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Prevalence and Determinants of Hoarseness of Voice in School Teachers: Implications for Occupational Vocal Health

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Abstract

Hoarseness of voice is a common occupational hazard among school teachers, often resulting from prolonged vocal use in challenging classroom environments. Despite its substantial impact on teachers' quality of life and job performance, there is limited data on the prevalence and contributing factors of voice disorders in Saudi Arabia. To evaluate the burden of hoarseness of voice and explore its associated risk factors among school teachers in Bisha, Saudi Arabia, using the Voice Handicap Index (VHI). A cross-sectional study was conducted among 101 randomly selected school teachers from 15 schools in Bisha, Asir Region. Data were collected using a validated, self-administered questionnaire, including socio-demographic variables, voice usage and perception, lifestyle factors, and the VHI. Statistical analysis was performed using SPSS version 27. Descriptive and bivariate analyses were conducted to explore associations between hoarseness of voice and independent variables. Among the 101 participants, 71.3% reported mild, 21.8% moderate, and 6.9% severe voice handicap based on the VHI. Hoarseness of voice was significantly associated with higher income (P=0.043), longer teaching experience (P=0.05), raising voice during teaching (P=0.034), and coffee consumption (P=0.04). Although older age and female gender were linked with increased voice handicap, these associations were not statistically significant. The findings reveal a high prevalence of hoarseness of voice among school teachers in Bisha, influenced by several modifiable risk factors. Implementation of preventive strategies such as vocal hygiene education, voice amplification devices, and routine medical evaluations is essential. Further longitudinal and clinically validated studies are needed to establish causality and improve voice health among educators.

Keywords Hoarseness of voice, School Teachers, Voice Handicap Index (VHI), Risk Factors

1. Introduction

Hoarseness of voice is characterized by an abnormal vocal quality that often manifests breathy, strained, rough, raspy, strangled sound affecting communication or reduces voice related quality of life (1). Hoarseness can significantly impact daily life, affecting various aspects of an individual's personal and professional activities. Teachers, whose profession places significant demands to speak for extended periods, frequently in noisy environments which can lead to vocal strain and eventually voice disorders (2).

Studies have shown that the prevalence of voice disorders among teachers is up to 20-50% worldwide at some point in their careers leading to significant morbidity and economic burden (2). Several risk factors such as socio-demographic factors, life style factors, voice usage and perception, psycho-emotional factors, occupational and environmental factors contribute to voice problems among teachers (3). Studies have shown that 70% of teachers were exposed to unfavorable environment whereas 65% to loud background noise contribute to hoarseness of voice (4). The higher prevalence of voice disorders 57.1 % among teachers which revealed higher than in general population in Saudi Arabia (5).

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The aim of this study is to assess the prevalence of hoarseness of voice teachers by using Voice Handicap Index (VHI). The VHI is a widely used, validated tool for assessing the impact of voice disorders on an individual's quality of life (6). It quantifies the emotional, functional and physical aspects of voice problems, making it an ideal instrument for assessing hoarseness of voice among teachers. By employing the VHI, the study seeks to provide objective measure of hoarseness of voice affecting school teachers and proposed interventions that could alleviate these issues.

Voice disorders can have a profound impact on teacher's quality of life, work productivity, and overall well-being. Despite the growing research, there is limited data specifically examining the prevalence and risk factors of hoarseness of voice among teachers in Saudi Arabia. In Saudi Arabia, the educational sector is rapidly expanding, with an increasing number of teachers entering the profession. Given the linguistic and cultural diversity of the country, as well as varied classroom environments, it is crucial to assess the prevalence of hoarseness of voice among teachers and identify the factors contributing to these issues. Research on this issue is still emerging, identifying the extent of this issue in Saudi teaching community is essential for designing targeted interventions to prevent and manage voice problems effectively. The primary objective of this study was to assess the prevalence of hoarseness of voice among school teachers and to identify associated risk factors contributing to its development. To achieve this, the Voice Handicap Index (VHI) a validated, self-reported tool for evaluating voice-related symptoms and their impact was employed. The findings aim to inform targeted interventions and preventive strategies to safeguard the vocal health of educators in similar occupational settings.

2. Methodology

This cross sectional study was carried out at schools of Bisha, Asir Region Saudi Arabia, after obtaining approval from the Institutional Review Board of Asir Region, Ministry of Health, Saudi Arabia.

A total of 15 schools including primary and secondary schools were selected by stratified sampling technique by obtaining data from Ministry of education by the principle investigator. A total of 101 school teachers were randomly selected and interviewed immediately after assigned a serial number to each school teacher. Data collectors wait outside the class rooms for the randomly assign participant to exit. Weighted samples were taken from each selected schools. Part time school teachers or who are involved in active teaching less than one year or involved in administrative activities were excluded. After ethical review committee approval data collector explained the nature and purpose of the study to all selected study participants. Data collectors were hired and trained by principle investigator. Written informed consent was obtained and data was collected from study participants by conducting face to face interviews until the required sample size was achieved.

Data were collected using pre-tested, self-administered, validated questionnaires including socio-demographic characteristics, voice usage and perception, life style and medical history and Voice Handicap index. The questionnaires were based on previous studies by researchers (7-9). VHI checklist (Annex I) designed to assess voice handicap in relation to vocal load as well as physical, environmental, and psycho-emotional factors. This patient-centered self-administered tool comprises 30 items that are distributed evenly across three domains: functional, physical, and emotional aspects of voice disorders. Each domain includes 10 questions, rated on a 5-point scale ranging from 0 (never) to 4 (always). The total score ranges from 0 to 120, with scores less than 30 indicating mild voice handicap, scores between 31 and 60 representing moderate voice handicap, and scores greater than 60 reflecting severe voice handicaps (6).

Statistical package of Social Sciences (SPSS version 27) was used to analyze the data. Data were initially imported from Microsoft Excel into the SPSS software. Appropriate coding was applied to variables within the variable view. Some continuous variables will categorize into new variables for purpose of analysis. Descriptive statistics was run to determine frequency and percentage of dependent variable (i.e. hoarseness of voice) and categorized them into mild, moderate and severe hoarseness of voice according to assigned scoring criteria. Descriptive statistics was run to determine mean and standard deviation for continuous independent variables (Age, year of teaching experience and income) and frequency and percentage for nominal independent variables (gender, nationality, level of education, level of school and average class size). A separate descriptive statistic was run to determine mean and standard deviation or frequency and percentages of variables includes in voice usage and perception and life style history.

Bivariate analysis was done to determine the relationship of dependent variable (i.e. hoarseness of voice) and independent variables (i.e. Age, year of teaching experience, income, gender, nationality, level of education, level of school and average class size). It was

assessed by chi-square test at a 95% confidence level and P-value ≤0.05 was taken as significant.

3. Results

Table 1: Socio-Demographic Characteristics of school teachers in Bisha, Saudi Arabia (N=101)

Variables	N	%
Age (42.56±7.9)		
≤ 40 years	40	39.6
> 40 years	61	60.4
Gender		
Male	63	62.4
Female	38	37.6
Nationality		
Saudi	91	90.1
Non-Saudi	10	9.9
Level of education		
Less than bachelor	5	5
Bachelor	80	79.2
More than bachelor	16	15.8
Years of teaching experienced (17.98±7.9)		
< 20 years	60	59.4
≥ 20 years	41	40.6
Types of School		
Pre-Kindergarden, Kindergarden, Primary	52	51.5
Stage One Intermediate/Junior High	26	25.7
Stage Two Secondary	23	22.8
Average Class Size		
<15 students	7	6.9
15-30 students	59	58.4
31-45 students	27	26.7
>45 students	8	7.9
Income (12800.59±6086.92)		
< 10000 SR	34	33.7
≥10000 SR	67	66.3
Number of Siblings at home		
< 5	59	58.4
≥ 5	42	41.6

Table 1 showed the socio-demographic characteristics of school teachers in Bisha, Saudi Arabia. A total of 101 interviews were performed during data collection period. Mean age of the participants was (42.56±7.9) years. Majority of the respondents were males (62.4%) having bachelor degree (79.2%) belong to Saudi nationality (90.1%). Regarding type of schools, (51.5%) teaching in Pre-Kindergarden, Kindergarden, Primary schools having teaching experienced more than 20 years was (59.4%). Mean income of the teachers were (12800.59±6086.92) SR means more than or equal to 10000 SR (66.3%). Majority of teachers had 15-30 students in class (58.4%) and having less than 5 siblings (58.4%).

Table 2: Voice Usage, Perceptions and life style of school teachers in Bisha Saudi Arabia (N=101)

Variables	N	%
How many hours /day you spend teaching		
< 5 hours	78	77.2
≥ 5 hours	23	22.8
Do you use any amplification device		
Yes	9	8.9
No	92	91.1
Do you frequently raise your voice while teaching to get attention or control the class?		
Yes	80	79.2
No	21	20.8
How often do you have breaks during your teaching day (Lasting more than 10 minutes)		
Frequently	27	26.7
Sometimes	67	66.3
Rarely	6	5.9

	Never	1	1
Do you smoke?			
	Yes	8	7.9
	No	93	92.1
Do you take coffee?			
	Yes	85	84.2
	No	16	15.8
How much caffeine do you consumed per day?			
	≤ 2 Cups	85	84.2
	> 2 Cups	16	15.8

Table 2 showed Voice Usage, Perceptions and life style of school teachers in Bisha Saudi Arabia. Among 101 teachers, (77.2%) of teachers spending time less than 5 hours in teaching and (79.2%) raised their voices during teaching and (92.1%) not used any kind of amplification devices. Only (7.9%) of teachers smoked while (84.2%) took coffee daily, including (84.2%) teachers having had coffee less than or equal to 2 cups.

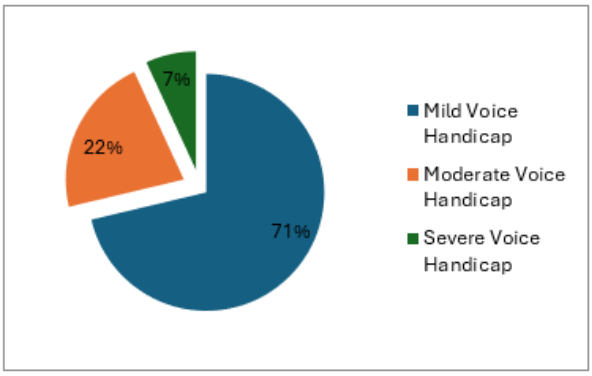

Figure 1: Percentage of Hoarseness of voice by Voice Handicap Index (N=101)

Fig 1 showed the percentage of hoarseness of voice among school teachers in Bisha, Saudi Arabia. A total of 101 teachers, (71.3%) had mild voice handicap, 21.8% had moderate voice handicap and 6.9% had severe voice handicap.

Table 3 showed bivariate analysis of socio-demographic characteristics versus Degree of Voice Handicap Index. The degree of voice handicap index was more prevalent among older age group as compare to younger. However, difference was not statistically significant (P=0.27). Significant difference was observed in the prevalence of degree of voice handicap index among those teachers who have income more than or equal to 10000 SR (P=0.043). Similarly, the degree of voice handicap index was more prevalent in teachers who have had experienced more than or equal to 20 years as compared to less than 20 years and found statistically significant difference (P=0.05). The degree of voice handicap index was more prevalent among Male gender, Saudi nationals, bachelor's degree holders, increasing class size and increasing number of siblings but difference was not statistically significant with the degree of voice handicap index.

Table 4 showed bivariate analysis of voice usage, perceptions and life style versus degree of Voice Handicap Index (N=101). Significant difference was observed in the prevalence of degree of voice handicap index among those teachers who frequently raise your voice while teaching to get attention or control the class (P=0.034). The degree of voice handicap index was more prevalent among smokers as compare to non-smokers. However, difference was not statistically significant (P=0.395). Drinking coffee was also significant associated with degree of voice handicap index (P=0.04). The degree of voice handicap index was more prevalent among teachers who spend less than 5 hours in class, who used amplification device, who took break sometimes but difference was not statistically significant with the degree of voice handicap index

4. Discussion

Voice is the main communication tool of teachers, so hoarseness of voice can affect their professional performance and routine daily life. School teachers have been identified at increased risk hoarseness of voice because of their demand (10).

This study was conducted to determine the prevalence of hoarseness of voice among teachers in Saudi Arabia and identify any associated socio-demographic, voice usage, voice perception and life style factors. The findings of this study revealed that (28.7%) of teachers have had moderate to severe hoarseness of voice. The findings of this study are consistent with earlier studies. A study conducted in Saudi Arabia, have highlighted a significant prevalence of hoarseness of voice (37.9%) among school teachers (4). In addition, a study from Iran, the prevalence of hoarseness of voice based on VHI criteria was 27.2% (11). Furthermore, a study in Spain revealed 59% prevalence of hoarseness of voice among school teachers. Similar finding is noticed in a study conducted in china having 47.9% prevalence of hoarseness of voice among school teachers (10).

Table 3: Bivariate analysis of socio-demographic characteristics versus Degree of Voice Handicap Index

Variable		Mild(N=72) N(%)	Moderate (22) N(%)	Severe (7) N(%)	X^2	P-Value
Age						
	≤ 40 years	28(70%)	11(27%)	1(2.5%)	3.149	0.271
	> 40 years	44(72.1%)	11(18.0%)	6(9.8%)		
Gender						
	Female	22(57.9%)	12(31.6%)	4(10.5%)	5.254	0.072
	Male	50(79.4%)	10(15.9%)	3(4.8%)		
Nationality						
	Saudi	64(70.3%)	20(22.0%)	7(7.7%)	1.59	0.451
	Non-Saudi	8(80.0%)	2(20%)	0(0%)		
Level of education						
	Less than bachelor	3(60%)	2(40%)	0(0%)	2.142	0.71
	Bachelor	58(72.5%)	17(21.3%)	5(6.3%)		
	More than bachelor	11(68.8%)	3(18.8%)	2(12.5%)		
Years of teaching experienced						
	< 20 years	38(63.3%)	16(26.7%)	6(10%)	5.306	0.05*
	≥ 20 years	34(82.9%)	6(14.6%)	1(2.4%)		
Type of schools						
	Pre-Kindergarden, Kindergarden, Primary	35(67.3%)	11(21.2%)	6(11.5%)	6.638	0.156
	Stage One Intermediate/Junior High	21(80.8%)	4(15.4%)	1(3.8%)		
	Stage Two Secondary	16(69.6%)	7(30.4%)	0(0%)		
Average Class Size						
	<15 students	6(85.7%)	0(0%)	1(14.3%)	10.413	0.108
	15-30 students	42(71.2%)	15(25.4%)	2(3.4%)		
	31-45 students	17(63%)	7(25.9%)	3(11.1%)		
	> 45 students	7(87.5%)	0(0%)	1(12.5%)		
Income						
	< 10000 SR	25(73.5%)	9(26.5%)	0(0%)	6.284	0.043*
	≥ 10000 SR	47(70.1%)	13(19.4%)	7(10.4%)		
Number of Sublings						
	< 5	41(69.5)	14(23.7)	4(6.8%)	0.319	0.853
	≥ 5	31(73.8%)	8(19.0%)	3(7.1%)		

The used test was chi-squared test
****Significant at level 0.05***

disorders (12). The higher prevalence of voice disorders

Table 4: Bivariate analysis of Voice Usage, Perceptions and lifestyle versus Degree of Voice Handicap Index (N101)

Variable		Mild(N=72) N(%)	Moderate (22) N(%)	Severe (7) N(%)	X^2	P-Value
How many hours /day you spend teaching in classroom						
	< 5 hours	55(75%)	17(21.8%)	6(7.7%)	0.347	0.841
	≥ 5 hours	17(73.9%)	5(21.7%)	1(4.3%)		
Do you use any amplification device						
	Yes	5(55.6%)	3(33.3%)	1(11.1%)	1.111	0.574
	No	67(7.28)	19(20.7%)	6(6.5%)		
Do you frequently raise your voice while teaching to get attention or control the class?						
	Yes	53(66.3%)	20(25.0%)	7(8.8%)	6.756	0.034*
	No	19(90.5%	2(9.5%)	0(0%)		
How often do you have breaks during your teaching day (Lasting more than 10 minutes)						
	Frequently	22(81.5%)	5(18.5%)	0(0%)	12.069	0.07
	Sometimes	47(70.1%)	13(19.4%)	7(10.4%)		
	Rarely	2(33.3%)	4(66.7%)	0(%)		
	Never	1(100%)	0(%)	0(%)		
Do you smoke?						
	Yes	7(87.5%)	1(12.5%)	0(%)	1.857	0.395
	No	65(69.9%)	21(22.6%)	7(7.5%)		
Do you take coffee?						
	Yes	57(67.1%)	21(24.7%)	7(8.2%)	6.454	0.04*
	No	15(93.8%)	1(6.3%)	0(%)		
How much caffeine do you consumed per day?						
	≤ 2 Cups	60(70.6%)	18(21.2%)	7(8.2%)	2.538	0.281
	> 2 Cups	12(75.0%)	4(25.0%)	0(%)		

The used test was chi-squared test
****Significant at level 0.05***

This study predicted more female teachers (42.1%) are likely to developed moderate to severe hoarseness of oice than male teachers. However, no significant difference was noticed between males and females in the study group regarding gender (P=0.072). This finding is supported in studies in the literature indicating that female teachers exhibits higher odds and prevalence rates than male teachers in having recent self-reported voice among females may be attributed to biological differences, a greater tendency to report health issues, or a combination of both. Anatomical distinctions between males and females could help explain this disparity. Women typically have shorter and thinner vocal folds, which produce a higher fundamental frequency compared to men. This leads to more frequent vibrations and increased collisions of the vocal folds, potentially heightening the risk of vocal fold damage (13).

This study revealed that with increase with age, there are more likely to developed moderate to severe hoarseness of voice (27.8%) but there is no significant difference was shown when comparing the degree of VHI scores with different age groups of the teachers included in this study (P=0.271). Our results in line with the study conducted in Taiwan, who studied risk factors and the effects of voice problems reported no significant difference between different age groups in relation to voice problems (14). Voice problems may become more prevalent with age largely due to structural changes in vocal mechanism that can compromise vocal quality and function (15-16). These changes encompass the ossification of the laryngeal cartilage and a decline in the structural and functional properties of larynx which collectively compromises the vocal function of larynx (17).

This study also identifies several factors associate with the degree of hoarseness of voice. In our study, we found a significant association of degree of hoarseness of voice with longer teaching experienced (P=0.05), Income (P=0.04), Raised voice during teaching (P=0.03) and coffee consumption (P=0.04). The findings of this study are consistent with the previous studies. A study conducted in Saudi Arabia identified several risk factors associated with high score of VHI including smoking, longer teaching experienced, and more teaching hours per week (4). Similarly, a study conducted in Korea, found a significant association of degree of hoarseness of voice with gender, coffee consumption, raised voice during teaching and spending more time in teaching (17). These findings collectively underscore the high prevalence of hoarseness of voice among teachers in Saudi Arabia and several factors contributing to this issue. The consistent use of VHI scale provides a reliable measure for assessing the hoarseness of voice on teacher's quality of life. Our research suggests a pressing need for targeted interventions, including vocal health education, use electronic voice amplification devices for teaching and access to specialized hospitals to mitigate the impact of hoarseness of voice.

This study has several limitations that must be acknowledged. Due to its cross-sectional design, it cannot establish causal relationships between identified risk factors and voice hoarseness. The use of a self-administered questionnaire (VHI) introduces potential recall and response biases, which may affect the accuracy of symptom reporting. Additionally, the absence of clinical assessments such as laryngoscopy or specialist voice evaluations limits the ability to confirm or objectively grade voice disorders. The small sample size and restriction to one geographic area (Bisha) further reduce the generalizability of the findings. Future research should address these issues by incorporating larger, more diverse samples, objective clinical tools, and longitudinal designs to better understand the burden and predictors of voice disorders among teachers.

5. Conclusion

Hoarseness of voice is a prevalent issue among school teachers, influenced by various factors such as the teaching environment, lifestyle choices, existing health conditions, and occupational stress. Utilizing the Voice Handicap Index (VHI) offered valuable insights into the impact of voice disorders on both the personal well-being and professional effectiveness of teachers. As vocal communication is central to the teaching profession, these results highlight the urgent need for preventive strategies. This includes providing vocal hygiene education, encouraging the use of voice amplification devices, and ensuring routine medical evaluations. Raising awareness and establishing adequate support systems can play a key role in minimizing the incidence and severity of voice problems. To better understand these relationships and evaluate the success of intervention strategies, further longitudinal research is recommended.

Conflict of interest The author declares no conflict of interest.

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ANNEX I

Voice Handicap Index

These are statements that many people have used to describe their voices & the effects of their voices ontheir lives. Circle the response that indicates how frequently you have the same experience.

0-Never 1-Almost Never 2-Sometime 3-Almost Always 4-Always

Part I-FUNCTIONAL

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 family has difficulty hearing me when I call them throughout the house.	0	1	2	3	4
I use the phone less often than I would like to.	0	1	2	3	4
I tend to avoid groups of people because of my voice.	0	1	2	3	4
I speak with friends, neighbors, or relatives less often because of my voice.	0	1	2	3	4
People ask me to repeat myself when speaking face-to-face.	0	1	2	3	4
My voice difficulties restrict my personal and social life.	0	1	2	3	4
I feel left out of conversations because of my voice.	0	1	2	3	4
My voice problem causes me to lose income.	0	1	2	3	4

Subtotal

Part II-PHYSICAL

I run out of air when I talk.	0	1	2	3	4
The sound of my voice varies throughout the day.	0	1	2	3	4
People ask, “What’s wrong with your voice?”	0	1	2	3	4
My voice sounds creaky and dry.	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
I try to change my voice to sound different.	0	1	2	3	4
I use a great deal of effort to speak.	0	1	2	3	4
My voice is worse in the evening.	0	1	2	3	4
My voice “gives out” on me in the middle of speaking.	0	1	2	3	4

Part III-EMOTIONAL

I am tense when talking to others because of my voice.	0	1	2	3	4
People seem irritated with my voice.	0	1	2	3	4
I find other people don't understand my voice problem.	0	1	2	3	4
My voice problem upsets me.	0	1	2	3	4
I am less outgoing because of my voice problem.	0	1	2	3	4
My voice makes me feels handicapped.	0	1	2	3	4
I feel annoyed when people ask me to repeat.	0	1	2	3	4
I feel embarrassed when people ask me to repeat.	0	1	2	3	4
My voice makes me feel incompetent.	0	1	2	3	4
I am ashamed of my voice problem.	0	1	2	3	4

Subtotal

Total