



PREVALENCE OF VOCAL FATIGUE AMONG MEDICAL RESIDENTS AFTER LONG SHIFTS OF MEDICAL CARE

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ABSTRACT

Vocal fatigue results from prolonged voice use and can affect the performance of professionals who engage in extensive verbal communication. There is little to no information regarding the prevalence of this phenomenon among medical residents who spend long hours providing patient care. The aim of this study was to determine the prevalence of vocal fatigue among outpatient medical residents at a tertiary care hospital using the Vocal Fatigue Index-19 (VFI-19) questionnaire. This was a prospective, descriptive, single-center, cross-sectional study involving 100 medical residents. Recorded parameters included age, sex, medical specialty, residency year (classified by training level from first to fifth year), and outpatient clinic hours and days. Prevalence was defined as a score >24 on Factor 1 of the VFI-19. Results are expressed as percentages. The overall prevalence of vocal fatigue was 12%, with equal rates among men and women (12% each, 6/50). The highest prevalence by medical specialty was observed among residents in the Pneumology (28.5%) and Urology (18.2%) departments. Regarding workload, the highest number of cases occurred among residents with 5 to 10 hours of outpatient clinic duty per week (13%), while the highest proportion was found in the group working 81 to 90 hours per week (100%; n = 2). The most frequent symptom corresponded to item 17 of the VFI-19, present in 45% of participants. Vocal fatigue was present in 12% of the evaluated medical residents. These findings highlight the need to strengthen vocal health monitoring and prevention among this group of healthcare professionals.

KEYWORDS: Vocal Fatigue Index-19, Medical Residents, Prevalence, Medical Care.

1. INTRODUCTION

Medical residency involves prolonged work shifts in which continuous verbal communication is essential. Activities such as patient rounds, emergency care, and outpatient consultations expose residents to sustained vocal demands. When vocal load exceeds the individual's capacity for recovery, vocal fatigue may develop, characterized by increased phonatory effort, laryngeal discomfort, and reduced voice quality.^[1] Its pathophysiology involves mechanical overload and

impaired vocal fold recovery, compounded by sleep deprivation and chronic stress.^[2,3]

Voice disorders represent an underestimated occupational risk among healthcare professionals. International evidence suggests that up to 53% of physicians and medical students experience vocal symptoms within a year, whereas structural lesions such as nodules or polyps are reported in approximately 5%, suggesting that early impairment may primarily be functional.^[4] Environmental factors in healthcare

settings, including background noise, poor ventilation, and the use of masks or personal protective equipment, may further increase the vocal effort required for effective communication.^[5, 6]

Medical residents may be particularly vulnerable because of prolonged working hours, intense vocal demands, and limited adherence to vocal hygiene measures. Previous studies have demonstrated the development of laryngeal tension and acoustic changes after brief periods of intensive voice use.^[7] In addition, inadequate hydration and other compensatory behaviors during demanding shifts may contribute to vocal deterioration.^[8, 9] Psychosocial factors and the hierarchical structure of medical training may also lead residents to minimize or overlook vocal symptoms, potentially affecting quality of life and professional performance.^[10-13]

The Vocal Fatigue Index (VFI-19) is a validated self-report instrument that assesses vocal fatigue through three dimensions: fatigue during phonation, physical discomfort associated with voice use, and improvement of symptoms with rest.^[14] Its standardized assessment allows early functional vocal symptoms to be identified and quantified.

Despite evidence regarding vocal risk among healthcare professionals, limited research has examined vocal fatigue across different years of medical residency.^[4] In Mexico, where residency programs involve demanding work schedules and substantial communication requirements, data on this condition remain limited.^[15] Therefore, this study aims to determine the prevalence of vocal fatigue among medical residents working in the outpatient clinic of Hospital General “Dr. Gaudencio González Garza” using the VFI-19.

2. MATERIAL AND METHODS

A prospective, descriptive, single-center, cross-sectional study was conducted involving medical residents in the outpatient department of the “Dr. Gaudencio González Garza” General Hospital, La Raza National Medical Center of the Mexican Institute of Social Security in Mexico City. The study included male and female physicians from various medical specialties who provided outpatient care. Initially, a total of 188 residents were considered; however, following the administration of various questionnaires, individuals were excluded based on criteria such as symptoms of gastroesophageal reflux, smoking, combined smoking and alcohol use, head and neck disorders, and the use of medications known to affect the voice (antidepressants, muscle relaxants, diuretics, antihypertensives, antihistamines, and anticholinergics), resulting in a final sample of 100 participants. Data collection was carried out over a three-

month period, accounting for residents' external rotations, vacation periods, and workload. General data were collected, including age, sex, medical specialty, residency year (classified from first to fifth year), and the number of hours and days per week dedicated to outpatient consultations. The VFI-19 was administered; this assessment tool comprises three factors: tiredness and avoidance of vocal use, physical discomfort associated with vocal use, and symptom improvement with rest. The presence of vocal fatigue was defined based on the score for Factor 1 of the VFI-19 (score >24). Additionally, the prevalence of physical discomfort was calculated using a score >7, and the prevalence for Factor 3 (improvement with rest) was calculated based on a score <7; individual symptom scores greater than 2 were also considered. Subsequently, the questionnaires were verified and entered a Microsoft Excel database for descriptive analysis. The statistical analysis was descriptive in nature, based on the calculation of prevalence rates expressed as percentages for each of the variables studied. Results were presented using graphs corresponding to each variable. Regarding ethical aspects, the study was classified as posing minimal risk in accordance with Article 17 of the Regulations of the General Health Law on Health Research, as it did not involve interventions that would compromise the participants' integrity. Written informed consent was obtained, ensuring the confidentiality of the information. The study was conducted in compliance with the ethical principles of the Declaration of Helsinki, the Nuremberg Code, the World Health Organization's international guidelines for research involving human subjects, and the Federal Law on the Protection of Personal Data Held by Private Parties. The researchers declared no conflicts of interest.

3. RESULTS

3.1. Sample selection

Figure 1 summarizes the procedure and selection criteria for the medical residents participating in this study. A total of 50 women and 50 men were included. They were divided into several groups based on age; the group aged 25 to 30 years represented 87.0% of the sample, followed by the groups aged 31 to 35 years (10.0%) and 36 to 40 years (3.0%).

Regarding the year of residency, the largest group of participants was in the third year (34.0%), followed by the second (28.0%), first (15.0%), fourth (14.0%), and fifth year (9.0%).

As for clinical activity, 58.0% of the residents spent between 5 and 20 hours per week in outpatient consultations, and 45.0% attended five days a week, while 24.0% attended three days a week.

The general characteristics of the population are shown in Table 1.

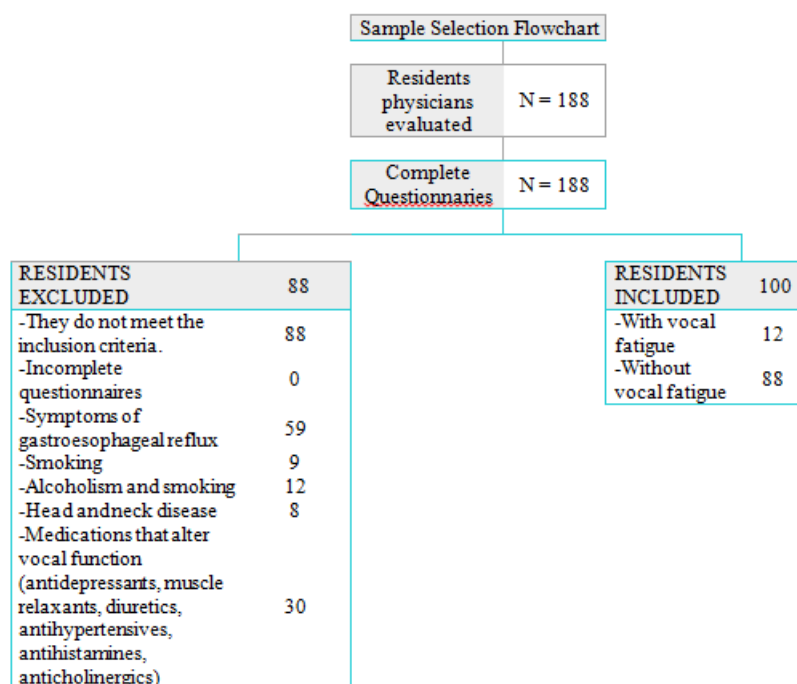


Figure 1. Flowchart of the sample selection of resident physicians evaluated at a tertiary-care hospital during the study period. Participants of both sexes were included in equal proportions.

Table 1: General characteristics of the resident physicians evaluated (n = 100).

Variable	n (%)	Variable	n (%)	Variable	n (%)
Sex		Age (years)		Residency year instead	
Female	50 (50.0)	25–30	87 (87.0)	R1	15 (15.0)
Male	50 (50.0)	31–35	10 (10.0)	R2	28 (28.0)
		36–40	3 (3.0)	R3	34 (34.0)
				R4	14 (14.0)
Weekly outpatient consultation hours		Outpatient clinic days per week		R5	9 (9.0)
5–10	31 (31.0)	1	4 (4.0)		
11–20	27 (27.0)	2	14 (14.0)		
21–30	13 (13.0)	3	24 (24.0)		
31–40	15 (15.0)	4	13 (13.0)		
41–50	9 (9.0)	5	45 (45.0)		
51–60	1 (1.0)				
61–70	1 (1.0)				
71–80	1 (1.0)				
81–90	2 (2.0)				

3.2. Prevalence of vocal fatigue

The overall prevalence of vocal fatigue, defined by a score exceeding 24 points on Factor 1 of the VFI-19, was 12.0% (12/100). The remaining 88.0% did not exhibit vocal fatigue according to the established operational criterion.

The prevalence of vocal fatigue was analyzed according to the demographic, academic, and occupational variables of the 100 medical residents included in the

study (Table 2). Regarding sex, an equal distribution was observed between men and women, with a vocal fatigue prevalence of 12.0% in both groups (6/50 participants of each sex). These results are presented in Figure 2.

Regarding age, the highest proportion of vocal fatigue was observed in the 31–35 age group at 20.0% (2/10), followed by the 25–30 age group at 11.5% (10/87). No cases of vocal fatigue were identified among residents aged 36–40 (0/3).

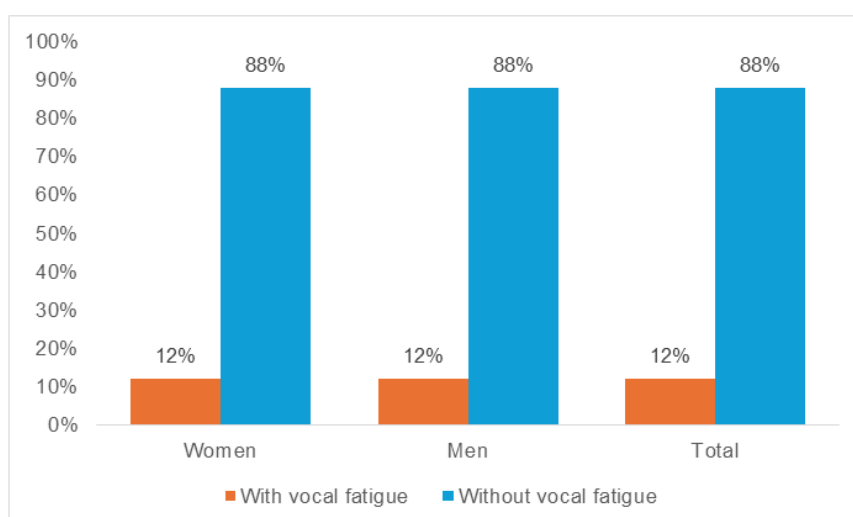


Figure 2: Prevalence of vocal fatigue according to demographic, academic, and occupational variables.

Regarding medical specialties, variability was observed in the prevalence of vocal fatigue. The highest proportions were found in Genetics and Pediatric Oncology at 50.0% (1/2 participants each), followed by Pediatric Surgery at 33.4% (1/3) and Pneumology at 28.5% (2/7). Cases were also observed in Urology (18.2%, 2/11), Audiology (12.5%, 1/8), Ophthalmology (11.2%, 2/18), Geriatrics (8.4%, 1/12), and Pediatrics (5.8%, 1/17). No cases of vocal fatigue were reported in Otorhinolaryngology, Pediatric Rheumatology, Pediatric Nephrology, Pediatric Pneumology, Pediatric Endocrinology, Cardiothoracic Surgery, or Pediatric Cardiology.

Regarding clinical workload—measured by weekly outpatient consultation hours—vocal fatigue was observed primarily at the extremes of exposure. Vocal fatigue was present in 100% of residents with schedules of 81 to 90 hours (2/2) and in the 51-to-60-hour group (1/1); however, these results involve groups with small sample sizes. The highest absolute number of residents with vocal fatigue was found in the group with 5 to 10 weekly outpatient consultation hours (4/31, 13%). No cases were identified in the 41-to-50-hour (0/9), 61-to-70-hour (0/1), or 71-to-80-hour (0/1) groups.

When analyzing outpatient clinic days per week, the highest prevalence was observed among residents with three clinic days (16.7%; 4/24), followed by those with five days (13.3%; 6/45). Residents with one clinic day showed no cases of vocal fatigue (0/4), while those with two days (7.1%; 1/14) and four days (7.7%; 1/13) showed lower proportions.

Finally, when stratified by residency year, the highest prevalence was observed among second-year residents (R2) at 25.0% (7/28), followed by fifth-year residents (R5) at 22.2% (2/9). A prevalence of 6.7% (1/15) was identified among first-year residents (R1), and 5.9% (2/34) among third-year residents (R3). No cases of vocal fatigue were found among fourth-year residents (R4) (0/14).

Table 2: Prevalence of vocal fatigue among men and women medical residents.

Variable	Participants	Number	With vocal fatigue (%)	Without vocal fatigue (%)
Sex	Women	50	6 (12.0)	44 (88.0)
	Men	50	6 (12.0)	44 (88.0)
Age (years)	25-30	87	10 (11.5)	77 (88.5)
	31-35	10	2 (20.0)	8 (80.0)
	36-40	3	0 (0.0)	3 (100.0)
Medical Specialty	Genetics	2	1 (50.0)	1 (50.0)
	Pediatric Oncology	2	1 (50.0)	1 (50.0)
	Pediatric Surgery	3	1 (33.3)	2 (66.7)
	Pneumology	7	2 (28.6)	5 (71.4)
	Urology	11	2 (18.2)	9 (81.8)
	Audiology	8	1 (12.5)	7 (87.5)
	Ophthalmology	18	2 (11.1)	16 (88.9)
	Geriatrics	12	1 (8.3)	11 (91.7)

	Pediatrics	17	1 (5.9)	16 (94.1)
	By specialty, without vocal fatigue*	20	0 (0.0)	20 (100.0)
Weekly outpatient consultation hours	5-10	31	4 (12.9)	27 (87.1)
	11-20	27	2 (7.4)	25 (92.6)
	21-30	13	1 (7.7)	12 (92.3)
	31-40	15	2 (13.3)	13 (86.7)
	41-50	9	0 (0.0)	9 (100.0)
	51-60	1	1 (100.0)	0 (0.0)
	61-70	1	0 (0.0)	1 (100.0)
	71-80	1	0 (0.0)	1 (100.0)
	81-90	2	2 (100.0)	0 (0.0)
Outpatient clinic days per week	1 día	4	0 (0.0)	4 (100.0)
	2 days	14	1 (7.1)	13 (92.9)
	3 days	24	4 (16.7)	20 (83.3)
	4 days	13	1 (7.7)	12 (92.3)
	5 days	45	6 (13.3)	39 (86.7)
Residency year instead	R1	15	1 (6.7)	14 (93.3)
	R2	28	7 (25.0)	21 (75.0)
	R3	34	2 (5.9)	32 (94.1)
	R4	14	0 (0.0)	14 (100.0)
	R5	9	2 (22.2)	7 (77.8)

*Vocal fatigue was defined by a score >24 points on Factor 1 of the Vocal Fatigue Index [VFI-19]. Percentages correspond to the proportion within each category.

3.3. Prevalence of symptoms of the VFI-19

Symptoms related to vocal fatigue in the 100 medical residents were analyzed using the three factors of the Vocal Fatigue Index-19 (VFI-19). For this analysis, a score greater than 2 on each item was considered indicative of the presence of a symptom.

Regarding Factor 1 (vocal fatigue and voice use avoidance), symptoms related to the perception of tiredness and vocal effort were identified as the most frequent. The symptom with the highest prevalence was “my voice feels tired when I speak a lot,” present in 20 participants (20.0%), followed by “I feel my voice is weak after a period of voice use” in 16 participants (16.0%) and “I experience greater vocal effort when speaking” in 15 participants (15.0%). Other reported symptoms included hoarseness associated with voice use in 12 participants (12.0%), difficulty speaking after a workday in 12 participants (12.0%), speech limitation following voice use in 11 participants (11.0%), avoidance of social situations in 10 participants (10.0%), and the need for greater effort to produce voice after a period of voice use in 10 participants (10.0%). The least frequent symptoms within this factor were difficulty

projecting the voice (8.0%), lack of desire to speak after voice use (9.0%), and perceived difficulty using the voice (5.0%) (Table 3).

For Factor 2 (physical discomfort associated with vocal use), a lower frequency of symptoms was observed compared to Factor 1. Physical discomfort was present in 7.0% to 8.0% of the participants. The most frequent symptoms were neck pain at the end of the day following vocal use, pain when speaking for prolonged periods, and neck discomfort during vocal use, each reported by 8 participants (8.0%). Sore throat following vocal use and pharyngeal pain during phonation were identified in 7 participants (7.0%) (Table 4).

The highest frequencies of positive responses were found for Factor 3 (improvement with vocal rest). Improvement following vocal rest was reported by 45 participants (45.0%), as was the resolution of hoarseness after the rest period. Additionally, 35 participants (35.0%) reported a reduction in the effort required for voice production after vocal rest. These results indicate that the vocal symptoms experienced by the residents tend to change with vocal recovery (Table 4).

Table 3: Prevalence of positive symptoms on the VFI-19 – Factor 1.

Factor	Symptom evaluated	Participants with symptoms n (%)
Factor 1. Vocal fatigue and actions taken	My voice sounds tired when I talk a lot.	20 (20.0)
	I feel my voice is weak after a period of vocal use.	16 (16.0)
	I experience greater vocal effort when speaking.	15 (15.0)
	My voice sounds hoarse when I use it too much.	12 (12.0)
	I feel like I can't talk to my family the same way after a long day of work.	12 (12.0)
	I generally tend to limit my speaking after a period of vocal use.	11 (11.0)
	I avoid social situations when I know I must speak	10 (10.0)

	more.	
	I need to exert more effort to produce my voice after a period of vocal use.	10 (10.0)
	I don't feel like talking after using my voice for a while.	9 (9.0)
	I find it difficult to project my voice when I use it.	8 (8.0)
	I feel like I struggle to use my voice.	5 (5.0)

Table 4: Prevalence of positive symptoms for Factor 1 of the VFI-19.

Factor	Symptom evaluated	Participants with symptoms n (%)
Factor 2. Physical discomfort	Neck pain at the end of the day after using my voice	8 (8.0)
	Pain when speaking after talking a lot	8 (8.0)
	Neck discomfort when using my voice	8 (8.0)
	Sore throat at the end of the day after using my voice	7 (7.0)
	Sore throat when using my voice	7 (7.0)
Factor 3. Improvement with rest	After resting my voice, I feel improvement.	45 (45.0)
	After resting my voice, I am recovering from my hoarseness.	45 (45.0)
	After resting my voice, the effort required to produce it decreases.	35 (35.0)

Note: The presence of a symptom was considered when the item scored >2 on the IFV-19.4.

4. DISCUSSION

Based on the literature reviewed, this study represents one of the first attempts in Mexico to assess the prevalence of vocal fatigue among medical residents using a standardized clinical instrument. An overall prevalence of 12% was identified, using a score above 24 on Factor 1 of the VFI-19 as the operational criterion to identify participants with a higher presence of symptoms related to vocal fatigue. Factor 1 was selected as the primary operational criterion because it represents the dimension of the instrument related to vocal tiredness, perceived limitation, and avoidance of voice use. Given that most literature employing this index has focused on teachers or other vocal professionals, international comparisons of our figures are initially drawn from these populations, where prevalence rates are typically higher than the 12% found in our sample. Authors such as Moreno et al.^[16] and Oliveira et al.^[17] have described variations in VFI-19 scores and manifestations of vocal fatigue across different occupational contexts and vocal demands, findings consistent with the proportion observed at our hospital. However, differences in vocal demands, work characteristics, and occupational exposure limit direct comparisons between medical residents and vocal professionals.

When shifting the analysis to the medical context, the systematic review by Feghali et al.^[3] indicates that approximately 53% of physicians report vocal symptoms, whereas a smaller proportion exhibits structural laryngeal abnormalities confirmed through specialized assessment. This methodological distinction is significant, as the presence of vocal symptoms does not necessarily imply the existence of vocal fatigue as measured by a specific instrument. A direct comparison of our results with these figures is limited because the

present study specifically assessed vocal fatigue using the VFI-19, rather than reports of isolated symptoms or the presence of anatomical pathology. Nevertheless, the 12% prevalence observed in our cohort may reflect a pattern consistent with functional vocal overload linked to occupational demands—a pattern that warrants monitoring, particularly given the persistence of working conditions involving high vocal demands. The clinical importance of timely identification of this condition lies in the potential to implement preventive strategies before the development of persistent vocal disorders or structural changes associated with prolonged vocal use.

Regarding demographic variables, no difference was observed in the prevalence of vocal fatigue by sex (12% in women and 12% in men). Although some studies have described sex-related differences in voice disorders, our results did not identify an association between the two variables. These findings should be interpreted with caution, considering that Baghban et al.^[18] primarily evaluated the psychometric properties of the VFI-19 and its cross-cultural adaptation; consequently, their results did not identify sex as a determining factor in the scores obtained on the VFI-19. In the hospital setting, clinical, environmental, and communicative demands may result in similar vocal exposure among residents, regardless of gender.

Regarding residency year, it is of significant clinical interest that the highest prevalence was observed among second-year residents (R2) at 25%. This finding may be linked to the progressive increase in clinical and academic responsibilities inherent to the standard structure of medical residency programs. This interpretation should be viewed as exploratory due to the limited size of the analyzed subgroups; furthermore, the

uneven distribution of resident numbers across years limits comparative analysis between groups. Similarly, in the specialty-based analysis, the high prevalence observed in Pneumology (28.5%) could be related to the communication dynamics involved in caring for patients with complex respiratory conditions, which require lengthy explanations and patient education. This association should be considered hypothetical, as the study design does not allow for the establishment of causal relationships. Likewise, the use of facial protective equipment—particularly high-efficiency masks—has been associated with increased communication effort and a perception of higher vocal demand among healthcare professionals; however, extrapolating these findings to medical residents requires caution.^[4]

The workload analysis showed that, although the majority of residents experiencing fatigue conducted between 5 and 10 hours of consultations per week, all physicians exposed to extreme work schedules (81–90 hours) exhibited vocal fatigue according to the established operational criterion (100%, 2/2); this finding should be interpreted with caution due to the small number of participants in this group. This pattern is consistent with research conducted primarily on professionals with high vocal demands, where increased phonatory load and insufficient vocal recovery have been linked to a higher frequency of vocal fatigue.^[19, 20-23]

A detailed analysis of the Vocal Fatigue Index-19 (VFI-19) among the 100 participants revealed that, among the individual items, Item 17 of Factor 3 ("My voice improves with rest") showed the highest frequency of positive responses (45%), followed by complaints regarding vocal effort and vocal fatigue. According to Nanjundeswaran et al.,^[22] symptom improvement with rest is a characteristic component assessed by Factor 3 of the Vocal Fatigue Index-19 (VFI-19), which relates to vocal recovery. This pattern suggests that the residents' reports are consistent with a symptom profile modulated by cumulative vocal load and recovery following rest.

It is necessary to point out the limitations of this study. Its cross-sectional design does not allow for the establishment of causality or the assessment of changes in vocal fatigue over time during the training period. As the sample was drawn from a single hospital, operational dynamics may not be generalizable to other institutions. Furthermore, some stratified analyses involved small sample sizes, limiting the precision of estimates across subgroups. Additionally, specific individual factors related to vocal health—such as vocal habits, sleep quality, stress, hydration, and exposure to irritants—were not analyzed, even though these could influence the perception of vocal fatigue. Although the Vocal Fatigue Index-19 (VFI-19) is a validated instrument for assessing vocal fatigue, the lack of objective measures—such as laryngoscopy, acoustic analysis, and complementary aerodynamic assessments—precludes correlating the

obtained scores with objective findings of structural or functional laryngeal abnormalities.^[24, 25] Future research should incorporate multicenter designs and clinical instrumentation to gain deeper insight into the occupational impact of medical residency on vocal health.

5. CONCLUSIONS

The prevalence of clinical vocal fatigue among the outpatient medical residents evaluated was 12%, demonstrating the presence of vocal demand-related issues during the specialty training period. These findings suggest that medical training entails significant communicative demands capable of causing symptoms consistent with vocal overload; no prevalence differences were observed between men and women, though a higher frequency was identified among second-year residents—a finding that should be interpreted in light of the characteristics and distribution of the study sample.

The main contribution of this study lies in highlighting vocal fatigue as a potential occupational health issue among medical personnel in training. The fact that symptoms predominantly improve with rest suggests a functional component linked to cumulative vocal demand and underscores the importance of early identification of these manifestations before they progress to persistent vocal disorders.

These results establish the need to conduct longitudinal, multicenter studies to evaluate the progression of vocal fatigue during medical residency, as well as to incorporate objective tools such as laryngoscopic assessment, acoustic analysis, and aerodynamic measurements. From an institutional perspective, the findings support the implementation of preventive strategies focused on vocal hygiene, education on efficient voice use, and vocal health monitoring programs for resident physicians.

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