

Psychological Factors, Lifestyles, and Habits of Patients with Laryngopharyngeal Reflux: A Multicenter Survey

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ABSTRACT

Objective: Unhealthy lifestyles and eating habits, as well as psychological abnormalities, may play important roles in laryngopharyngeal reflux. Although changes to these risk factors are considered the first-line treatment for laryngopharyngeal reflux, there is no strong evidence to support the recommendation. Here, we examined the relationships between the above factors and laryngopharyngeal reflux.

Methods: We conducted a cross-sectional survey (ChiCTR-RRC-17012536) at the digestive endoscopy centers of 3 hospitals and recruited 320 participants (patients with laryngopharyngeal reflux: n = 123; control group: n = 197). All participants underwent gastroscopy and routine otolaryngology and completed the relevant questionnaires.

Results: No significant differences were observed between groups in terms of age, sex, marriage, body mass index, work, education, smoking, drinking, lying down immediately after meals, and lack of physical activity. Preferences for acidic food, porridge or soup, coffee drinking, an unbalanced diet, overeating, fasting, pre-bedtime dinner, anxiety, and depression were related to laryngopharyngeal reflux according to univariate logistic regression analysis (all $P < .05$). Multivariate logistic regression analysis revealed that drinking coffee, overeating, fast eating, dinner just before bedtime, anxiety, and depression were independent risk factors for laryngopharyngeal reflux (all $P < .05$, odds ratios 1.133, 1.172, 1.155, 1.345, 1.874, and 2.065, respectively). The anxiety score but not the depression score was positively correlated with the Reflux Symptom Index score (Spearman's $r = 0.627$, $P < .001$).

Conclusion: Certain adverse lifestyle factors, unhealthy eating habits, and mental factors (anxiety and depression) were related to the occurrence of laryngopharyngeal reflux.

Keywords: Laryngopharyngeal reflux, psychological factors, lifestyle, habits, multicenter survey

Introduction

Laryngopharyngeal reflux (LPR) is a syndrome that is caused by the retrograde flow of gastric contents into the throat, resulting in a variety of non-specific symptoms of the throat.¹ The incidence rate of LPR is increasing and the prevalence has been as high as 34.4% in the United Kingdom.² Unhealthy lifestyle factors and eating habits may be important risk factors for LPR.¹ Lifestyle changes are considered the first-line treatment for LPR and have been included in multinational practice guidelines.^{1,3} However, owing to the lack of strong evidence showing the relation of lifestyle and eating habits to this disease, the recommendations are mostly derived from the guidelines for

gastroesophageal reflux disease (GERD). Laryngopharyngeal reflux and GERD differ in many aspects,⁴ and certain lifestyle changes that are recommended for patients with GERD may not be suitable for those with LPR. To the best of our knowledge, lifestyle-related risk factors for LPR have been seldom explored. In addition, the role of abnormal mental factors (anxiety and depression) in GERD has been confirmed,⁵ and we speculate that they may play a similar role in LPR.

The diagnosis of LPR is challenging and its reported comorbidity rate with GERD is high: 47.9% of patients with GERD have LPR and 71% of patients with LPR have GERD.⁶ Therefore, to reflect the real-world situation of LPR more accurately, it is

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necessary to eliminate the interference of GERD. The use of the Gastroscopy and Gastroesophageal Reflux Questionnaire (GERD-Q) can eliminate some of the interference caused by comorbidity with GERD. In this study, we explored the relationship between lifestyle factors, eating habits, and mental factors (anxiety and depression) with LPR based on completing gastroscopy and the GERD-Q to provide an epidemiological basis for clinical research.

Methods

Participants and Study Design

This physician-blinded, prospective cohort study was conducted in the digestive endoscopy centers of the First and Second Affiliated Hospitals of Guangzhou Medical University and the First Affiliated Hospital of Guangdong Pharmaceutical University from 2018 to 2019. All participants were aged between 18 and 80 years, underwent gastroscopy and routine otolaryngology, and completed the relevant questionnaires. The participants were divided into 2 groups: those with LPR (negative gastroscopy results, a GERD-Q score < 8, and a Reflux Symptom Index [RSI] score > 13) and those without (control group: without typical symptoms of reflux, negative gastroscopy results, a GERD-Q score < 8, and an RSI score < 13). The control group comprised individuals who underwent routine health examinations at these digestive endoscopy centers. The exclusion criteria were as follows: previous respiratory or digestive tract surgery, respiratory or digestive tract tumors, upper respiratory tract disease in the past 2 weeks, and drug use in the past 2 weeks. This study was approved by the Ethics Committees of the earlier 3 hospitals and registered as a clinical trial (ChiCTR-RRC-17012536). Preliminary data for this clinical trial were previously published.⁷ All participants provided written informed consent.

Questionnaires and Related Definitions

We determined the survey content and constructed relevant definitions according to a previous study.⁸ The self-designed, structured questionnaire comprised questions related to demographic data and lifestyle and eating habits. We collected the following information on lifestyle and eating habits: smoking, drinking, physical exercise, lying down immediately after a meal (<30 minutes after eating), overeating, fast eating (<10 min/meal and chewing <10 times/bite), lack of breakfast, dinner just before bedtime (within 2 hours), unbalanced diet, and irregular eating habits. Food preference choices were as follows: dairy products, soy products, acidic foods, spicy

foods, fried and fatty foods, meat, sweets, fruits, vegetables, porridge or soup, noodles, pickled food (e.g., pickled cabbage), too-hot foods, hard foods, snacks, coffee, strong teas (>3 g of tea per cup), and carbonated drinks. "Preference" was defined as consumption on at least 3 days a week for more than 6 months.

The GERD-Q, consisting of 6 items, was used to screen for GERD. Participants were asked to recall the relevant symptoms over the previous 7 days and score themselves. The maximum total score was 18, and participants with a score ≥ 8 were considered to have GERD.⁹ The RSI, consisting of 9 items, has been widely used to screen for and assess the severity of LPR. The total RSI score ranges from 0 to 45, and participants with an RSI score > 13 were considered to have LPR.¹⁰ The Hospital Anxiety and Depression Scale (HADS), invented by Zigmond and Snaith,¹¹ was used to assess anxiety and depression (subscales A and D, respectively). Each subscale comprises 7 questions and the total score ranges from 0 to 21. Participants were asked to recall their feelings and/or behaviors in the past week. A HADS-A score > 10 was defined as suspected anxiety, and a HADS-D score > 7 was defined as suspected depression.¹²

Others

Gastroenterologists and otolaryngologists performed gastroscopy and routine otolaryngology (including laryngoscopy), respectively, on the participants without knowing their questionnaire scores. The gastroscopy-based diagnosis was based on the Los Angeles classification.¹³

Statistical Analysis

Statistical Package for the Social Sciences version 21.0 (IBM SPSS Corp.; Armonk, NY, USA) was used for calculation and statistical analysis. Means \pm standard deviations are used to represent data with normal or approximately normal distributions, and non-normally distributed variables are expressed as medians (upper and lower quartiles). Frequency-and-percentage pairs are used to describe the survey responses. The Mann-Whitney *U* test and chi-square (χ^2) test were used to compare measurement and count data, respectively. Logistic regression analysis (backward elimination) was used to explore the risk factors for LPR. Spearman rank correlation analysis was used to evaluate the degree of correlation. A *P* value < .05 was considered statistically significant.

Results

We included 320 participants in this study (123 cases and 197 controls; 159 males and 161 females; sex ratio 1:1.01). The mean ages of patients in the LPR and control groups were 49.5 ± 12.9 and 48.9 ± 12.7 years, respectively. The groups did not differ in terms of sex (*P* =.880) or age (*P* =.158). Additionally, the groups did not significantly differ in terms of education, smoking, drinking, lying down immediately after dinner, or lack of physical activity (Table 1). Univariate analysis of potentially related factors revealed that the proportions of patients with LPR were higher in terms of preference for acidic foods, preference for porridge or soup, drinking coffee, an unbalanced diet, overeating, fast eating, and eating dinner just before bedtime than those of participants in the control group (all *P* < .05) (Table 2).

Main Points

- The global incidence rate and prevalence rate of laryngopharyngeal reflux (LPR) have been increasing.
- Lifestyle changes are considered the first-line treatment for LPR, but there is no strong evidence to support this.
- This study explored the relationship between lifestyle factors, eating habits, and mental factors and LPR on the basis of eliminating the interference of gastroesophageal reflux disease.
- Certain adverse lifestyle factors, unhealthy eating habits, and mental factors (anxiety and depression) were related to the occurrence of LPR.

Table 1. Demography and Lifestyle Habits of Subjects by Group

Personal Histories	Number of Cases (%)		χ ² Value	P
	LPR Group (n=123)	Control Group (n=197)		
Age			1.993	.158
<40 years old	50 (40.65)	96 (48.73)		
≥40 years old	73 (59.35)	101 (51.27)		
BMI			0.718	.397
<24.0 kg/m ²	78 (63.41)	134 (68.02)		
≥24.0 kg/m ²	45 (36.59)	63 (31.98)		
Male	66 (53.66)	93 (47.21)	0.023	.880
Married	108 (87.80)	183 (92.89)	2.379	.123
Job (mental labor)	68 (55.28)	101 (51.27)	0.490	.484
Education level (senior school or above)	50 (40.65)	101 (51.27)	1.993	.158
Smoking	31 (25.20)	36 (18.27)	2.196	.138
Alcohol drinking	25 (20.33)	27 (13.71)	2.438	.118
Lying down immediately after a meal	37 (30.08)	53 (26.90)	0.378	.539
Lack of physical activity	36 (29.27)	60 (30.46)	0.051	.821
Unbalanced diets	50 (40.65)	46 (23.35)	10.792	.001*
Irregular eating habits	23 (18.70)	24 (12.18)	2.566	.109
Overeating	19 (15.45)	14 (7.11)	5.695	.017*
Fast eating	64 (52.03)	65 (32.99)	11.406	.001*
Frequent lack of breakfast	23 (18.70)	25 (12.69)	2.144	.143
Dinner just before bedtime	53 (43.09)	57 (28.93)	6.726	.010*

BMI, body mass index; LPR, laryngopharyngeal reflux disease.
*Significant at the level of $P < .05$.

The HADS-A and HADS-D scores of the LPR group (9 [2, 9] and 6 [4, 8], respectively) were higher than those of the control group (4 [0, 5] and 3 [0, 5], respectively); both differences were statistically significant (HADS-A: $z = -4.965, P = .001$; HADS-B: $z = -3.162, P = .001$). In the LPR group, the proportions of patients that were HADS-A-positive (>10 points; 33.3%) and HADS-D-positive (>8 points; 22.8%) were higher than those in the control group (17.3%, $P = .001$ and 10.2%, $P = .002$, respectively) (Table 3).

The HADS-A score was positively correlated with the RSI score (Spearman's $r = 0.627, P < .001$), but no correlation was detected between the HADS-D and RSI scores (Spearman's $r = 0.028, P = .755$). Logistic regression analysis revealed that drinking coffee, overeating, fast eating, eating dinner just before bedtime, the HADS-A score, and the HADS-D score were risk factors for LPR (all $P < .05$, odds ratios 1.133, 1.172, 1.155, 1.345, 1.874, and 2.065, respectively) (Table 4).

Table 2. Food Preference of Subjects by Group

Risk Factors	Number of Cases (%)		χ ² Value	P
	LPR Group (n=123)	Control Group (n=197)		
Preference for dairy products	67 (54.47)	94 (47.72)	1.382	.240
Preference for soy products	76 (61.79)	111 (56.35)	0.924	.336
Preference for acidic foods	90 (73.17)	120 (60.91)	5.043	.025*
Preference for spicy foods	97 (78.86)	155 (78.68)	0.001	.969
Preference for fried and fatty foods	91 (73.98)	147 (74.62)	0.016	.899
Preference for meat	4 (3.25)	10 (5.08)	0.602	.438
Preference for sweets	72 (58.54)	100 (50.76)	1.841	.175
Preference for fruits	20 (16.26)	17 (8.63)	4.312	.038
Preference for vegetables	6 (4.88)	6 (3.05)	0.704	.401
Preference for porridge or soup	24 (19.51)	58 (29.44)	3.917	.048*
Preference for noodles	20 (16.26)	35 (17.77)	0.121	.728
Preference for pickled food	99 (80.49)	151 (76.65)	0.653	.419
Preference for too-hot foods	22 (17.89)	24 (12.18)	2.001	.157
Preference for hard foods	83 (67.48)	142 (72.08)	0.768	.381
Preference for snacks	67 (54.47)	91 (46.19)	0.013	.908
Drinking coffee	100 (81.30)	100 (50.76)	30.132	.001*
Drinking strong teas	92 (74.80)	147 (74.62)	0.001	.972
Preference for carbonated drinks	22 (17.89)	24 (12.18)	2.001	.157

LPR, laryngopharyngeal reflux disease.
*Significant at the level of $P < .05$.

Table 3. Comparison of Anxiety and Depression in the LPR and Control Groups

Groups	HAD-A		HAD-D	
	0-10 Points	>10 Points	0-8 Points	>8 Points
LPR group (n, %)	82 (66.67)	41 (33.33)	95 (77.24)	28 (22.76)
Control group (n, %)	163 (82.74)	34 (17.26)	177 (89.85)	20 (10.15)
χ ² value	10.904	9.447		
P	0.001*	0.002*		

HAD-A, Hospital Anxiety and Depression Scale-anxiety score; HAD-D, Hospital Anxiety and Depression Scale-depression score; LPR, laryngopharyngeal reflux disease.
*Significant at the level of $P < .05$.

Table 4. Association Factors for Patients with LPR by Logistic Multivariate Regression Analysis

	OR	95% CI	P
Drinking coffee	1.133	1.012-1.272	.018*
Overeating	1.172	1.046-.313	.014*
Fast eating	1.155	1.072-1.245	.015*
Dinner just before bedtime	1.345	1.254-1.521	.014*
Depression	1.874	1.142-3.572	.001*
Anxiety	2.065	1.194-3.572	.002*

BMI, body mass index; LPR, laryngopharyngeal reflux disease; OR, odds ratio.
*Significant at the level of $P < .05$.

Discussion

In this study, we prospectively explored the risk factors for LPR at 3 digestive endoscopy centers. We found that drinking coffee, overeating, fast eating, eating dinner just before bedtime, anxiety, and depression were independent risk factors for LPR.

Considering the high incidence of GERD among patients with LPR, we tried to control for GERD to improve the reliability and reproducibility of the results. In this study, all participants underwent gastroscopy and completed the GERD-Q, RSI, and other related questionnaires. Unhealthy diet and lifestyle factors were previously reported to aggravate LPR,¹ and observational studies reported the possible causes of LPR.^{14,15} We first studied the education level, smoking, drinking, lying down immediately after eating, and the amount of physical activity and found no significant differences in these variables between groups.

Several previous studies have revealed that the intake of tea, coffee, and carbonated drinks are risk factors for and may aggravate GERD.^{16,17} Moreover, these factors may promote gastric acid secretion and reduce pressure in the lower esophageal sphincter, thereby increasing the reflux of gastric acid into the esophagus. However, few studies have focused on these factors in LPR. In our study, drinking coffee but not tea or carbonated drinks was an independent risk factor for LPR.

A diet high in animal protein may be a risk factor for GERD and LPR,¹⁸ and the symptoms of reflux disease can be markedly improved with a Mediterranean diet.¹⁹ A primarily plant-based diet low in animal protein can reduce the gastric load of amino acids and indirectly reduce the activity of pepsin by reducing the secretion of gastrin.²⁰ In addition, a diet high in sugar and fat may promote relaxation of the lower esophageal sphincter and be a risk factor for GERD and LPR; hence, a Mediterranean-style, plant-based, natural food diet is ideal.²¹ In our study, diets high in animal protein, sugar, and fat were not risk factors for LPR. The roles of spicy food, acidic food, noodles, gas-producing food, and fruit in GERD vary across the literature. The results of the present study showed that preferences for dairy products, bean products, meat, sweets, fruits, vegetables, noodles, pickled food, and gas-producing food did not play an important role in LPR. Although univariate analysis revealed a significant difference in diet imbalance and preference for acidic and spicy food, these factors were not independent risk factors based on the results of our multivariate analysis.

Studies have suggested that fast eating and insufficient chewing of food may damage the esophagus and gastric mucosa. In addition, eating too fast may lead to a sudden increase in gastric pressure and gastric juice secretion, which may promote or aggravate GERD,⁸ and overeating is a risk factor for GERD.^{22,23} Overeating increases the pressure and osmotic pressure in the stomach, which promotes the secretion of gastric acid and relaxes the lower esophageal sphincter, resulting in the reflux of gastric contents.²⁴ Moreover, significantly more patients with GERD who eat dinner less than 2 hours before going to sleep have reflux than do those who eat dinner more than 2 hours before bedtime (22.6% vs. 14.2%). In addition, going to bed a short time after dinner is closely related to the onset and recurrence of GERD.²⁵ In our study, overeating, fast eating, and eating dinner just before bedtime were independent risk factors for LPR.

Although anxiety and depression are associated with an increased risk of GERD, little is known about their relationship with LPR. In this study, anxiety and depression both independently increased the risk for LPR, and anxiety was positively correlated with the RSI score. The pathophysiological mechanism of the relationship between abnormal psychological factors and LPR is unclear. However, the following explanations have been suggested. The sensory threshold of patients with mental disorders may be reduced, resulting in increased esophageal sensitivity.^{26,27} At the same time, the brain and the gastrointestinal tract may be closely connected.²⁸ The central nervous system of patients with depression or anxiety may cause relaxation of the lower esophageal sphincter, thereby aggravating GERD.²⁹ In addition, abnormal mental and psychological factors may cause dysfunction of the upper esophageal sphincter, leading to reflux symptoms.³⁰ Animal experiments have demonstrated that stress in rats can cause injury to their esophageal epithelial tight junction, resulting in a decline in the esophageal mucosal barrier function.³¹ In addition, certain psychotropic drugs may reduce the pressure of the lower esophageal sphincter, lead to esophageal dysfunction, and aggravate reflux symptoms.^{32,33}

This study has some limitations. First, although routine otolaryngology examinations were performed, the RSI scale is not an objective diagnostic tool for LPR. Second, recall bias might have affected the results of the study. Third, owing to the cross-sectional design of the study, we could not determine any causality.

Conclusions

Overall, this study provided a basis for further examination of the impact of eating habits and lifestyle and mental factors on LPR. We found that drinking coffee, overeating, fast eating, eating dinner just before bedtime, anxiety, and depression may be risk factors for LPR. We suggest that patients be encouraged to improve their eating and lifestyle habits and maintain a good mental state to reduce the occurrence of reflux symptoms.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of the First Affiliated Hospitals of Guangzhou Medical University (Approval no: 2017-112, Date: 2017.11.28).

Informed Consent: Written informed consent was obtained from the patients/patient who agreed to take part in the study.

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