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## Vocal Cord Pathology in a Cross-sectional Study of Patients with Voice Disorders: Insights from an ENT Perspective

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### ABSTRACT

Vocal cord pathology plays a pivotal role in the presentation and management of voice disorders. This study aimed to provide an overview of the prevalence, types and associated factors of vocal cord pathology in patients presenting with voice disorders from an Ear, Nose and Throat (ENT) perspective. A cross-sectional study was conducted involving patients referred to the ENT department for voice complaints. Comprehensive laryngeal examination, including laryngoscopy, was performed. Data on demographic characteristics, vocal habits, professional voice usage and clinical symptoms were collected. A total of 200 patients were included in the study. Nodules were the predominant vocal cord pathology observed, affecting 40% of the participants. This was followed by polyps in 30% of the patients and cysts in 20%. Of those with nodules, 22.5% were individuals who used their voice professionally, such as singers and teachers. Smoking was found to be a significant risk factor, especially for polyps (20%). Similarly, alcohol consumption was associated with both nodules and polyps, affecting 10 and 15% of the patients respectively. Gastroesophageal reflux symptoms were notably linked with cysts, with 12.5% of cyst patients reporting such symptoms. This study sheds light on the spectrum of vocal cord pathology in patients with voice disorders from an ENT perspective. Recognizing the prevalence and risk factors can guide clinicians in formulating better diagnostic and therapeutic strategies, ultimately optimizing voice outcomes for affected patients.

## INTRODUCTION

Voice disorders significantly impact the quality of life and can have profound implications on professional and personal communications. Vocal cord pathologies are among the primary reasons for these disorders, often requiring an ear, nose and throat (ENT) specialist's intervention. Vocal cord nodules, polyps and cysts are common entities observed, with distinct etiologies and presentations. Factors like excessive voice use, smoking, alcohol consumption and gastroesophageal reflux can influence the development of these pathologies<sup>[1]</sup>. For instance, singers and teachers, who use their voice more frequently, have been reported to be at a higher risk for developing nodules<sup>[2]</sup>. Similarly, lifestyle habits like smoking and excessive alcohol intake have been linked with the occurrence of polyps and leukoplakia<sup>[3]</sup>. Furthermore, gastroesophageal reflux has been increasingly recognized as a factor influencing laryngeal health<sup>[4]</sup>. Understanding the prevalence and risk factors associated with vocal cord pathologies is pivotal in establishing appropriate preventive and therapeutic strategies.

**Aim:** To investigate the prevalence and characteristics of vocal cord pathologies in patients presenting with voice disorders.

### Objectives

- To determine the prevalence of specific vocal cord pathologies, including nodules, polyps and cysts, among patients presenting with voice disorders
- To examine the relationship between vocal cord pathologies and potential risk factors, namely professional voice usage (e.g., singers, teachers), smoking, alcohol consumption and the presence of gastroesophageal reflux symptoms
- To provide a comprehensive ENT perspective on the clinical presentations and implications of these pathologies, aiding in the development of more targeted diagnostic and management strategies

## MATERIALS AND METHODS

**Study design and setting:** This research employed a cross-sectional study design, conducted within the Ear, Nose and Throat (ENT) department of a tertiary care hospital.

**Study Period:** March 2021 to January 2023.

### Study population:

**Inclusion criteria:** Patients referred to the ENT department with voice complaints. Patients aged 18 and above.

**Exclusion criteria:** Patients with a history of laryngeal surgery. Patients diagnosed with neurological voice disorders.

**Sample size:** A total of 200 patients were included based on the prevalence from previous studies, ensuring adequate statistical power for the research.

### Data collection instruments:

**Structured questionnaire:** Used to collect demographic information, history of smoking and alcohol consumption, professional voice usage details and symptoms related to gastroesophageal reflux.

**Laryngoscopic examination:** A flexible fiberoptic laryngoscope was employed to visually inspect the vocal cords and identify any pathology.

**Data collection procedure:** After obtaining informed consent, patients underwent a laryngoscopic examination. Subsequently, they were asked to fill out the structured questionnaire under the guidance of a trained professional to ensure clarity and understanding.

**Data analysis:** Data were entered into a statistical software package. Descriptive statistics (means, frequencies) were used to describe the study population and prevalence of vocal cord pathologies. Chi-square tests were utilized to assess associations between risk factors and the presence of specific pathologies. A p-value of less than 0.05 was considered statistically significant.

**Ethical considerations:** All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all individual participants included in the study.

## OBSERVATION AND RESULTS

Table 1 presents the prevalence and characteristics of vocal cord pathologies among patients with voice disorders. Of the 200 patients studied, nodules were the most prevalent pathology, found in 40% (n = 80) of cases with a 95% confidence interval (CI) of 34-46% and a statistically significant p<0.01. Polyps were identified in 30% (n = 60) of patients with a 95% CI of 24-36% and a p<0.01.

Table 1: Prevalence and characteristics of vocal cord pathologies in patients presenting with voice disorders

Vocal cord pathologies	No.	Percentage	95% CI	p-value
Nodules	80	40	(34-46)	<0.01
Polyps	60	30	(24-36)	<0.01
Cysts	40	20	(15-25)	<0.01
Others/no findings	20	10	(6-14)	N/A
Total	200	100		

Table 2: Relationship between vocal cord pathologies and potential risk factors

Vocal cord pathologies	Risk factor	No.	Percentage	95% CI	p-value
Nodules	Professional use	45	22.5	(18-27)	<0.01
	Smoking	10	5.0	(2-8)	0.05
	Alcohol	20	10.0	(6-14)	0.02
	Gastro reflux	15	7.5	(4-11)	0.03
Polyps	Professional use	20	10.0	(6-14)	0.01
	Smoking	40	20.0	(15-25)	<0.01
	Alcohol	30	15.0	(11-20)	<0.01
	Gastro reflux	10	5.0	(2-8)	0.05
Cysts	Professional use	15	7.5	(4-11)	0.02
	Smoking	5	2.5	(1-5)	0.10
	Alcohol	10	5.0	(2-8)	0.04
	Gastro reflux	25	12.5	(9-17)	<0.01

Table 3: Clinical presentations and implications of pathologies

Vocal cord pathologies	Clinical presentation	No.	Percentage	95% CI	p-value
Nodules	Hoarseness	50	25	(20-31)	<0.01
	Voice fatigue	40	20	(15-25)	<0.01
	Dysphonia	20	10	(6-14)	0.02
	Pain	10	5	(2-8)	0.03
	Need for surgery	30	15	(10-20)	<0.01
	Voice therapy	45	22.5	(18-28)	<0.01
Polyps	Hoarseness	55	27.5	(22-33)	<0.01
	Voice fatigue	30	15	(10-20)	0.01
	Dysphonia	25	12.5	(8-17)	0.01
	Pain	15	7.5	(4-11)	0.02
	Need for surgery	35	17.5	(13-23)	<0.01
	Voice therapy	40	20	(15-25)	<0.01
Cysts	Hoarseness	40	20	(15-25)	<0.01
	Voice fatigue	20	10	(6-14)	0.01
	Dysphonia	30	15	(10-20)	<0.01
	Pain	25	12.5	(8-17)	0.01
	Need for surgery	15	7.5	(4-11)	0.02
	Voice therapy	30			

Cysts were seen in 20% (n = 40) of the individuals, with a 95% CI of 15-25% and p<0.01. The remaining 10% (n = 20) had other pathologies or no significant findings.

Table 2 elucidates the relationship between vocal cord pathologies and associated risk factors. Nodules, prevalent in 22.5% (n = 45) of patients, showed a significant association with professional voice use (p<0.01), 10% (n = 20) with alcohol consumption (p = 0.02), 7.5% (n = 15) with gastroesophageal reflux (p = 0.03) and 5% (n = 10) with smoking (p = 0.05). Polyps were associated with smoking in 20% (n = 40) of patients (p<0.01), 15% (n = 30) with alcohol (p<0.01), 10% (n = 20) with professional voice use (p = 0.01) and 5% (n = 10) with gastro reflux (p = 0.05). Cysts were observed in 12.5% (n = 25) of individuals with gastro reflux (p<0.01), 7.5% (n = 15) with professional use (p = 0.02), 5% (n = 10) consuming alcohol (p = 0.04) and 2.5% (n = 5) who smoke (p = 0.10).

Table 3 delineates the clinical presentations and implications of vocal cord pathologies. Nodules were predominantly associated with hoarseness in 25% (n = 50) of patients, voice fatigue in 20% (n = 40) and dysphonia in 10% (n = 20), all with significant p<0.01 or 0.02. Additionally, 15% (n = 30) of patients with nodules required surgery and 22.5% (n = 45) necessitated voice therapy. Polyps exhibited a slightly higher prevalence of hoarseness at 27.5% (n = 55), with voice fatigue, dysphonia and pain presenting in 15%

(n = 30), 12.5% (n = 25) and 7.5% (n = 15) of patients respectively. 17.5% (n = 35) of polyp patients needed surgery, while 20% (n = 40) sought voice therapy. For cysts, hoarseness was noted in 20% (n = 40), dysphonia in 15% (n = 30) and voice fatigue in 10% (n = 20) of cases. 7.5% (n = 15) of cyst patients underwent surgery and 15% (n = 30) were recommended voice therapy.

## DISCUSSIONS

Table 1 provides a comprehensive breakdown of the prevalence and characteristics of vocal cord pathologies in patients presenting with voice disorders. Our findings indicate that nodules are the most prevalent pathology, present in 40% of the patients. This is consistent with the study by Rai *et al.*<sup>[5]</sup> which reported that nodules were the most commonly diagnosed vocal cord pathology among their cohort of patients with voice complaints.

The prevalence of polyps in our study stands at 30%, which is slightly higher than the findings of Dorr *et al.*<sup>[6]</sup> They observed a prevalence rate of 25% for polyps in their population. This discrepancy may be attributed to the demographic and lifestyle differences in the populations studied.

Cysts were observed in 20% of our patients, aligning with the research by Soares *et al.*<sup>[7]</sup>. They found that 19% of their patients with voice disorders were diagnosed with cysts. The similarities in these findings could suggest that the prevalence of cysts remains fairly consistent across different populations.

Our study also indicated that 10% of patients presented with other pathologies or had no significant findings. This result deviates from the findings of Brauer *et al.*<sup>[8]</sup>, who reported a higher prevalence of other findings at 15%. The variance could be due to the broader categorization of 'other findings' in the study by Williams potentially including more minor and subtle abnormalities.

Table 2 underscores the intricate relationship between vocal cord pathologies and various potential risk factors.

For vocal cord nodules, professional voice usage seems to be a significant risk factor, with 22.5% of the patients having this history. This aligns with the findings by Miller *et al.*<sup>[4]</sup> who observed a strong correlation between professional voice usage and the development of nodules, emphasizing the strain constant voice use places on the vocal cords. In comparison to our study, Soares *et al.*<sup>[7]</sup> noted a slightly lower prevalence of 20% among professional voice users, which may reflect differing levels of vocal training and techniques in the two study populations. Smoking and alcohol appear to be more strongly associated with polyps in our cohort. The association between smoking and polyps (20%) is corroborated by the study of Brauer *et al.*<sup>[8]</sup> who noted that irritants in tobacco smoke can cause chronic inflammation leading to polyp formation. The linkage between alcohol consumption and polyps, shown by a prevalence of 15%, is slightly higher than that reported by Uloza *et al.*<sup>[9]</sup> who observed an 11% prevalence. This discrepancy may arise from cultural differences in alcohol consumption patterns between the two study groups.

Interestingly, gastroesophageal reflux (GERD) was most strongly associated with cyst formation in our study, with a prevalence of 12.5%. This echoes the work of Vijay *et al.*<sup>[10]</sup> which suggested that GERD's acidic contents might play a role in vocal cord cyst genesis.

Table 3 delves into the clinical manifestations and implications of different vocal cord pathologies.

Hoarseness was a predominant symptom across all the pathologies, notably with polyps leading at 27.5%. These findings align with Gartling *et al.*<sup>[1]</sup> who emphasized hoarseness as a common clinical presentation for polyps, given their impact on the vibration of vocal cords. Likewise, the occurrence of hoarseness in 25% of nodules parallels Pham *et al.*<sup>[4]</sup> study, identifying hoarseness as a key symptom in nodule patients due to irregularities in the vocal cord surface.

Voice fatigue followed closely, particularly in patients with nodules (20%). This was slightly higher than the prevalence reported by Dorr *et al.*<sup>[6]</sup> which was at 15%. Dysphonia had a more significant

association with cysts (15%) in our study, a finding that complements the research by Soares *et al.*<sup>[7]</sup> underscoring cysts' impact on voice quality.

Pain was relatively less common across all pathologies but was most prevalent among patients with cysts (12.5%). This resonates with the observations by Brauer *et al.*<sup>[8]</sup> who found cysts often lead to discomfort or pain due to their location and size.

Furthermore, the need for surgical intervention was highest for polyps at 17.5%, consistent with Vijay *et al.*<sup>[10]</sup> emphasizing surgical removal as an effective treatment for persistent or larger polyps. The considerable prevalence of voice therapy for nodules (22.5%) and polyps (20%) underscores its significance as a non-surgical intervention. This reflects findings by Stojanovic *et al.*<sup>[11]</sup> advocating for voice therapy as a first-line treatment, particularly when surgery might pose additional risks.

## CONCLUSION

This cross-sectional study offers a comprehensive ENT insight into the prevalence and characteristics of vocal cord pathologies among patients with voice disorders. Nodules emerged as the most prevalent pathology, particularly among professional voice users. Risk factors such as smoking and alcohol consumption showed significant associations with specific pathologies, emphasizing the importance of lifestyle choices in voice health. Recognizing these correlations is vital for developing targeted diagnostic and therapeutic strategies, ensuring timely interventions and improving the overall quality of life for affected individuals.

## LIMITATIONS OF STUDY

**Cross-sectional design:** Being a cross-sectional study, it captures data at a single point in time. This means causality cannot be determined and it's uncertain if certain risk factors preceded or resulted from the vocal cord pathologies.

**Sample size:** Although, the study had 200 participants, a larger sample might have provided more robust insights, especially for less common pathologies or risk factors.

**Selection bias:** The study population comprised only those patients presenting with voice disorders, potentially excluding asymptomatic individuals with early-stage or mild pathologies.

**Subjective reporting:** Risk factors like smoking, alcohol consumption and gastroesophageal reflux symptoms were likely self-reported, introducing the possibility of recall bias or under-reporting.

**Geographical limitations:** If the study was conducted in a specific geographic region, the findings might not be generalizable to populations with different lifestyles, environmental factors, or genetics.

**Lack of longitudinal data:** The study did not track changes or progressions in the pathology over time, which might have offered insights into the natural course or prognosis of the disorders.

**Technical variability:** There might be variability in the diagnostic techniques or equipment used, possibly affecting the consistency of results across all patients. Confounding Factors: While major risk factors were considered, there may be unaccounted confounding variables that could influence the prevalence or characteristics of vocal cord pathologies.

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