frequency of vegetable intake	Never/seldom	43 (12.01%)
	Sometimes	221 (61.73%)
	Often	94 (26.26%)
Frequency of fruit intake	Never/seldom	103 (34.92%)
	Sometimes	169 (46.93%)
	Often	86 (18.16%)

Table 2. Distribution of anxiety, depression, and OHRQoL scores in the enrolled patients.

Psychological and Quality-of-Life Measures	Category / Score Level	Mean ± SD	n (%)
Anxiety (GAD-7)	No anxiety	1.91 ± 1.13	182 (50.84%)
	Mild anxiety	6.84 ± 1.26	128 (35.75%)
	Moderate anxiety	11.73 ± 1.31	30 (8.38%)
	Moderately severe anxiety	17.33 ± 1.64	18 (5.03%)
	Severe anxiety	–	0 (0%)
Depression (PHQ-9)	No depression	2.11 ± 0.84	255 (71.23%)
	Mild depression	6.97 ± 1.25	67 (18.72%)
	Moderate depression	11.79 ± 1.32	19 (5.31%)
	Moderately severe depression	16.35 ± 1.22	17 (4.75%)
	Severe depression	–	0 (0%)
Oral Health-Related Quality of Life (OHIP-14)	Total score (all participants)	21.06 ± 8.39	–

To determine which variables influenced the presence of anxiety and depression, we initially used univariate logistic models to screen candidates **(Tables 3 and 4)**. After adjustment in multivariate analyses, several independent contributors to anxiety were identified: ulcer episodes lasting longer periods (OR: 11.95, $p < 0.001$) and choosing TCM-related treatments (OR: 13.20, $p < 0.001$). Anxiety likelihood also increased among individuals who frequently consumed fried foods (OR: 3.88, $p = 0.006$) or reported moderate fruit intake (OR: 3.70, $p < 0.001$). In contrast, ulcers exceeding 1 cm in diameter (OR: 0.29, $p = 0.004$) lowered the odds of anxiety. Regarding depression, risk was elevated among those aged 35–64 (OR: 2.38, $p = 0.049$) and 65+ (OR: 2.74, $p = 0.029$), those with ulcer durations ≥2 weeks (OR: 5.14, $p < 0.001$), those preferring TCM care (OR: 6.51, $p = 0.005$), individuals eating fried food 1–3 times weekly (OR: 13.20, $p < 0.001$) or ≥3 times weekly (OR: 13.20, $p < 0.001$), and those consuming vegetables ≥4 times per week (OR: 19.53, $p < 0.001$). The notably higher depression rates in the 35–64 (OR: 2.38, $p = 0.049$) and ≥65 (OR: 2.74, $p = 0.029$) groups may reflect an interplay of psychosocial demands and age-related biological decline [33].

Table 3. Variables associated with anxiety occurrence.

Variable	Reference Category	Multivariable Analysis		Univariable Analysis	
		p-value	OR (95% CI)	p-value	OR (95% CI)
Gender	Female	0.291	1.361 (0.768–2.413)	<0.001*	2.237 (1.456–3.438)
Age (years)	18–34				
35–64		–	–	0.529	0.847 (0.506–1.419)
≥65		–	–	0.220	1.396 (0.818–2.381)
Marital status	Married	–	–	0.182	1.338 (0.873–2.050)
Occupation	State-owned units				

Private enterprise		–	–	0.872	0.955 (0.543–1.678)
Freelance/self-employed		–	–	0.051	1.763 (0.996–3.119)
Retired		–	–	0.372	1.326 (0.714–2.462)
Education	Middle school or below				
Bachelor's degree		–	–	0.742	0.909 (0.517–1.600)
Master's or higher		–	–	0.247	0.737 (0.440–1.235)
Socioeconomic status	Low				
Middle		–	–	0.072	1.555 (0.961–2.515)
High		0.167	1.708 (0.799–3.652)	<0.001*	2.177 (1.207–3.929)
Smoking	No	0.091	1.859 (0.905–3.822)	0.029*	1.847 (1.066–3.201)
Alcohol consumption	No	–	–	0.134	0.635 (0.350–1.151)
Ulcer diameter	≤1 cm	0.004*	0.295 (0.130–0.670)	<0.001*	2.254 (1.413–3.595)
Recurrence frequency	<7 episodes/year	0.714	1.154 (0.537–2.479)	<0.001*	3.387 (2.187–5.245)
Ulcer duration	<14 days	<0.001*	11.946 (5.069–28.151)	<0.001*	7.328 (3.775–14.223)
Preference for TCM interventions	No	<0.001*	13.201 (4.847–35.956)	<0.001*	6.300 (3.791–10.469)
Pain intensity (NRS)	NRS = 0 (no pain)				
Mild pain (NRS 1–3)		–	–	0.055	4.543 (0.967–21.341)
Moderate pain (NRS 4–6)		0.274	3.704 (0.354–38.736)	0.013*	7.033 (1.503–32.918)
Severe pain (NRS 7–10)		0.769	1.429 (0.133–15.383)	0.039*	5.232 (1.089–25.125)
Fried food intake	Never/seldom				
Sometimes		0.123	1.900 (0.841–4.296)	<0.001*	2.623 (1.465–4.697)
Often		0.006*	3.877 (1.489–10.100)	<0.001*	4.708 (2.329–9.515)
Spicy food intake	Never/seldom				
Sometimes		–	–	0.995	0.998 (0.551–1.808)
Often		–	–	0.965	1.015 (0.521–1.977)
Vegetable intake	Never/seldom				
Sometimes		–	–	0.250	0.681 (0.354–1.311)
Often		–	–	0.101	1.849 (0.887–3.855)
Fruit intake	Never/seldom				
Sometimes		<0.001*	3.703 (1.984–6.911)	0.002*	2.219 (1.353–3.639)

Often		–	–	0.142	1.543 (0.864–2.754)

*p < 0.05 indicates statistical relevance.

Table 4. Variables associated with depression occurrence.

Variable	**Reference Category**	**Multivariable Analysis**		**Univariable Analysis**	
		p-value	OR (95% CI)	p-value	OR (95% CI)
Gender	Female	–	–	0.295	1.280 (0.806–2.031)
Age (years)	18–34				
35–64		0.049*	2.382 (1.006–5.642)	0.030*	1.975 (1.068–3.650)
≥65		0.029*	2.740 (1.106–6.788)	0.016*	2.159 (1.152–4.044)
Marital status	Married	–	–	0.375	0.806 (0.501–1.298)
Occupation	State-owned units				
Private enterprise		–	–	0.805	1.084 (0.573–2.052)
Freelance/self-employed		–	–	0.306	1.388 (0.741–2.598)
Retired		–	–	0.317	1.416 (0.717–2.797)
Socioeconomic status	Low				
Middle		–	–	0.574	0.842 (0.464–1.531)
High		0.814	0.907 (0.403–2.041)	0.036*	0.547 (0.311–0.961)
Education	Middle school or below				
Bachelor’s degree		–	–	0.662	1.125 (0.662–1.911)
Master’s or higher		–	–	0.620	1.176 (0.620–2.229)
Smoking	No	–	–	0.464	1.228 (0.688–2.191)
Alcohol consumption	No	–	–	0.935	0.973 (0.510–1.859)
Ulcer diameter	≤1 cm	0.994	0.996 (0.362–2.744)	<0.001*	5.934 (3.590–9.809)
Recurrence frequency	<7 episodes/year	0.215	1.763 (0.720–4.317)	<0.001*	6.029 (3.425–10.613)
Ulcer duration	<14 days	<0.001*	5.136 (1.960–13.458)	<0.001*	8.400 (4.743–14.875)
Preference for TCM interventions	No	0.005*	6.515 (1.749–24.265)	<0.001*	4.596 (2.482–8.509)
Pain intensity (NRS)	NRS = 0 (no pain)				
Mild pain (NRS 1–3)		–	–	0.807	1.183 (0.307–4.562)
Moderate pain (NRS 4–6)		–	–	0.239	0.434 (0.108–1.743)
Severe pain (NRS 7–10)		0.491	2.355 (0.206–26.881)	0.011*	5.862 (1.492–23.032)
Fried food intake	Never/seldom				
Sometimes		0.244	2.016 (0.619–6.564)	0.006*	2.893 (1.355–6.178)

Often		0.683	0.770 (0.219–2.702)	<0.001*	4.966 (2.149–11.480)
Spicy food intake	Never/seldom				
Sometimes		–	–	0.509	1.262 (0.633–2.519)
Often		–	–	0.214	1.615 (0.758–3.443)
Vegetable intake	Never/seldom				
Sometimes		–	–	0.336	1.629 (0.602–4.403)
Often		<0.001*	19.530 (5.359–71.179)	<0.001*	12.811 (4.611–35.596)
Fruit intake	Never/seldom				
Sometimes		–	–	0.643	1.135 (0.665–1.939)
Often		–	–	0.977	1.009 (0.533–1.912)

*p < 0.05 indicates statistical relevance.

To investigate what drives anxiety severity among those already meeting the diagnostic threshold (GAD-7 ≥5), we applied univariate logistic regression within this subgroup **(Table 5)**. Dietary behaviors dominated the significant findings. Patients who consumed fruit ≥4 times weekly displayed markedly higher anxiety intensity (B: 3.42, $p < 0.001$) relative to those consuming fruit rarely or up to 1–3 times weekly. Conversely, steady vegetable consumption was tied to milder anxiety symptoms, and moderate spicy-food intake (B: −1.18, $p = 0.004$) also appeared to mitigate anxiety levels.

Table 5. Predictors of heightened anxiety severity.

Variable	**Reference Category**	**Multivariable Linear Regression**		**Univariable Linear Regression**	
		p-value	B (95% CI)	p-value	B (95% CI)
Gender	Female	–	–	0.347	0.523 (−0.571 to 1.617)
Age (years)	18–34				
35–64		–	–	0.106	−1.145 (−2.538 to 0.248)
≥65		–	–	0.080	−1.216 (−2.581 to 0.149)
Marital status	Married	–	–	0.280	−0.608 (−1.715 to 0.499)
Occupation	State-owned units				
Private enterprise		–	–	0.928	0.070 (−1.473 to 1.614)
Freelance/self-employed		–	–	0.083	−1.277 (−2.724 to 0.170)
Retired		0.935	0.028 (−0.661 to 0.718)	0.033*	−1.763 (−3.383 to −0.143)
Socioeconomic status	Low				
Middle		–	–	0.268	0.813 (−0.630 to 2.256)

High		–	–	0.772	−0.197 (−1.536 to 1.142)
Education	Middle school or below				
Bachelor's degree		0.948	0.023 (−0.702 to 0.657)	0.031*	−1.437 (−2.742 to −0.133)
Master's or higher		0.593	−0.212 (−0.993 to 0.569)	0.006*	−2.112 (−3.606 to −0.617)
Smoking	No	–	–	0.725	0.234 (−1.074 to 1.542)
Alcohol consumption	No	–	–	0.513	0.561 (−1.129 to 2.250)
Ulcer diameter	≤1 cm	–	–	0.315	−0.575 (−1.701 to 0.551)
Recurrence frequency	<7 episodes/year	0.732	0.117 (−0.557 to 0.792)	<0.001*	2.577 (1.446 to 3.708)
Ulcer duration	<14 days	–	–	0.185	−0.775 (−1.926 to 0.376)
Preference for TCM interventions	No	0.558	0.320 (−0.757 to 1.398)	0.005*	2.182 (0.672 to 3.692)
Pain intensity (NRS)	NRS = 0 (no pain)				
Mild pain (NRS 1–3)		–	–	0.809	0.553 (−3.962 to 5.068)
Moderate pain (NRS 4–6)		–	–	0.415	1.859 (−2.635 to 6.353)
Severe pain (NRS 7–10)		0.267	0.542 (−0.420 to 1.504)	0.016*	5.603 (1.052 to 10.153)
Fried food intake	Never/seldom				
Sometimes		–	–	0.373	0.685 (−0.829 to 2.199)
Often		0.650	−0.196 (−1.046 to 0.655)	<0.001*	4.854 (3.199 to 6.509)
Spicy food intake	Never/seldom				
Sometimes		0.004*	−1.181 (−1.971 to −0.391)	<0.001*	−4.017 (−5.250 to −2.784)
Often		–	–	0.186	0.931 (−0.451 to 2.313)
Vegetable intake	Never/seldom				
Sometimes		<0.001*	−4.174 (−5.579 to −2.767)	<0.001*	−7.958 (−8.992 to −6.923)
Often		<0.001*	−4.820 (−6.444 to −3.195)	<0.001*	−9.563 (−10.644 to −8.482)
Fruit intake	Never/seldom				
Sometimes		–	–	0.065	0.683 (−0.043 to 1.409)

Often		<0.001*	3.418 (2.273 to 4.563)	<0.001*	7.464 (6.612 to 8.316)

*p < 0.05 indicates statistical relevance.

Among individuals with PHQ-9 scores ≥5, multivariate modeling was used to identify factors affecting depression severity after univariate screening **(Table 6)**. Larger ulcer size (>1 cm; B = 2.09, p = 0.02), ≥7 ulcer recurrences annually (B = 4.74, p < 0.001), and frequent fried-food consumption (B = 2.19, p = 0.002) all intensified depressive symptoms. Meanwhile, choosing TCM-based management (B = −3.70, p = 0.023) and vegetable intake ≥4 times per week (B = −3.33, p < 0.001) showed a protective association against worsening depression.

Table 6. Predictors of worsening depression.

Variable	**Reference Category**	**Multivariable Linear Regression**		**Univariable Linear Regression**	
		p-value	B (95% CI)	p-value	B (95% CI)
Gender	Female	–	–	0.068	−1.376 (−2.856 to 0.104)
Age (years)	18–34				
35–64		–	–	0.894	0.141 (−1.945 to 2.228)
≥65		–	–	0.495	0.141 (−2.849 to 1.386)
Marital status	Married	–	–	0.654	0.355 (−1.215 to 1.926)
Occupation	State-owned units				
Private enterprise		–	–	0.491	−0.740 (−2.864 to 1.384)
Freelance/self-employed		–	–	0.590	0.560 (−1.494 to 2.614)
Retired		–	–	0.424	0.896 (−1.321 to 3.113)
Socioeconomic status	Low				
Middle		–	–	0.270	−1.042 (−2.905 to 0.822)
High		–	–	0.062	−1.717 (−3.519 to 0.085)
Education	Middle school or below				
Bachelor's degree		–	–	0.390	0.741 (−0.960 to 2.441)
Master's or higher		0.167	1.003 (−0.426 to 2.432)	0.014*	2.560 (0.520 to 4.599)
Smoking	No	–	–	0.291	−0.991 (−2.841 to 0.859)
Alcohol consumption	No	–	–	0.949	0.069 (−2.056 to 2.194)
Ulcer diameter	≤1 cm	0.017*	2.092 (0.377 to 3.806)	0.001*	2.378 (0.938 to 3.819)
Recurrence frequency	<7 episodes/year	<0.001*	4.743 (2.386 to 7.100)	0.003*	2.918 (1.030 to 4.805)

Ulcer duration	<14 days	0.190	1.056 (−0.533 to 2.645)	0.031*	1.616 (0.148 to 3.084)
Preference for TCM interventions	No	0.023*	−3.703 (−6.876 to −0.529)	0.010*	2.787 (0.669 to 4.903)
Pain intensity (NRS)	NRS = 0 (no pain)				
Mild pain (NRS 1–3)		–	–	0.596	−1.121 (−5.302 to 3.060)
Moderate pain (NRS 4–6)		–	–	0.266	−2.458 (−6.821 to 1.904)
Severe pain (NRS 7–10)		–	–	0.429	1.647 (−2.472 to 5.766)
Fried food intake	Never/seldom				
Sometimes		–	–	0.599	0.683 (−1.889 to 3.255)
Often		0.002*	2.186 (0.796 to 3.576)	0.019*	3.290 (0.557 to 6.024)
Spicy food intake	Never/seldom				
Sometimes		–	–	0.246	0.282 (−1.993 to 2.556)
Often		–	–	0.163	−1.737 (−4.189 to 0.716)
Vegetable intake	Never/seldom				
Sometimes		–	–	0.657	0.495 (−1.711 to 2.699)
Often		<0.001*	−3.335 (−4.723 to −1.946)	0.023*	−2.489 (−4.629 to −0.348)
Fruit intake	Never/seldom				
Sometimes		–	–	0.353	−0.827 (−2.584 to 0.931)
Often		–	–	0.809	−0.258 (−2.367 to 1.851)

*p < 0.05 indicates statistical relevance.

Prolonged ulcer duration (B = 3.44, p < 0.001), selecting TCM therapy (B = 2.08, p = 0.022), elevated pain ratings, frequent fried-food consumption (B = 2.68, p = 0.004), and moderate fruit intake (1–3 times weekly) (B = 1.39, p = 0.019) independently contributed to poorer OHRQoL **(Table 7).** The overall influence of all significant variables on anxiety, depression, and OHRQoL is outlined in **Table 8.**

Table 7. Contributors to OHRQoL impairment.

Independent Variable	Reference Category	B	Std. Error	β (Standardized)	95% CI for B	p-value	t
Gender	Female	0.880141	0.550946	0.051709	−0.203681 to 1.963966	0.111112	1.597508
Marital status	Married	0.295392	0.499336	0.017152	−0.686902 to 1.277686	0.554545	0.591570
Age (years)	18–34						
35–64		−0.926488	0.604860	−0.053870	−2.116370 to 0.263394	0.126548	−1.531739

≥65		0.624415	0.667101	0.035093	−0.687906 to 1.936736	0.349953	0.936013
Occupation	State-owned units						
Private enterprise		−0.880721	0.663	−0.043	−2.108 to 0.347	0.226	−1.213
Freelance/self-employed		0.070763	0.663	0.012	−1.075 to 1.217	0.729	0.347
Retired		−1.145711	0.783	−0.053617	−2.686736 to 0.395314	0.144542	−1.462562
Socioeconomic status	Low						
Middle		0.254468	0.675586	0.013783	−1.074545 to 1.583481	0.706667	0.376663
High		0.093926	0.627	0.005583	−1.141085 to 1.328937	0.881163	0.149611
Education level	Middle school or below						
Bachelor's degree		−0.176121	0.563971	−0.010482	−1.285565 to 0.933323	0.755019	−0.312288
Master's or higher		0.024340	0.689890	0.001187	−1.332812 to 1.381492	0.971877	0.035281
Smoking	No	0.326573	0.639565	0.015019	−0.931580 to 1.584726	0.609961	0.510617
Alcohol consumption	No	−0.442068	0.698903	−0.018731	−1.816950 to 0.932814	0.527489	−0.632516
Ulcer diameter	≤1 cm	−1.286967	0.855645	−0.070096	−2.970193 to 0.396259	0.133517	−1.504091
Recurrence frequency	<7 episodes/year	0.359289	0.796122	0.021324	−1.206844 to 1.925422	0.652072	0.451298
Ulcer duration	<14 days	3.442	0.878	0.165	1.716 to 5.168	<0.001*	3.922
Preference for TCM interventions	No	2.077	0.904	0.117	0.298 to 3.856	0.022*	2.296
Pain intensity (NRS)	NRS = 0 (no pain)						
Mild pain (NRS 1–3)		4.505459	1.395743	0.256710	1.759751 to 7.251167	0.001372*	3.227999
Moderate pain (NRS 4–6)		12.376157	1.495251	0.719597	9.434698 to 15.317616	<0.001*	8.276976
Severe pain (NRS 7–10)		18.901399	1.525620	0.939368	15.900197 to 21.902601	<0.001*	12.389319
Fried food intake	Never/seldom						
Sometimes		1.447813	0.793901	0.084793	−0.113950 to 3.009576	0.069109	1.823669
Often		2.684344	0.912800	0.129684	0.888683 to 4.480005	0.003506*	2.940779
Spicy food intake	Never/seldom						
Sometimes		−1.394341	0.842936	−0.081919	−3.052566 to 0.263884	0.099051	−1.654148
Often		−0.449115	0.921043	−0.023496	−2.260991 to 1.362761	0.626147	−0.487615
Vegetable intake	Never/seldom						
Sometimes		−1.132621	0.922951	−0.065677	−2.948251 to 0.683009	0.220635	−1.227174

Often		−1.884366	0.998163	−0.098925	−3.847953 to 0.079221	0.059928	−1.887833
Fruit intake	Never/seldom						
Sometimes		1.388838	0.587050	0.082629	0.233992 to 2.543684	0.018571*	2.365790
Often		1.360459	0.731759	0.068496	−0.079057 to 2.799975	0.063897	1.859164

*p < 0.05 indicates statistical relevance.

Table 8. Summary of determinants impacting anxiety, depression, and OHRQoL.

Variable	Occurrence of Depression	Occurrence of Anxiety	Elevated Depression Symptoms	Elevated Anxiety Symptoms	Impaired OHRQoL
Age (years)					
35–64	△				
≥65	△				
Ulcer diameter (>1 cm)		○		△	
Recurrence frequency (≥7 episodes/year)			△		
Ulcer duration (≥14 days)	△	△			△
Preference for TCM interventions	△	△	○		△
Pain intensity (NRS)					
Mild pain (NRS 1–3)					△
Moderate pain (NRS 4–6)					△
Severe pain (NRS 7–10)					△
Fried food intake (Often)		△	△	△	△
Spicy food intake (Sometimes)				○	
Vegetable intake					
Sometimes				○	
Often	△		○	○	
Fruit intake					
Sometimes		△			△
Often			△		

△ = risk factor; ○ = protective factor.

This cross-sectional investigation provides a systematic overview of anxiety, depression, and compromised OHRQoL among individuals with RAS. Using standardized self-reported measures, and by uniquely integrating variables such as dietary patterns, ulcer features, pain intensity, and inclination toward TCM-based care, we clarified the multivariable relationships linking these factors with psychological disturbances (anxiety/depression) and OHRQoL outcomes.

The analysis revealed that extended ulcer persistence and a tendency to pursue TCM were common contributors that markedly increased the likelihood of both anxiety and depressive manifestations in the RAS cohort. Similar trends have been documented in chronic oral disorders like BMS, where patients—even those lacking classical burning sensations—present comparable levels of anxiety and depressive comorbidities driven by BMS-related orofacial functional disruption (e.g., taste alteration or masticatory dysfunction), mirroring the mental health burden observed in those with typical burning pain [34]. Our data indicate that long-lasting ulcers may heighten psychological vulnerability through cumulative impacts of sustained oral dysfunction (e.g., speech or swallowing issues persisting beyond >14 days). Because participants were recruited from a TCM institution, many naturally exhibited a preference for traditional therapies. In this study, TCM inclination was strongly linked to greater risks of anxiety and

depression in those with RAS. To our knowledge, this is the first work to examine how TCM preference relates to mental health in the RAS population. A nationwide survey across 31 provincial capitals in China (N = 31,599 completing full treatment pathways) showed that the public widely regarded TCM as beneficial throughout the disease course, especially for prevention, pain control, and improving life quality. Furthermore, individuals treated at TCM hospitals displayed more favorable views of TCM compared with those from other healthcare settings [21]. Another discrete-choice experiment spanning six provinces (N = 2,019 residents) found stronger preferences for TCM therapies in hypothetical severe chronic disease scenarios [35]. We suggest that RAS patients turn to TCM due to dissatisfaction with conventional care and distress caused by functional limitations. These individuals may carry heavier emotional loads, resembling patterns seen in other persistent illnesses with limited therapeutic success, such as refractory atrial fibrillation, where recurrent symptoms, repeated treatment setbacks, and unpredictable episodes contribute to heightened anxiety and depression [36, 37]. Yet among RAS patients already experiencing depressive symptoms, a preference for TCM appeared to reduce overall depression severity, likely influenced by positive expectations regarding TCM effectiveness, as expectancy-based benefits are known to alleviate emotional strain [38, 39].

Regarding RAS-related attributes, our study noted that greater ulcer diameter intensified depressive symptoms among RAS patients with established depression. People living with chronic disorders commonly face significant psychological strain due to long disease duration, repeated flare-ups, and subsequent limitations on daily functioning [40]. Depression severity frequently correlates with long-term illnesses such as diabetes, pulmonary disease, cardiovascular conditions, and arthritis [41], and individuals with noncommunicable chronic diseases often present with more severe depressive symptoms than those with communicable disorders [42]. Larger ulcers hinder oral activity and disrupt everyday routines, thereby worsening depression. In our findings, frequent recurrences were associated with more intense depressive symptoms, consistent with prior literature. This pattern likely arises from the disease's recurring nature, ongoing discomfort, repeated relapses, and less-than-ideal treatment responses, all of which reinforce a sense of low control over the condition and heighten psychological distress [43]. Similar relationships between recurring symptoms and negative emotional states are seen in chronic obstructive pulmonary disease and systemic lupus erythematosus [44]. Notably, ulcer diameter was identified as a protective element against developing anxiety, potentially because larger lesions prompt increased medical consultation. This aligns with problem-focused coping strategies, which epidemiological data link to lower psychological morbidity in chronic illness populations [45].

Notably, this work further clarified how different eating patterns influence emotional comorbidities. Frequent intake of fried foods was linked to a marked rise in anxiety risk and to worsening depressive intensity. A large nationwide cohort (n = 140,728) reported that habitual consumption of fried potato items was tied to a 12% higher likelihood of anxiety disorders [hazard ratio (HR): 1.12; 95% CI: 1.06–1.18; $p < 0.001$ for trend] and a 7% increase in depressive symptoms (HR = 1.07, 95% CI: 1.02–1.12; $p < 0.001$ for trend) [46]. In line with these results, limiting fried foods should be emphasized for RAS patients, especially those presenting both anxiety and depression.

Our findings also showed that greater fruit consumption frequency correlated with higher anxiety incidence among RAS individuals and intensified anxiety among those already diagnosed. This observation differs from earlier studies—for example, HEI-2020 data, which associated nutrient-dense diets (higher in fruits/vegetables and lower in added sugars) with a reduced anxiety risk [47]. Importantly, 52.6% of Chinese respondents reported intentionally increasing fruit intake during ulcer flare-ups, likely due to assumptions that fruit-derived micronutrients and hydration support mucosal repair [48]. A reasonable interpretation is that frequent fruit snacking during symptomatic periods may aggravate oral pain due to mechanical irritation during chewing and swallowing, subsequently heightening emotional distress. Additionally, certain fruit types—including oranges, lemons, and pineapples—have been implicated in triggering inflammatory pathways and worsening RAS manifestations [49]. Symptom aggravation from these fruits may therefore contribute to anxiety or emotional disturbances.

The results also indicated that spicy food intake may offer some degree of anxiety relief. Spicy flavors are widely consumed worldwide; for example, in China, more than 30% of adults eat spicy dishes daily [50]. Research on taste–emotion associations has shown that spicy flavors are second only to sweetness in their connection to positive emotional descriptors [51], which may partly explain their potential protective effect against anxiety.

In this study, higher-frequency vegetable intake reduced depressive severity in RAS patients with depression and lowered anxiety levels in those diagnosed with anxiety disorders. This corresponds with previous evidence showing that a 12-week vegetable-enhancement intervention can significantly reduce depressive symptoms, demonstrating therapeutic benefits for clinically depressed groups [13]. Additional studies have linked vegetable consumption with decreased anxiety and depression, and plant-forward diets enriched with vegetables and omega-3 fatty acids have been associated with improved emotional health [52].

Interestingly, frequent vegetable consumption also appeared to increase the likelihood of depression in our RAS sample. We suggest that repetitive exposure of high-fiber vegetables to ulcerated areas may cause friction-induced irritation, adding to emotional strain. Another possible explanation is that RAS patients may hold strong expectations about vegetables' healing properties; such experience-shaped dietary adherence—where individuals choose foods based on perceived therapeutic benefit—often coexists with negative emotional states [53].

Overall, these findings highlight the need for individualized dietary strategies, particularly for patients dealing with chronic oral inflammatory disorders. In clinical management of RAS, nutritional advice should fully integrate (1) current disease activity (e.g., active lesion stages), (2) characteristics of the foods eaten (including preparation techniques), and (3) patients' personal beliefs and interpretations of food effects. Future longitudinal cohort studies are warranted to delineate how dietary habits influence psychological outcomes in individuals with RAS.

OHRQoL is used to assess how oral conditions influence an individual's overall health experience, encompassing functional, emotional, and social dimensions [54]. Oral health status shows a strong correlation with OHRQoL [55]. In this study, pain was a major determinant of diminished OHRQoL among RAS patients, suggesting that RAS-associated discomfort substantially interferes with their sense of well-being. Recurrent painful oral ulcers can impair chewing, swallowing, and speech, leading to pronounced reductions in daily functioning and quality of life [56]. Our results also suggest that omega-3 polyunsaturated fatty acids may offer pain-relieving benefits through anti-inflammatory activity by lowering inflammatory mediators (e.g., cytokines, eicosanoids, C-reactive protein [CRP]), which may in turn enhance OHRQoL by alleviating RAS-related pain [57]. Frequent consumption of fried foods was similarly linked to poorer OHRQoL, consistent with earlier work demonstrating that fast-food habits are associated with elevated stress and more severe suicidal ideation [58]. Patients who sought traditional medical approaches also presented with lower OHRQoL. We propose that this may stem from dissatisfaction with previous conventional treatments, heightening psychological strain [59], and creating a negative feedback loop between treatment expectations and perceived life quality. For individuals receiving care in TCM-oriented settings, it is especially important to clarify the natural course of RAS, manage treatment expectations, and encourage a balanced understanding of traditional therapy outcomes. Although moderate fruit intake is usually seen as health-promoting, this study found it related to worse OHRQoL. This may be attributable to local irritant effects of highly acidic fruits (e.g., citrus). Acidic foods can lower oral pH, disrupt mucosal protection, and aggravate ulcer discomfort. These observations highlight the need for personalized recommendations regarding fruit choices—for instance, favoring low-acid fruits like apples or bananas.

Given methodological constraints, these findings should be interpreted carefully. The relatively small sample size may limit statistical robustness. Additionally, conducting the study in a single center within one national group restricts external validity. Reliance on self-reported instruments also introduces subjective bias, which may lead to under- or overestimation of anxiety/depression and influence disease severity assessment. Thus, careful consideration of these sources of error is needed when applying the results clinically or academically. Despite these shortcomings, this research provides the first systematic assessment of multiple determinants shaping anxiety, depressive symptoms, and OHRQoL in RAS patients, offering new insights for the field.

The results point to the importance of adopting a whole-person perspective in oral healthcare, emphasizing the integration of psychological assessment rather than limiting care to localized oral symptoms. When treating RAS patients, clinicians should prioritize evaluation and management of mental health factors to support improvements in both oral condition and daily functioning. Future prospective studies are needed to confirm these findings and enhance the clinical application of this work. Importantly, this research is the first comprehensive examination of multidimensional influences on anxiety, depression, and OHRQoL in individuals with RAS, forming a conceptual basis for biopsychosocial approaches to disease management.

Conclusion

This study identifies ulcer-related features, eating behaviors, and reliance on traditional medicine as contributors to psychological distress and quality-of-life outcomes in individuals with RAS. Psychological distress appears to play a critical role in precipitating recurrent ulcer episodes. At the same time, continued ulcer recurrence can itself heighten psychological strain and reduce well-being, positioning psychological distress as a secondary consequence of RAS. Additional survey-based studies and clinical trials are needed to guide the design of targeted psychological interventions for RAS. Such approaches aim to enhance patients' mental health and QoL, reduce episode frequency, and ultimately improve clinical outcomes.

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