

Original Research Article

Does laryngopharyngeal reflux affect voice quality? a cross-sectional study

Almas J. Vakil*, Pratibha Vyas, Shreya Prasad, Praveen Singh

Department of Otorhinolaryngology, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur, Rajasthan, India

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***Correspondence:**

Dr. Almas J. Vakil,

E-mail: princess8almas@gmail.com

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ABSTRACT

Background: Laryngopharyngeal reflux (LPR) is a rising disease that leads to voice changes. This study aimed to assess the potential association between the symptoms of laryngopharyngeal reflux (LPR) and voice disorders using the Reflux symptom index (RSI) and the Voice handicap index (VHI-10) scales, respectively.

Methods: This cross-sectional study was conducted in the Department of Otorhinolaryngology at Mahatma Gandhi Medical College and Hospital, Jaipur, India, from June 2019 to November 2019, on a sample size of 144 patients having complaints related to voice change and laryngopharyngeal reflux. The participants filled the RSI and the VHI-10 questionnaires. RSI scores of >13 and VHI-10 scores of >11 indicated LPR-related symptoms and voice disorders, respectively.

Results: The study included 70 (48.61%) patients who were males and 74 (51.38%) patients who were females. The mean age was 33.5 years. Overall, 89(61.80%) patients had RSI scores of >13 while 102 (70.83%) patients had VHI-10 scores of >11. A significant association was found between positive RSI and VHI-10 scores ($p < 0.001$).

Conclusions: A significant association between RSI and VHI-10 scores reflects an association of laryngopharyngeal reflux with long-standing voice change. RSI and VHI-10 may constitute valuable tools in diagnosing suspected patients with voice change and direct early start of empirical therapy with PPI.

Keywords: Laryngopharyngeal reflux, Voice disorders, Reflux symptom index, Voice handicap index

INTRODUCTION

Laryngopharyngeal reflux (LPR) is an inflammatory disease defined as the retrograde flow of gastric contents into the larynx and pharynx, where it comes in contact with the tissues of the upper aerodigestive tract.^{1,2} This is in contrast to gastroesophageal reflux disease (GERD), where the retrograde flow of gastric contents is limited to the esophagus.³ Both these Acid reflux diseases have become epidemics.^{4,5} According to El-Serag, the prevalence of LPR and GERD has increased by 4% every year since 1976.⁴ Many studies have reported an increase in visits to the otolaryngologist due to LPR in the last few

decades, with 4%–30% of patients visiting otolaryngology departments having LPR.⁵

Although both LPR and GERD are attributed to a loose lower oesophageal sphincter, they are considered different diseases and present with different symptoms.^{6,7} The most common symptoms of LPR are idiopathic hoarseness, chronic coughing, globus sensation, clearing of the throat and choking episodes.⁷ Heartburn accounts for less than 40 % of cases, whereas esophagitis occurs only in 25 % of LPR patients.⁸ Of these, hoarseness accounts for 71%–79% of the symptoms reported.⁹ LPR is the major etiologic factor for hoarseness of more than 3 months duration, with

a prevalence of 55 to 79 % in patients having dysphonia.¹⁰⁻¹²

Relevant clinical information can be obtained in patients with voice disorders using the Voice Handicap Index (VHI). The VHI is among the most widely used tools worldwide for the measurement of the physical, functional and emotional aspects of voice disorders.¹³ In 2004, Rosen et al developed a simplified 10-item version of the VHI (VHI-10) that represented the original 30-item VHI (VHI-30), to quantify patients' perception of their voice handicap.¹⁴ VHI-10 consists of 10 items that require the participant to rate each item using a scale ranging from 0 to 4 (0-never, 1-almost never, 2- sometimes, 3- almost always, 4- always) with a maximum score of 40.

The symptoms of laryngopharyngeal reflux can be assessed using the Reflux Symptom Index (RSI). It is a nine-item questionnaire developed by Belafsky et al.¹⁵ The scale for each item ranges from 0 (no problem) to 5 (severe problem), with a maximum score of 45.

The relationship between laryngopharyngeal reflux and voice changes has been in evolution over the last 40 years. Several studies have shown higher VHI scores among subjects with high RSI scores.^{15,16} This study was aimed to assess the potential association between the symptoms of laryngopharyngeal reflux (LPR) and voice disorders using the RSI and VHI-10 scales, respectively.

METHODS

This cross-sectional study was conducted in the Department of Otorhinolaryngology and Head and Neck Surgery at Mahatma Gandhi Medical College and Hospital, Jaipur, India, from June 2019 to November 2019. The subjects were patients aged 18 years or above who came with complaints related to voice change lasting more than 3 weeks or symptoms suggestive of laryngopharyngeal reflux. Patients with a history of neurological disease affecting voice, vocal cord paralysis/paresis, benign vocal fold lesions, pharyngolaryngeal malignancy, laryngeal trauma, laryngeal surgery, cervical surgery, radiotherapy to the neck, chemical exposure (other than tobacco smoke) causing laryngitis, psychiatric illness, chronic pulmonary disease, asthma, heart disease, scleroderma, pregnant women, an antacid treatment already started (i.e., proton pump inhibitors (PPIs), gastroprokinetic, or antihistamine), prior antireflux surgery, or having untreated thyroid disease were excluded from the study. Informed consent was obtained from all patients and the study was approved by the institution's Ethics board.

Patient details including age, gender, profession, history of voice abuse, health complaints, addiction, allergies, diet, and drug use were obtained.¹⁷ This was followed by general and ENT examination. The participants were then asked to fill the VHI-10 and RSI questionnaires (Table 1 and 2), according to which they scored their symptoms. As

per previous studies, RSI scores of >13 and VHI-10 scores of >11 indicated LPR-related symptoms and voice disorders, respectively.^{15,18}

All statistical analyses were performed using the Social Science Statistics program. No sampling technique was applied and all the patients visiting the hospital's ENT outdoor during the period of study were included based on the inclusion and exclusion criteria. Apart from the descriptive analysis of the data collected, categorical variables were analysed using the Chi-square test. For all statistical analyses, a p<0.050 was considered significant.

RESULTS

The study included 144 patients after applying the inclusion and exclusion criteria. Of them, 70 (48.61%) patients were males and 74 (51.38%) patients were females. The mean age was 33.5 years.

Table 1: VHI-10 questionnaire.

VHI-10 problem	Response
My voice makes it difficult for people to hear me	0 1 2 3 4
People have difficulty understanding me in a noisy room	0 1 2 3 4
My voice difficulties restrict my personal and social life	0 1 2 3 4
I feel left out of the conversations because of my voice	0 1 2 3 4
My voice problem causes me to lose income	0 1 2 3 4
I feel as though I have to strain to produce voice	0 1 2 3 4
The clarity of my voice is unpredictable	0 1 2 3 4
My voice problem upsets me	0 1 2 3 4
My voice makes me feel handicapped	0 1 2 3 4
People ask, "What's wrong with your voice?"	0 1 2 3 4

0=Never, 1=Almost never, 2=Sometimes, 3=Almost always, 4=Always

Overall, 89 (61.80%) patients had RSI scores of >13 while 102 (70.83%) patients had VHI-10 scores of >11 (Table 3).

A statistically significant association was found between positive RSI and VHI-10 scores amongst the patients (p<0.001).

Overall, 101 (70.13%) patients had a history of smoking (Table 4) and 58 (40.27%) patients had a history of consuming alcohol (Table 5).

A statistically significant association was found between smoking and positive RSI scores ($p < 0.001$).

Table 2: RSI questionnaire.

Within the previous month, how did the following problem affect you?	0 = No problem to 5= Severe problem
Hoarseness or a problem with your voice	0 1 2 3 4 5
Clearing your throat	0 1 2 3 4 5
Excess throat mucous or postnasal drip	0 1 2 3 4 5
Difficulty in swallowing food, liquids, or pills	0 1 2 3 4 5
Coughing after you ate or after lying down	0 1 2 3 4 5
Breathing difficulties or choking episodes	0 1 2 3 4 5
Troublesome or annoying cough	0 1 2 3 4 5
Sensations of something sticking in your throat or a lump in your throat	0 1 2 3 4 5
Heartburn, chest pain, indigestion, or stomach acid coming up	0 1 2 3 4 5

Also, a statistically significant association was found between smoking and positive VHI-10 scores ($p < 0.001$).

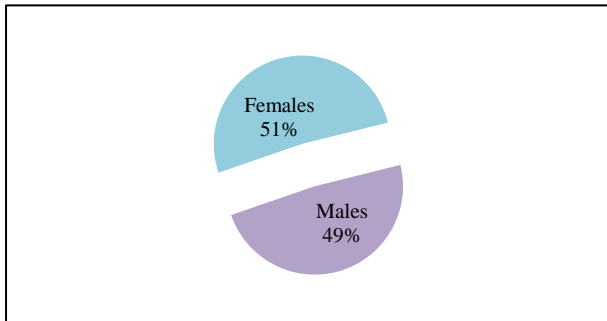


Figure 1: Sex distribution.

Table 3: Prevalence of symptoms of laryngopharyngeal reflux and voice disorders as scored using RSI and VHI-10, among the patients.

Symptom	Patients (n=144)
RSI	
>13	89 (61.80%)
<13	55 (38.19%)
VHI-10	
>11	102 (70.83%)
<11	42 (29.17%)

A statistically significant association was found between consumption of alcohol and positive RSI scores ($p < 0.001$).

Also, a statistically significant association was found between consumption of alcohol and positive VHI-10 scores ($p < 0.001$).

Table 4: Prevalence of symptoms of laryngopharyngeal reflux and voice disorders as scored using RSI and VHI-10, amongst smokers and non-smokers.

Index	Smokers (n=101)	Non-Smokers (n=43)
RSI >13	72 (71.28%)	17 (39.53%)
VHI-10 >11	80 (79.20%)	22 (51.16%)

Table 5: Prevalence of symptoms of laryngopharyngeal reflux and voice disorders as scored using RSI and VHI-10, amongst those consuming alcohol and those not.

Index	Alcoholics (n=58)	Non-Alcoholics (n=86)
RSI >13	50 (86.20%)	39 (45.34%)
VHI-10 >11	51 (87.93%)	51 (59.30%)

Table 6: Prevalence of symptoms of laryngopharyngeal reflux and voice disorders as scored using RSI and VHI-10, amongst professional voice users.

Index	Professional voice users (n=65)
RSI	
>13	46 (70.76%)
<13	19 (29.23%)
VHI-10	
>11	51 (78.46%)
<11	14 (21.53%)

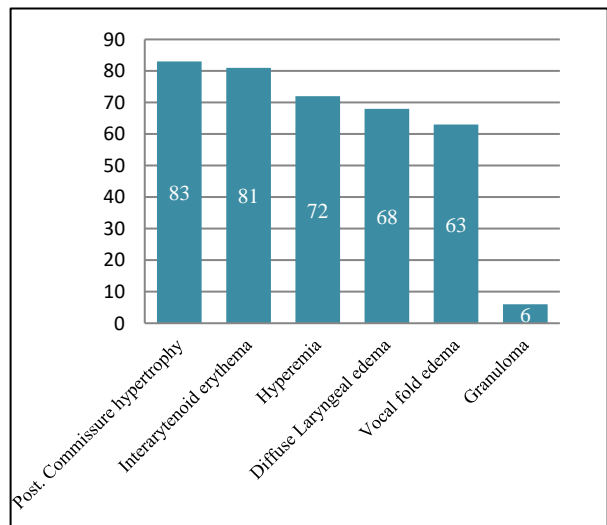


Figure 2: Findings on fiberoptic laryngoscopy.

A statistically significant association was found between positive RSI and VHI-10 scores amongst professional voice users such as teachers and singers ($p=0.0011$) (Table 6).

On examination of the larynx, 83 patients were found to have posterior commissure hypertrophy, 81 patients had interarytenoid erythema, 72 patients had hyperemia, 68 patients had diffuse laryngeal edema and 63 patients had vocal fold edema. Only 6 patients had developed granuloma (Figure 2).

DISCUSSION

Laryngopharyngeal reflux (LPR) is a common disease that leads to dysphonia. Studies related to voice problems and reflux disorders reveal that approximately two-thirds of patients with voice problems have laryngopharyngeal reflux (LPR).^{10,12} Many clinical and experimental studies report that LPR leads to significant macroscopic and microscopic histological changes in the mucosa of the vibratory margin of the vocal folds.¹⁹ Epithelial cell dehiscence, microtraumas, Reinke's space modifications, inflammatory infiltrates, mucosal drying, and epithelial thickening is seen in patients with LPR. These histological changes may alter the biomechanical properties of the vocal fold tissue leading to hoarseness. A hoarse voice significantly reduces the speaker's communicative effectiveness.²⁰

In the present study, there was a statistically significant association between RSI and VHI-10 scores, thus reflecting the link between hoarseness and LPR. Belafsky et al in their study administered the RSI and VHI-30 to 25 patients with LPR. After a six-month course of proton pump inhibitors (PPIs), both scales were re-administered; their findings indicated that those with greater improvement in RSI scores were 11 times more likely to have corresponding improvements in VHI-30 scores.¹⁵ Wang et al. in their study also noted higher VHI scores among subjects with RSI scores of >13 versus those with scores of <13 .¹⁶

In the present study, smoking and consumption of alcohol were significantly associated both with positive RSI as well as positive VHI-10 scores. Lin et al in their study reported the association of laryngopharyngeal symptoms with smoking and drinking.²¹ Tobacco smoking and alcohol use have also been reported to increase the risk of voice disorders.²²

Voice disorders are among the most serious occupational hazards for professional voice users. In the present study, there was a statistically significant association between RSI and VHI-10 scores among professional voice users. In a study of 119 singers, 70 teachers, and 111 control subjects, Hočevár-Boltežar et al observed that LPR was more common among the singers and teachers.²³ Several studies have shown LPR to be frequent among teachers and singers with dysphonia.²⁴⁻²⁶

LPR signs include posterior commissure hypertrophy (89%), vocal fold edema (79%), hyperemia (79%), and diffuse laryngeal edema (76%).¹⁹ In the present study, on laryngoscopic examination, the majority of the patients were found to have posterior commissure hypertrophy and interarytenoid erythema. These were followed by hyperemia, diffuse laryngeal edema, and vocal fold edema. Granuloma formation, which occurs in severe cases was seen in 6 patients. In Belafsky et al's study, the most common sign was pseudosulcus vocalis.²⁷ Qadeer et al and Noordzij et al in their study found that arytenoids edema and erythema were the most common findings (60%) in LPR.^{28,29}

Shortcomings of the present study include the sample size. A larger sample size may have helped in better analysis. A more accurate diagnostic evaluation of LPR would include proximal acid exposure percentage time by dual-probe pH monitoring. But we cannot ignore the significant association between LPR and voice change proved statistically in our study by the use of RSI and VHI-10 scales.

CONCLUSION

The current study showed a significant association between RSI and VHI-10 scores. Thus laryngopharyngeal reflux has to be considered as one of the causes in patients coming with the complaint of hoarseness of duration more than three weeks. LPR is partly related to lifestyle with increased consumption of junk food and lesser physical activity. Many times LPR is overlooked in patients who complain of voice change. RSI and VHI-10 may constitute valuable diagnostic tools in the assessment of LPR and voice disorder cases, as they are easy to administer, highly reproducible, and exhibit excellent construct- and criterion-based validity, unlike other diagnostic methods such as pH monitoring which has low sensitivity. Hence they can be easily used in diagnosing suspected patients with voice change and direct early start of empirical therapy with PPI.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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