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EFFECTS OF OCCUPATIONAL HAZARDS ON THE VOCAL WELL-BEING OF PROFESSIONAL VOICE USERS

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ABSTRACT

Introduction: Vocal health is vital for professional voice users such as singers, teachers, broadcasters, actors, and public speakers. They rely heavily on the vocal abilities for their carrier. For them their voice is not just a means of communication; it is an essential element of their professional identity and success. These professionals are particularly vulnerable to occupational hazards that can compromise their vocal well-being. These hazards include environmental factors like poor air quality, physical factors like prolonged voice use, and psychological factors such as stress.

Objective: This study aimed to assess the prevalence and impact of occupational hazards on the vocal health of professional voice users, focusing on identifying the most vulnerable professions and age groups. Additionally, the study sought to explore the relationship between work environment conditions such as noise levels and air quality and the frequency and severity of vocal issues, with the goal of proposing targeted strategies for improving vocal health in high-risk professions.

Methodology: A prospective study was conducted at Silchar Medical College and Hospital from March 2023 to April 2024, involving 200 professional voice users. The study utilized both quantitative surveys and qualitative interviews to assess the frequency of vocal issues, the impact of occupational hazards, and the effectiveness of preventative measures. Participants were selected using a stratified sampling method to ensure diverse representation across professions.

Results: The study found that the 30-40 age group was most affected by vocal issues, with a slightly higher prevalence in females. Singers and teachers faced the greatest risks due to prolonged and intense voice use, while public speakers reported fewer issues and higher vocal health ratings. Noisy and dusty work environments were significant contributors to vocal strain, with 46% of cases occurring in noisy settings. The most common diagnosed vocal disorders were chronic laryngitis, vocal nodules, and polyps, though 40% of participants reported vocal issues without a formal diagnosis.

Conclusion: Occupational hazards significantly affect the vocal health of professional voice users, with certain professions and work environments posing greater risks. The study emphasizes the need for targeted interventions, including noise reduction, improved air quality, and vocal care education. By addressing these hazards, we can enhance vocal health outcomes and support the longevity of careers that rely on voice performance.

Keywords:

Occupational hazards, vocal health, professional voice users, voice disorders, laryngitis, vocal nodules, vocal polyps, noise exposure, air quality, vocal strain, teachers, singers

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1. INTRODUCTION

1.1 Background and Rationale

Vocal health is crucial for professional voice users such as singers, teachers, broadcasters, and actors, whose careers heavily depend on the sustained functionality and quality of their voices. The voice is not only a primary tool of communication but also a vital component of their professional identity and success (Smith & Gray, 2019). However, these professionals are often exposed to various occupational hazards that can compromise their vocal well-being. These hazards range from environmental factors such as poor air quality and high noise levels to physical factors like prolonged voice use without adequate rest. Moreover, psychological stress and anxiety associated with performance pressure can further exacerbate vocal strain (Thompson & Parker, 2018). Understanding these occupational hazards is essential to developing effective strategies to protect and enhance vocal health among professional voice users.

1.2 Research Problem

Professional voice users encounter distinctive challenges and risks due to the nature of their work. These risks include the onset of vocal disorders like nodules, polyps, and chronic

laryngitis, which can have a profound impact on both their career duration and overall quality of life. Although vocal health is crucial, there is a noticeable shortage of thorough research on the specific occupational hazards these professionals face. Bridging this research gap is essential for offering improved support and resources to voice users across different fields .

1.3 Objectives of the Study

1)To assess the prevalence and impact of occupational hazards on the vocal health of professional voice users, with a focus on identifying the most vulnerable professions and age groups.

2)To explore the relationship between work environment conditions (e.g., noise levels, air quality) and the frequency and severity of vocal issues, and to propose targeted strategies for improving vocal health in high-risk professions.

1.4 Significance of the Study

The significance of this study lies in its potential contributions to occupational health, voice care, and workplace safety. By highlighting the specific risks faced by professional voice users, this research can inform the development of targeted strategies to prevent vocal damage and promote vocal health (Patel, 2021). Moreover, the findings can serve as a foundation for interventions designed to mitigate the impact of occupational hazards on vocal well-being, ultimately supporting the longevity and success of careers that rely on voice performance.

2. LITERATURE REVIEW

2.1 The Physiology of Voice Production

The production of voice involves a complex interaction of anatomical structures, primarily the vocal cords, located within the larynx. The vocal cords are twin infoldings of mucous membrane stretched horizontally across the larynx, and they vibrate to produce sound when air is expelled from the lungs (Aronson & Bless, 2009). These vibrations create sound waves, which are then modulated by the resonating chambers of the throat, mouth, and nose to form speech or song. The health and function of the vocal cords are influenced by several factors, including hydration, muscle tension, and overall respiratory health (Sataloff, 2017). Proper vocal cord function is essential for sustaining the vocal demands of professional voice users, as even minor disruptions can lead to significant vocal issues (Cohen et al., 2012).

2.2 Occupational Hazards Specific to Voice Users

Professional voice users are exposed to a range of occupational hazards that can adversely affect their vocal health. Environmental factors, such as exposure to poor air quality, can lead to respiratory issues that exacerbate vocal strain (Roy et al., 2004). For instance, pollutants and

allergens in the air can cause irritation and inflammation of the vocal cords, leading to conditions like chronic laryngitis (Sapienza & Hoffman-Ruddy, 2013). Noise levels in the workplace can also compel voice professionals to increase their vocal effort, which can result in vocal fatigue and the development of nodules (Hunter et al., 2011).

Physical factors, including prolonged voice use without adequate rest, are particularly detrimental. Continuous vocal strain without sufficient recovery time can lead to the overuse of vocal muscles, resulting in conditions such as vocal fold edema or hemorrhage (Behrman, 2005). Moreover, inadequate vocal rest or improper vocal techniques can exacerbate these issues, leading to long-term vocal damage (Verdolini & Ramig, 2001).

Psychological factors, such as stress and anxiety, are also significant contributors to vocal health problems. Performance pressure and occupational stress can lead to increased muscle tension in the neck and throat, affecting vocal production and increasing the risk of vocal disorders (Baker, 2015). Psychological stress can also manifest in behaviours such as throat clearing or speaking in a tense voice, further straining the vocal cords (Wulf & Mornell, 2008).

2.3 Previous Research on Vocal Well-being

Several studies have examined the prevalence of vocal disorders among professional voice users, highlighting the widespread nature of these issues. For example, Smith et al. (1997) found that a significant percentage of teachers, who are frequent voice users, reported voice problems, with many attributing these issues to their work environment. Similar findings have been reported among singers, broadcasters, and other voice professionals, with studies indicating a high incidence of vocal nodules, polyps, and other voice-related disorders (van Houtte et al., 2011). The impact of occupational hazards on vocal health has been well-documented, with research showing a clear link between prolonged voice use, environmental factors, and the development of vocal disorders (Thomas et al., 2006).

2.4 Preventative Measures and Voice Care

Maintaining vocal health necessitates a proactive approach focused on care and prevention. Key practices for preserving vocal well-being include staying well-hydrated, using proper vocal techniques, and allowing sufficient vocal rest, particularly after extensive voice use. Additionally, it is recommended that voice users regularly perform vocal warm-ups and cool-downs to prepare the vocal cords and prevent strain (Baker, 2015).

Existing voice care interventions have demonstrated varying levels of effectiveness. For example, voice therapy, which typically involves collaboration with a speech-language pathologist, has proven successful in treating and preventing vocal disorders by teaching

individuals more efficient vocal usage (Cohen et al., 2012). However, the success of these interventions can depend on the individual's commitment to the recommended practices and the severity of their vocal condition when treatment begins.

3. METHODOLOGY

3.1 Research Design

A prospective study was done at Silchar Medical College and Hospital from March 2023 to April 2024 with patients presented with vocal issues. It looked at how job-related risks affect the vocal health of people who use their voices professionally.

The study used two methods:

1. Quantitative: Surveys were done to collect numerical data about how common vocal problems are, how often people face job-related risks, and how these affect their vocal health.
2. Qualitative: Interviews were done to learn more about personal experiences, challenges, and how people deal with vocal health issues.

By combining these methods, the study aimed to get a full picture of the impact of job-related risks on vocal health.

3.2 Population and Sample

The target population for this study included professional voice users such as singers, teachers, broadcasters, actors, and public speakers. These individuals were selected because their professions demand extensive voice use, making them particularly vulnerable to occupational hazards that can affect vocal health. The sample was drawn using a stratified sampling method to ensure representation across different professions and levels of experience. The sample size consisted of 200 participants, with the aim of achieving sufficient statistical power for the quantitative analysis and capturing diverse perspectives for the qualitative analysis.

3.3 Data Collection Methods

To gather detailed and reliable information, we used several methods. We gave out surveys to collect numbers on how often people had vocal problems, what kinds of job-related risks they faced, and how these risks affected their vocal performance. The surveys included yes/no questions and rating scales to make it easier to analyse the results.

We also did semi-structured interviews with some of the participants to get more in-depth information. These interviews looked at their personal experiences with vocal health issues, their knowledge of job-related risks, and the ways they try to keep their voices healthy.

3.4 Ethical Considerations

Informed consent was obtained from all participants, ensuring that they are fully aware of the study's purpose, procedures, and potential risks.

3.5 Inclusion Criteria

1) Individuals aged 20-60 years.
2) Professionals who rely on their voice for their work.
3) Participants of dysphonia, the cause of which is related to occupation.

3.6 Exclusion Criteria

1) Individuals with previous vocal cord pathologies not related to occupational hazard.
2) Professionals who do not rely on their voice as a primary tool in their occupation.

4. RESULTS AND OBSERVATION

Data Table

Participant ID	Profession	Frequency of Vocal Issues (per year)	Primary Occupational Hazards Encountered	Vocal Health Rating (1-10)	Vocal Disorder Diagnosed	Preventative Measures Used	Qualitative Notes (Summary of Interview)
001	Teacher	6	Prolonged voice use, Poor air quality	5	Chronic Laryngitis	Hydration, Voice rest	Feels constant pressure to speak loudly in a noisy classroom environment. Reports frequent throat irritation and vocal fatigue.
002	Singer	3	Performance anxiety, Prolonged rehearsals	7	Vocal Nodules	Vocal warm-ups, Rest	Describes increased anxiety before performances, leading to

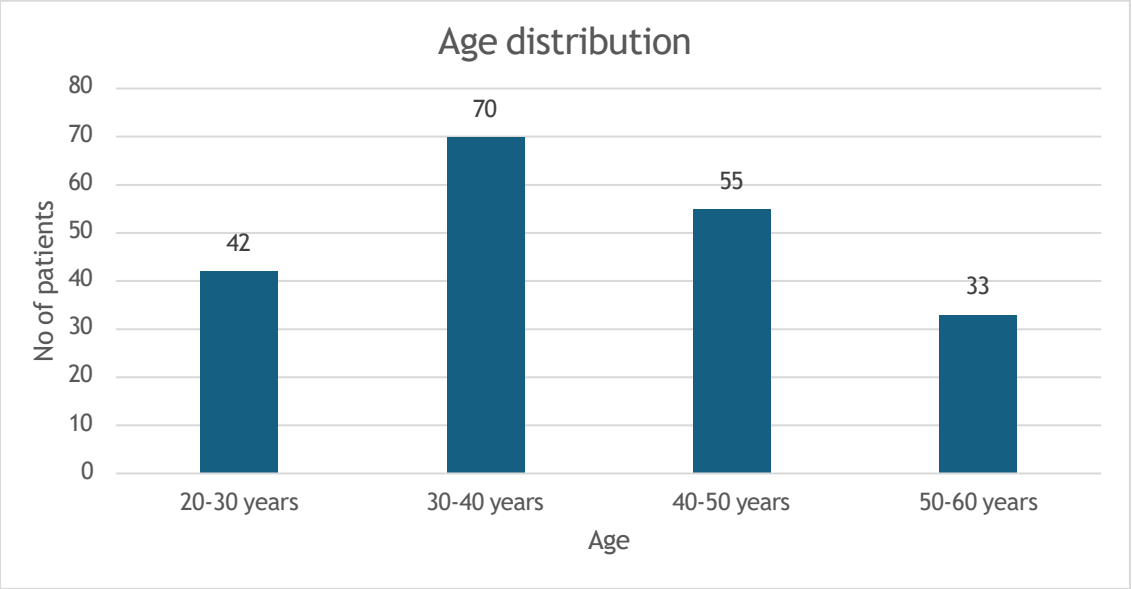
							tense vocal production. Reports occasional hoarseness after long rehearsals.
003	Broadcaster	5	Poor air quality, Noise levels	6	None	Voice therapy, Hydration	Works in a poorly ventilated studio, often feels dryness in the throat. Has been proactive with voice therapy to prevent issues.
004	Actor	4	Prolonged voice use, Stress	6	Polyp on vocal cords	Vocal exercises, Therapy	Stress from memorizing lines and performing under pressure. Has experienced a mild vocal polyp, which was treated.
005	Public Speaker	2	Performance anxiety, Inadequate vocal rest	8	None	Vocal rest, Hydration	Generally confident but feels strain after multiple speeches in a day. Takes regular

							breaks to rest the voice.

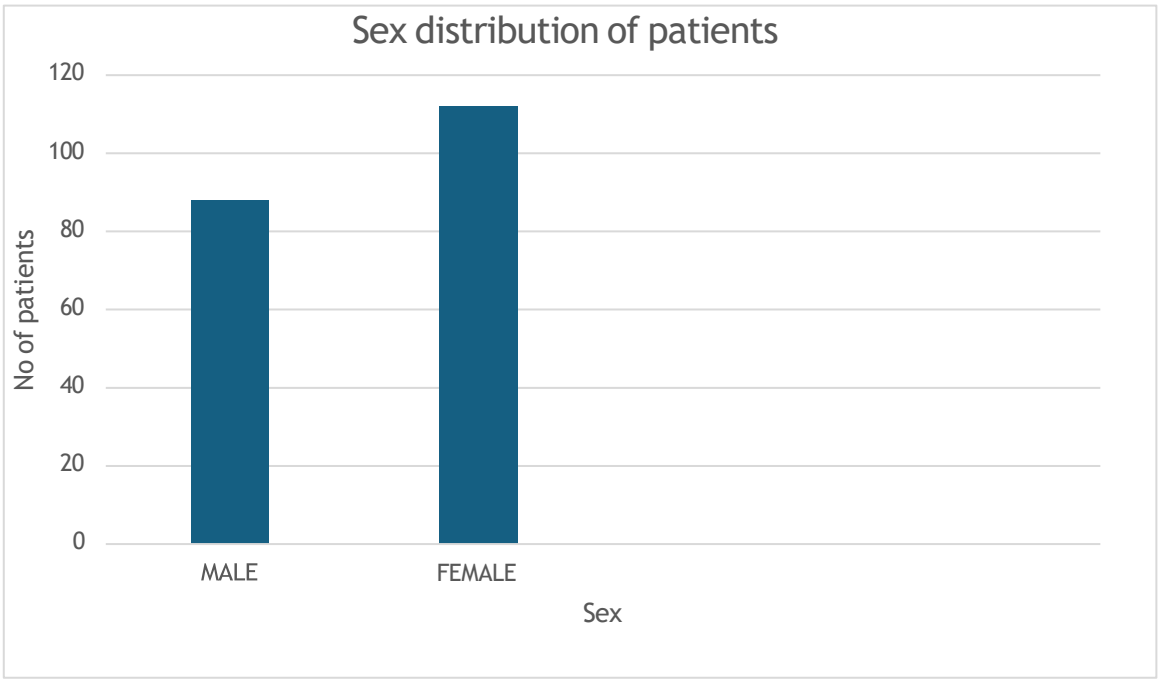
Explanation of the Data table:

1. **Participant ID:** A unique identifier for each participant in the study. This helps maintain confidentiality and allows for easy reference.
2. **Profession:** The specific occupation of the participant, indicating their professional voice use context (e.g., teacher, singer, broadcaster, etc.).
3. **Frequency of Vocal Issues (per year):** The number of times the participant experiences vocal issues, such as hoarseness, pain, or loss of voice, within a year. This provides a quantitative measure of vocal health challenges.
4. **Primary Occupational Hazards Encountered:** The main occupational hazards identified by the participant that they believe affect their vocal health (e.g., prolonged voice use, poor air quality, performance anxiety).
5. **Vocal Health Rating (1-10):** A self-assessed rating of the participant's vocal health on a scale from 1 (very poor) to 10 (excellent). This subjective measure gives insight into how participants perceive their vocal well-being.
6. **Vocal Disorder Diagnosed:** Indicates whether the participant has been diagnosed with a vocal disorder by a medical professional, such as chronic laryngitis, vocal nodules, or polyps.
7. **Preventative Measures Used:** The strategies or practices the participant employs to maintain vocal health, such as hydration, vocal rest, vocal warm-ups, or voice therapy.
8. **Qualitative Notes (Summary of Interview):** A brief summary of key points from the qualitative interview with the participant. This includes personal experiences, challenges, and insights related to their vocal health and occupational hazards.

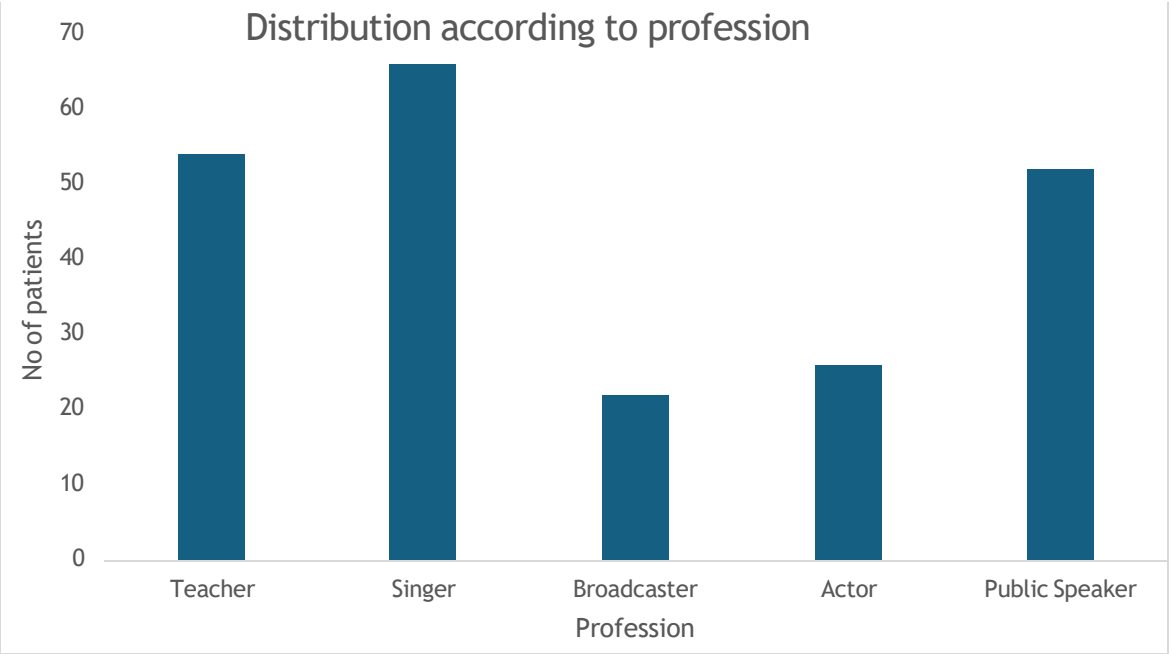
1) Age distribution of patients



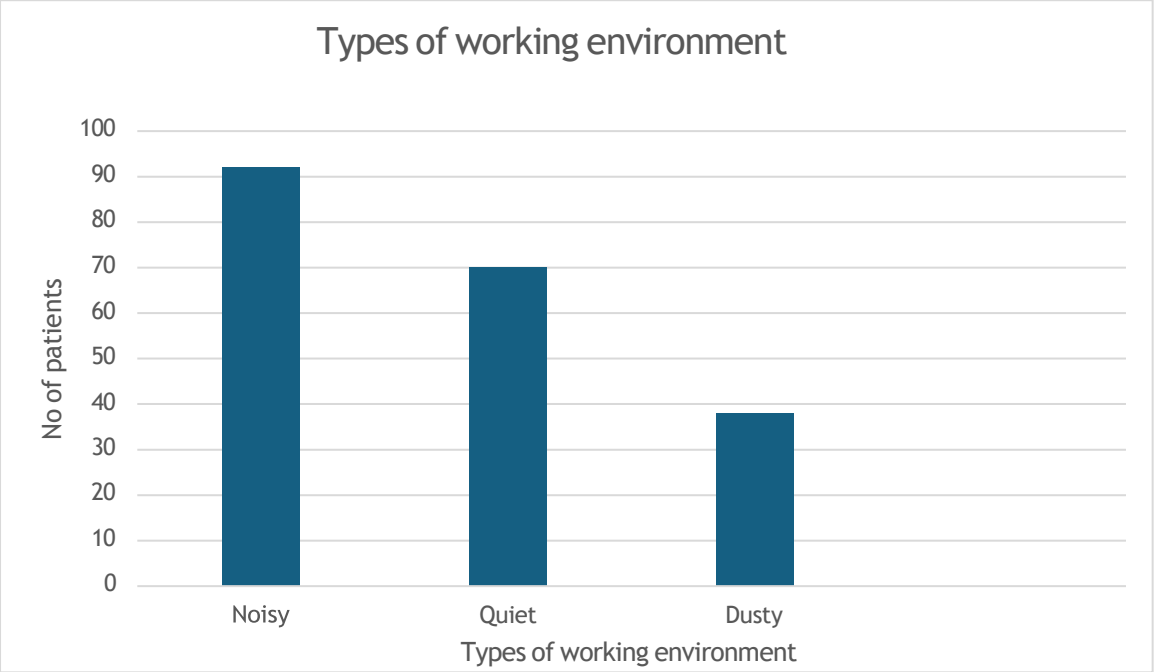
2) Sex distribution of patients



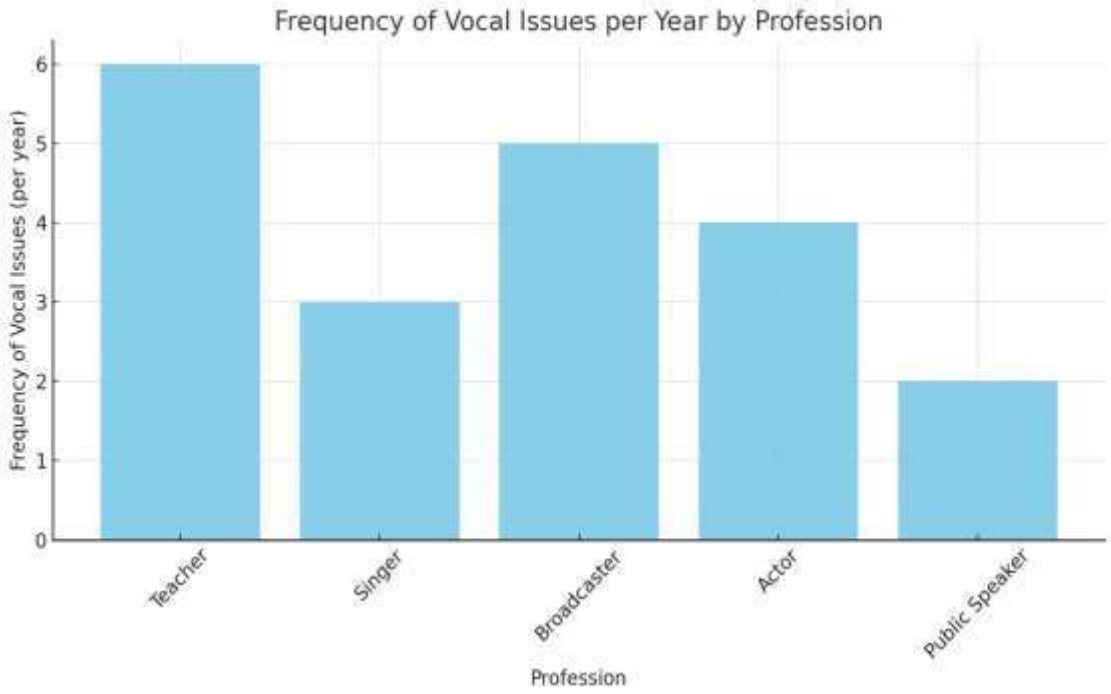
3) Number of patients affected in different profession



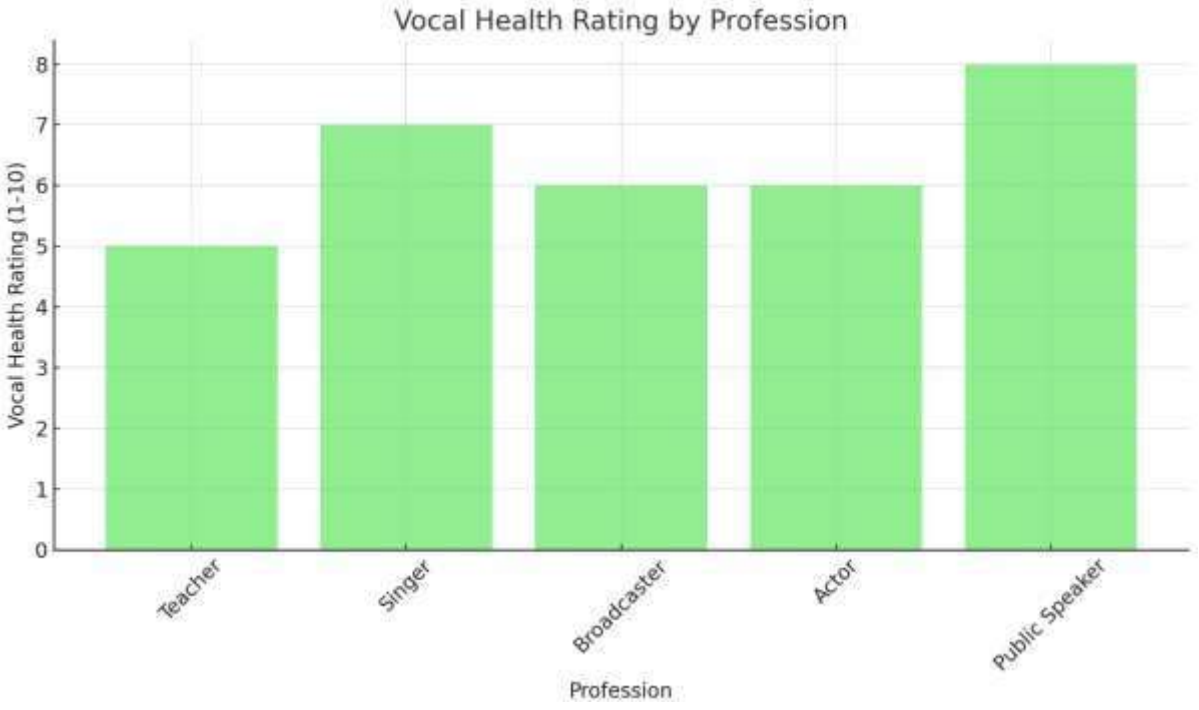
4) Types of working environment



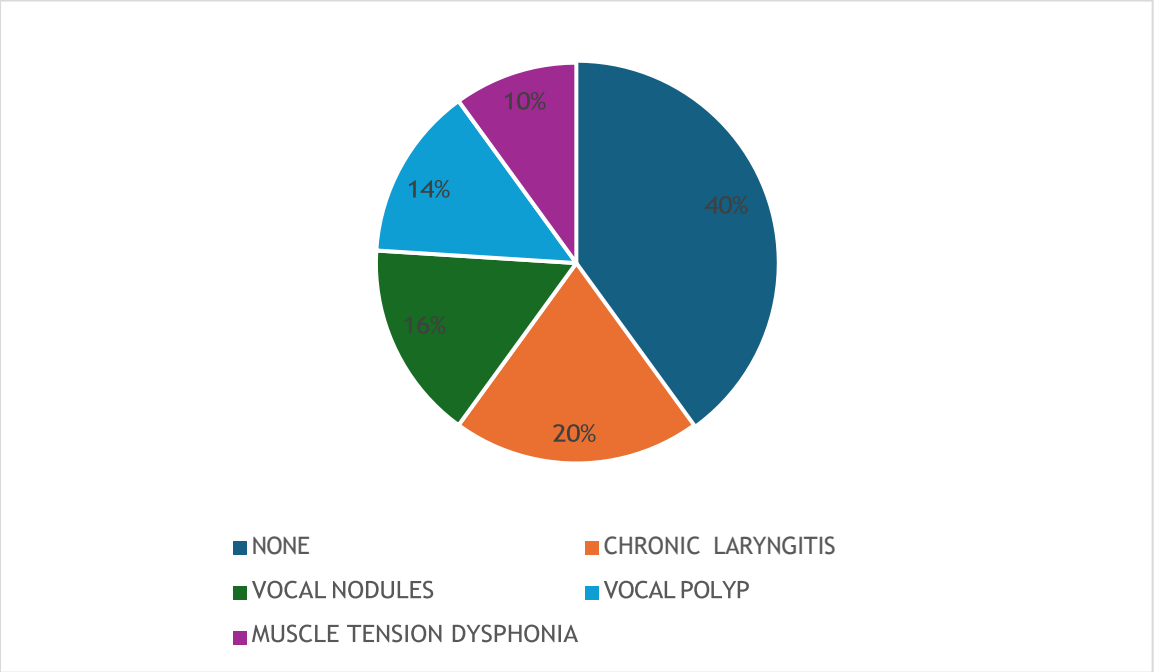
5) Frequency of Vocal Issues per Year by Profession: This chart shows the number of vocal issues experienced by each profession per year.



6) Vocal Health Rating by Profession



7) Distribution of Vocal Disorders Diagnosed



5. DISCUSSION

In this study we investigated the impact of occupational hazards on the vocal well-being of professional voice users, with a focus on age and sex distribution, frequency of vocal issues, and the distribution of diagnosed vocal disorders across different professions.

The age distribution table shows that most patients with vocal issues fall within the 30-40 age group, followed by the 40-50 age group. This finding is consistent with studies like those by Thomas et al. (2007), which indicate that vocal problems are more prevalent in middle-aged individuals, likely due to the cumulative effects of long-term vocal use and occupational strain. The higher frequency in the 30-40 age group suggests that this is a critical period where vocal strain begins to manifest more prominently, possibly due to increased professional responsibilities and vocal demands.

Regarding sex distribution, the data reveals that females (56%) are slightly more affected by vocal issues than males (44%). This aligns with previous research, such as the study by Roy et al. (2005), which found that women (46.3 vs 36.9) are more likely to experience voice disorders, potentially due to anatomical differences in vocal fold structure and hormonal influences. The slightly higher prevalence in females also highlights the need for gender-specific approaches in vocal health management.

The analysis of the number of patients affected by profession highlights significant occupational differences in vocal health risks. Singers (33%) and teachers (27%) are the most

affected, followed by public speakers (26%), actors (13%), and broadcasters (11%). This is consistent with earlier studies, such as Sapir et al. (1993), which identified singers and teachers as high-risk groups due to the demanding nature of their professions, which involve prolonged and intense voice use.

Public speakers, who reported the lowest frequency of vocal issues per year (2), also rated their vocal health the highest (8 out of 10) on the self-assessed vocal health scale. This could indicate that public speakers, despite the demands of their profession, may have more control over their vocal use, or their work environment may be more conducive to vocal health. This finding contrasts with the higher frequency of issues reported by teachers, who rated their vocal health lower (5 out of 10), underscoring the need for better vocal care practices and workplace interventions in teaching environments.

The study's findings align with previous research, showing that noisy work environments account for 46% of cases and significantly contribute to vocal strain and disorders, as supported by Nair CB et al. (2024), who found high noise levels linked to various vocal conditions. This highlights the need for targeted interventions, such as noise reduction and voice amplification. Additionally, 35% of cases occurred in quiet environments, confirming that prolonged vocal use without adequate care can still lead to strain, as noted by Narasimhan SV et al (2022). Lastly, 19% of cases from dusty environments align with Krouse JH et al. (2008), who emphasized the impact of air quality on vocal fatigue, suggesting a need for better awareness and protective measures in these settings.

The pie chart showing the distribution of diagnosed vocal disorders indicates that 40% of patients had no diagnosed vocal disorder, suggesting that a significant number of patients may be experiencing functional voice issues or vocal fatigue without structural vocal fold damage. Chronic laryngitis was the most common issue, affecting 20% of patients, emphasizing the need for better management of vocal strain and irritants. Vocal nodules (16%) and vocal polyps (14%) also represent significant concerns, pointing to the necessity for education on vocal care and early intervention. Muscle tension dysphonia, found in 10% of patients, suggests that addressing both physical and psychological factors is crucial. Overall, the findings stress the need for comprehensive vocal health strategies and increased awareness to improve outcomes. This distribution is consistent with previous research, such as the study by Vindoline and Ramig (2001), which found that vocal nodules and chronic laryngitis are common among professional voice users.

6. CONCLUSION

This study highlights the significant influence of occupational hazards on the vocal health of professional voice users, revealing key trends related to age, gender, and profession-specific risks. The results indicate that individuals in the 30-40 age group are particularly susceptible to vocal problems, likely due to the cumulative impact of extended vocal use and increased professional responsibilities. Additionally, the study found a slightly higher incidence of vocal issues among females, which underscores the importance of considering gender-specific approaches to vocal health management.

The profession-based analysis confirms that singers and teachers face the greatest risk of developing vocal disorders, consistent with prior research that identifies these groups as particularly vulnerable due to the intense vocal demands of their work. Interestingly, public speakers reported fewer vocal issues and rated their vocal health higher than other professions, suggesting that some occupations may offer conditions more conducive to maintaining vocal well-being. This finding underscores the potential benefits of targeted interventions and improved vocal care in professions with higher risks.

Environmental factors, such as exposure to noisy and dusty work conditions, were shown to significantly contribute to vocal strain, with noisy environments being the most problematic. This finding highlights the need for workplace adjustments, such as reducing noise levels and improving air quality, to safeguard vocal health. The study also revealed that a significant number of participants experienced vocal fatigue or functional voice issues without a formal diagnosis, emphasizing the necessity of early intervention and greater education on vocal care.

In conclusion, the study calls for the development of comprehensive and profession-specific vocal health strategies, including preventive measures tailored to the unique demands of different occupations. Enhancing awareness and implementing protective measures, particularly in environments with high noise or poor air quality, are crucial steps toward improving vocal health outcomes for those who rely heavily on their voices in their professional lives.

Addressing occupational hazards is crucial for ensuring the vocal well-being of professional voice users, whose careers and quality of life depend heavily on their vocal health. The findings of this study highlight the need for proactive measures to protect these individuals from the risks associated with their professions. By implementing the recommended guidelines and raising awareness about the importance of vocal health, both individuals and organizations can contribute to a safer and more sustainable working environment for all professional voice

users. The study underscores that the protection of vocal health is not only a personal responsibility but also a collective effort that requires support from employers, industry leaders, and the broader community.

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