Hoarseness among school teachers: A cross-sectional study from Dammam

Ahmed A. Alrahim, Rawan A. Alanazi, Mohammad H. Al-Bar

Abstract:
BACKGROUND: Voice disorders are known to be a serious occupational hazard for teachers. Compared to the general population, teachers have a greater risk of developing hoarseness of voice. The prevalence of voice disorders in teachers is 20%–50%. To the best of our knowledge, there has been no study in Saudi Arabia (SA) on the prevalence of hoarseness in teachers.

MATERIALS AND METHODS: A cross-sectional survey was conducted in 13 randomly selected schools at different levels of education in Khobar, SA, between February 2016 and March 2016. Data collected included demographic data, comorbidity, smoking, school type, laryngopharyngeal reflux, hearing problems, common cold, family history, number of students, and stress. The study included teachers who were actively teaching. Teachers with laryngeal cancer and those who were not actively teaching as well as those who were on sick leave were all excluded from the study. Data were analyzed using SPSS version 20.

RESULTS: Out of 400 surveys distributed, 187 teachers responded; mean age of teachers was 42.5 years and 55.1% were females. The percentage of teachers who subjectively complained of hoarseness was 27%; teachers in public schools had a higher prevalence of hoarseness than teachers in private schools. The greater the number of students per class, the more likely it was for the teacher to develop hoarseness (P = 0.038). The factors statistically significantly associated with hoarseness included smoking, acid reflux, family history of hoarseness, and work-related stress.

CONCLUSION: Prevalence of hoarseness in teachers is high owing to a combination of multiple associated factors, many of which can be controlled.

Keywords: Hoarseness, schools, teachers, voice disorders

Introduction

Voice change, hoarseness, or dysphonia is one of the most serious occupational hazards, particularly for school teachers, as the voice remains the main educational tool for delivering lessons to students. Hoarseness is a common consequence of multiple vocal fold traumas for those who use their voices professionally and may abuse them such as teachers and singers. This commonly results in vocal fold tissue damage and hoarseness. In 2014, Martin et al. published an article after reviewing all available studies in the literature and indicated that the prevalence of dysphonia in teachers varied in different regions in the world ranging from 20% to 80%. This wide range of variation at different schools and countries can be related to voice hygiene, as well as degrees of awareness of teachers with regard to their voice and the stage of the school. A study in Brazil showed that elementary and kindergarten school teachers have a higher rate of developing dysphonia than middle and high school teachers. This was because children in elementary and kindergarten schools have difficulty with words, so teachers are compelled to speak louder and more frequently to fulfill the children’s needs. The significance of studying hoarseness in schools is important because of the serious

How to cite this article: Alrahim AA, Alanazi RA, Al-Bar MH. Hoarseness among school teachers: A cross-sectional study from Dammam. J Fam Community Med 2018;25:205-10.
effect on the performance of teachers, which in turn can affect the community’s financial and educational costs.\[4\]

The quality of teaching of about 40% of teachers had fallen because of their voice disorders.\[5\] Some teachers had been obliged to retire early because of their voice problems.\[6\] In the United States alone, around 2.5 billion dollars is spent annually on voice disorder-related sick leave for teachers.\[1\] Other environmental, social, and personal factors including age, gender, years of teaching, family history of vocal problems, past history of voice disorders, allergies, vocal load, work-related stress, and others can also contribute to voice disorders in teachers.\[1,4\]

Due to the lack of awareness of voice problems in teachers and its consequences and the absence of voice protection guidelines, around 80% of teachers have never consulted an otolaryngologist.\[7\] To the best of our knowledge, the prevalence of hoarseness in teachers in our region remains unknown. We have not discovered any study conducted in Saudi Arabia (SA) that tested the prevalence of hoarseness in school teachers. Our aim in this study was to discover the prevalence of hoarseness in Saudi schools in the Eastern Province and analyze the potential associated factors that lead to voice disorders and determine the factors that have the greatest impact on teachers’ voices.

Materials and Methods

Approval from the Institutional Review Board was obtained through King Fahd Hospital of the University Al-Khobar, SA. A cross-sectional questionnaire survey with thirty questions together with a validated Voice Handicap Indexed-10 (VHI-10) was conducted.\[8,9\] Informed consent was taken from all participants involved in the study.

Both English and Arabic versions of the surveys were given to 13 randomly selected schools in Al-Khobar, SA, of different educational levels between February 2016 and March 2016. The random selection of schools was based on voluntary response to our study. All other schools which showed no interest in participating in the study were excluded. Out of 400 questionnaires distributed to teachers, 187 responded. The study elements were grouped into different categories as shown in Table 1.

The survey design and the number of teachers selected were based on previously published literature.\[10-14\] In the study, hoarseness was subjectively assessed through teachers’ complaints. There were 84 males and 103 females who were actively working. Teachers with a history of laryngeal cancer, those who were not actively teaching as well as those who were on sick leave at the time of the survey, and all personnel in school administration were excluded from the study. The survey offered an optional visit to our clinic for a proper examination and management to address their complaints.

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0. (IBM, Chicago, Illinois, USA). Continuous variables were analyzed using t-test, while categorical variables were studied using the Chi-square test. For statistical analysis, \( P = 0.05 \) was considered statistically significant.

Results

The total number of teachers selected was 187, with a mean age of 42.5 years, 55.1% were females [Figure 1]. Thirteen schools with different class levels were visited. A total of 105 teachers were high school teachers (56.1%) and 53 were elementary school teachers (28.3%). The types of schools visited were both public (6 schools) and private (7 schools). Hoarseness was found to be high in public school teachers (34.6%) than teachers in private schools (16.7%), \( P = 0.006 \). Hoarseness was found in 27% of teachers (\( n = 50 \)), 21 males and 29 females [Figure 2]. The number of students per class was also found to be an associated factor to developing hoarseness. The more students per class, the more likely it was for the teacher’s voice to be hoarse (\( P = 0.038 \)). Seventy teachers had 20–29 students per class, 40 teachers had 30–39 students per class, and 40 teachers had more than 39 students per class. We found that in the private schools, the majority of classes had 20–29 students, while in public schools, the majority of classes had more than 30 students per class. Around 85 teachers (males = 27, females = 58) missed days of work because of problems with their voice (\( P = 0.016 \)). Twenty-five of these teachers were in private schools and 60 were in public schools. The mean number of days missed was 7 days per teacher per year. Both active and passive smoking were found to be associated with hoarseness as well (39.0%, \( P = 0.037 \) and 0.047, respectively).

Twenty-three teachers who complained of hoarseness also complained of acid reflux (35.9%, \( P = 0.040 \)). Fourteen teachers with hoarseness (4 males, 10 females) also complained of hearing problems (\( P = 0.004 \)); 5 of these teachers were in private schools and 9 in public schools. Family history of hoarseness was found to be statistically significant and associated with 16 teachers who were currently complaining of hoarseness (7 males, 9 females) (\( P = 0.0001 \)). Thirty-seven teachers with hoarseness also experienced work-related stress and anxiety (\( P = 0.040 \)). Fifty-eight teachers had comorbidities including hypertension, diabetes mellitus, asthma, thyroid diseases, and allergy. Three teachers had a past history of vocal cord surgery. The number of episodes of common cold and throat infections during the past year with a mean of four infections was found to have a significant role in developing
hoarseness of voice ($P = 0.022$, $P < 0.05$, and $P = 0.017$, respectively) [Table 2].

**Discussion**

Voice is considered a high species communication tool that has significant importance in many different professions. Teaching is one of the professions that mainly depend on the voice as a primary tool for the delivery of their message. Any disorder in the voice affects the teacher’s work in different ways. The prevalence of hoarseness among teachers in our cross-sectional observational study was 27%, which is in agreement with other published data in a variety of regions worldwide.[3] Our sampling size was low because only 13 schools agreed to participate. Out of 400 teachers who received our survey, only 187 responded. This was a major issue that affected a number of teachers, some of whom had complaints and some who did not. It reflected the level of awareness of teachers on the hygiene health, of their voices. This agrees with other previously published findings stating that around 80% of teachers had never consulted an otolaryngologist about their voices.[7] Out of 187 teachers, the 50 who complained of hoarseness were mostly female (55%). Female gender in other literature is considered an associated factor for developing hoarseness.[15-17] In our study, however, we did not find any association with gender ($P = 0.628$), perhaps as a result of our sample size. Preciado et al.[18] and Higgins[19] had similar results with sample; no increased rate of hoarseness were reported for female teachers. We suggest that further research should be done to clarify this gender difference. We also found that the number of students per class was statistically significant as an associated factor for school teachers to develop hoarseness ($P = 0.038$). The more students there were in the class, the more likely it was for the teachers to develop hoarseness. In the study by Neto et al.,[10] teachers interviewed in both public and private schools in Brazil showed that, to avoid hoarseness, the ideal number of students per class was between 20 and 30 students, respectively. We had similar results in our study since the prevalence of hoarseness was less when there were fewer than thirty students per class. Type of school (private vs. public) was found to be an associated factor to developing hoarseness, with more prevalence of hoarseness in public schools than in private schools with statistical significance of $P = 0.006$ [Table 3]. The reason behind it might be the number of students per class. The number of students per class in public schools tends to exceed 40, a situation which has been shown to increase the likelihood of teachers developing hoarseness of voice. In private schools, the number of students never exceeds 29, which explains the lower prevalence of hoarseness in teachers in those schools. In our data, seventy teachers had been teaching for 10–19 years and 49 teachers had taught for 5–9 years. We found no relationship between the number of years of teaching and developing a hoarse voice ($P = 0.425$) as explained by
Da Costa et al. [20] who studied 237 kindergarten teachers. That study explained that, the longer the experience the teacher had, the better the impact on the teachers’ voice. This might be because experience over the years has taught the teacher the importance of voice hygiene. Teachers with longer experience can manage and modify their style of teaching, tone of voice, and vocal hygiene to reduce the impact of strain and the likelihood of developing a hoarse voice. Our survey did not include teachers who had taken an early retirement because of issues with their voice. Therefore, it is difficult to draw any conclusions on the relationship between the years of teaching and hoarseness of voice. We found that of the 85 teachers who had missed days of work (males = 27, females = 58), the majority were from public schools (60 teachers) ranging from 1 to 25 days/teacher/year and a mean of 7 days/year (P = 0.016) owing to voice problems. Da Costa et al. [20] found that 65 teachers out of 237 teachers in their study missed from 1 to 12 days/teacher/year for the same reason. Pereira et al. [21] compared absenteeism in ninety teachers and ninety nonteachers due to voice problems and found that 23% of teachers missed school owing to voice problems, with an average absence of 1–5 days/year, whereas for the nonteachers, it was 0% missed days.

Smoking was also found to be associated with hoarseness. In our study, 15 teachers were active smokers, while 41 were passive smokers. We found a significant association of smoking with hoarseness of voice in both active and passive smokers (P = 0.037 and P = 0.047, respectively). The literature indicated many divergent opinions on smoking. For example, the study by Urrutikoetxea et al. [22] on 1046 teachers found that smoking was associated with the presence of a vocal nodule; the more cigarettes they smoked, the more likely they were to have vocal pathology. A research by Lira Luce et al. [11] with 157 participants showed no association of smoking with voice disorders or laryngostroboscopic anomalies in teachers.

Due to their daily rush and hectic life, teachers consume large amounts of unhealthy snacks and fast food, which leads to gastroesophageal reflux and eventual acid reflux.

### Table 2: Factors statically significantly associated with hoarseness among school teachers, Khobar, SA

| Variables                                                                 | p-Value  |
|---------------------------------------------------------------------------|----------|
| 1. Number of students per class                                           | 0.038    |
| 2. Type of schools (private vs. public)                                   | 0.006    |
| 3. Missing days of work                                                   | 0.016    |
| 4. Active smoker                                                          | 0.037    |
| 5. Passive smoker                                                        | 0.047    |
| 6. Laryngopharyngeal reflux                                               | 0.040    |
| 7. Hearing problem                                                        | 0.004    |
| 8. Family history of hoarseness                                           | 0.0001   |
| 9. Stress                                                                 | 0.040    |
| 10. Comorbidity (HTN, DM, asthma, allergy, and thyroid diseases)          | 0.022    |
| 11. History of vocal cord surgery                                         | <0.05    |
| 12. Episodes of common cold and throat infections per year with a mean of 4 infections | 0.017    |
| 13. VHI-10                                                               | 0.008    |
| 14. RSI with score >11                                                   | 0.0001   |

**Variables that were statistically significant, p<0.05. VHI=Voice Handicap Index, RSI=Reflux Symptom Index, HTN=Hypertension, DM=Diabetes mellitus**

### Table 3: Logistic regression analysis: Factors related to hoarseness of voice among school teachers

| Variables                          | B    | SE   | Wald  | df  | Significant | EXP(ß) | 95% CI for EXP(ß)   | Lower | Upper |
|------------------------------------|------|------|-------|-----|-------------|--------|---------------------|-------|-------|
| Public school                      | 0.891| 0.371| 5.769 | 1   | 0.016       | 2.437  | 1.178               | 5.041 |
| Family history of voice problems  | 1.526| 0.437| 12.199| 1   | 0.0001      | 4.599  | 1.953               | 10.828|
| Constant                           | 0.944| 0.233| 16.386| 1   | 0.0001      | 0.389  |                     |       |

**SE=Standard error, CI=Confidence interval**

### Table 4: Analysis of hours of teaching, number of cigarette, cups of coffee/tea , cups of water, and episodes of common cold

| Do you complain of hoarseness?                  | Yes | No  | Total | Mann-Whitney test p-Value |
|------------------------------------------------|-----|-----|-------|----------------------------|
| On an average, how many hours per week do you teach? | 38  | 121 | 159   | 0.823                      |
| How many cigarettes/cigars/shisha do you consume per day? | 7   | 5   | 12    | 0.934                      |
| How many cups of coffee or tea do you take per day?   | 43  | 111 | 154   | 0.172                      |
| How many cups of water do you drink per day?          | 48  | 131 | 179   | 0.121                      |
| How many episodes of common cold did you get in past year? | 49  | 129 | 178   | 0.017                      |

**SD=Standard deviation**
laryngitis. Nearly 35.9% of the teachers with hoarseness of voice in our study complained of laryngopharyngeal reflux symptoms, which was found to be statistically significant as an associated factor that leads to hoarseness in teachers \( (P = 0.004) \). In their study on 113 teachers, Koufman et al.\(^{[23]} \) found that 50% of patients with voice disorders had pH-documented reflux.

Almost 14 teachers with hoarseness of voice in our study (4 males, 10 females) were found to have hearing problems, which was statistically significant \( (P = 0.0001) \) [Table 3]. Although the association is not clearly explained in the literature, the study by De Ceballos\(^{[25]} \) on 467 teachers with hoarseness of voice indicated that a hereditary association found in families was most likely caused by certain emotional and environmental factors and habits in their household such as speaking loudly and shouting and frequent drinking of cold beverages. These contributed to the changes in their voices which led to hoarseness.

Thirty-seven teachers in our sample with hoarseness of voice complained of work-related stress and anxiety \( (P = 0.040) \). Many studies in the literature showed that the psychological impact of stress on teachers can be significant contributors to the increased likelihood of hoarseness of voice.\(^{[26,27]} \) Rantala et al.\(^{[28]} \) conducted a study on voice ergonomic factors in 14 elementary schools and found that, of the multiple associated factors, stress correlated with voice symptoms the most strongly \( (P < 0.05) \).

Three teachers had a past history of vocal fold surgery \( (P\text{-value}=0.05) \) and Fifty-eight teachers included in our survey were found to have comorbidities \( (P\text{-value}=0.022) \) including diabetes mellitus \((n = 11)\), hypertension \((n = 18)\), allergy \((n = 17)\), thyroid diseases \((n = 13)\), asthma \((n = 5)\). Comorbidities as an associated factor of developing hoarseness could be the result of the disease itself or the side effects of the medications taken. For example, asthmatic patients with chronic use of inhaler glucocorticoids sometimes develop hoarseness of voice as a side effect of the drug.\(^{[29]} \)

VHI-10 is one of the most common indexes used worldwide owing to its simplicity and ease of application.\(^{[12,30]} \)

**Conclusion**

The prevalence of hoarseness in teachers is high. It is due to a combination of multiple associated factors: number of students per class, type of school, smoking, laryngopharyngeal reflux, hearing problems, family history of hoarseness, work-related stress, comorbidity, episodes of common cold and throat infections, and history of vocal cord surgery. Many of these factors can be controlled with good teacher awareness and knowledge. These can help in reducing the likelihood of hoarseness of voice.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Akinbode R, Lam KB, Ayres JG, Sadhra S. Voice disorders in Nigerian primary school teachers. Occup Med (Lond) 2014;64:382-6.
2. Martins RH, Pereira ER, Hidalgo CB, Tavares EL. Voice disorders in teachers. A review. J Voice 2014;28:716-24.
3. Mattiske JA, Oates JM, Greenwood KM. Vocal problems among teachers: A review of prevalence, causes, prevention, and treatment. J Voice 1998;12:489-99.
4. Leão SH, Oates JM, Purdy SC, Scott D, Morton RP. Voice problems in New Zealand teachers: A National survey. J Voice 2015;29:645.e1-.45E+15.
5. Smith E, Kirchner HL, Taylor M, Hoffman H, Lemke JH. Voice problems among teachers: Differences by gender and teaching characteristics. J Voice 1998;12:328-34.
6. Chen SH, Chiang SC, Chung YM, Hsiao LC, Hsiao TY. Risk factors and effects of voice problems for teachers. J Voice 2010;24:183-90, quiz 191-2.
7. Hamdan AL, Sibai AM, Sourr ZM, Sabra OA, Deeb RA. Voice disorders in teachers. The role of family physicians. Saudi Med J 2007;28:422-8.
8. Malki KH, Mesallam TA, Farahat M, Bukhari M, Murry T. Validation and cultural modification of Arabic voice handicap index. Eur Arch Otorhinolaryngol 2010;267:1743-51.
9. Khalaf M, Matar N. Translation and transcultural adaptation of the VHI-10 questionnaire: The VHI-10lb. Eur Arch Otorhinolaryngol 2017;274:3139-45.
10. Neto FX, Neto OB, Filho JS, Palheta AC, Rodrigues LG, Silva FA. Relationship between working conditions and grade school teachers vocal self-evaluation. Int Arch Otorhinolaryngol 2008;12:230-8.
11. Lira Luce F, Teggi R, Ramella B, Biafora M, Girasoli L, Calori G, et al. Voice disorders in primary school teachers. Acta
12. Rosen CA, Lee AS, Osborne J, Zullo T, Murry T. Development and validation of the voice handicap index-10. Laryngoscope 2004;114:1549-56.
13. Belafsky PC, Postma GN, Koufman JA. Validity and reliability of the reflux symptom index (RSI). J Voice 2002;16:274-7.
14. Angelillo M, Di Maio G, Costa G, Angelillo N, Barillari U. Prevalence of occupational voice disorders in teachers. J Prev Med Hyg 2009;50:26-32.
15. Korn GP, Augusto de Lima Pontes A, Abranches D, Augusto de Lima Pontes P. Hoarseness and risk factors in university teachers. J Voice 2015;29:518.e21-8.
16. Bermúdez de Alvear RM, Barón FJ, Martínez-Arquero AG. School teachers’ vocal use, risk factors, and voice disorder prevalence: Guidelines to detect teachers with current voice problems. Folia Phoniatr Logop 2011;63:209-15.
17. Van Houtte E, Claeys S, Wuyts F, Van Lierde K. The impact of voice disorders among teachers: Vocal complaints, treatment-seeking behavior, knowledge of vocal care, and voice-related absenteeism. J Voice 2011;25:570-5.
18. Preciado J, Pérez C, Calzada M, Preciado P. Frequency and risk factors of voice disorders among teaching staff of La Rioja, Spain. Clinical study: Questionnaire, function vocal examination, acoustic analysis and videolaryngostroboscopy. Acta Otorrinolaringol Esp 2005;56:161-70.
19. Higgins KP. The Prevalence of Voice Disorders in University Teaching Faculty. Electronic Theses and Dissertations; 2006. p. 286.
20. Da Costa V, Prada E, Roberts A, Cohen S. Voice disorders in primary school teachers and barriers to care. J Voice 2012;26:69-76.
21. Pereira ER, Tavares EL, Martins RH. Voice disorders in teachers: Clinical, videolaryngoscopic, and vocal aspects. J Voice 2015;29:564-71.
22. Urrutikoetxea A, Ispizua A, Matellanes F, Aurrekoetxea J. Prevalence of Vocal Nodules in Female Teachers. Video Presentation at 1st World Voice Congress, Oporto, Portugal; 1995.
23. Koufman JA, Amin MR, Panetti M. Prevalence of reflux in 113 consecutive patients with laryngeal and voice disorders. Otolaryngol Head Neck Surg 2000;123:385-8.
24. Ohlsson AC, Andersson EM, Södersten M, Simberg S, Barregård L. Prevalence of voice symptoms and risk factors in teacher students. J Voice 2012;26:629-34.
25. de Ceballos AG, Carvalho FM, de Araújo TM, dos Reis EJ. Auditory vocal analysis and factors associated with voice disorders among teachers. Rev Bras Epidemiol 2011;14:285-95.
26. Santana Mda C, Goulart BN, Chiari BM. Voice disorders in teachers: Critical review on the worker’s health surveillance practice. J Soc Bras Fonoaudiol 2012;24:288-95.
27. de Alvear RM, Martínez-Arquero G, Barón FJ, Hernández-Mendo A. An interdisciplinary approach to teachers’ voice disorders and psychosocial working conditions. Folia Phoniatr Logop 2010;62:24-34.
28. Rantala LM, Hakala SJ, Holmqvist S, Sala E. Connections between voice ergonomic risk factors and voice symptoms, voice handicap, and respiratory tract diseases. J Voice 2012;26:819.e13-20.
29. Galván CA, Guarderas JC. Practical considerations for dysphonia caused by inhaled corticosteroids. Mayo Clin Proc 2012;87:901-4.
30. Lu D, Wen B, Yang H, Chen F, Liu J, Xu Y, et al. A comparative study of the VHI-10 and the V-RQOL for quality of life among Chinese teachers with and without voice disorders. J Voice 2017;31:509.e1-509.e6.