



Teachers at Risk: Exploring Hoarseness of Voice and the Effectiveness of Self-Report Screening Tools Vocal Handicap Index (VHI) & Voice Symptom Scale (VoiSS) in a Saudi Population

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Abstract

Teachers who use their voices for extended periods of time in less than ideal environments are more likely to develop voice disorders like hoarseness. Preventing long term vocal impairment requires early detection with validated screening instruments. To compare the diagnostic performance of the Voice Handicap Index (VHI) and the Voice Symptom Scale (VoiSS) as screening instruments. 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 VHI and VoiSS. Statistical analysis was performed using SPSS version 27. The gold standard was a speech language pathologist's clinical voice evaluation. To assess the diagnostic precision of VHI and VoiSS, sensitivity, specificity, and Receiver Operating Characteristic (ROC) curves were computed. ROC analysis demonstrated high diagnostic accuracy for both tools, with AUCs of 0.86 (VHI) and 0.89 (VoiSS). At optimal cut-off scores, the VoiSS showed higher sensitivity (88.9%) and specificity (81.3%) than the VHI (84.4% and 78.7%, respectively). Hoarseness of voice is very common among school teachers. While both VoiSS and VHI are useful screening tools, VoiSS performs marginally better in terms of diagnosis. In educational settings, routine use of these tools may help with early diagnosis and treatment of voice disorders.

Keywords: Hoarseness of voice, Screening Tools, Voice Symptom Scale (VoiSS), Voice Handicap Index (VHI)

1. Introduction

Voice is an essential tool for communication, especially for occupations like teaching that requires constant verbal exchange. Teachers are particularly susceptible to developing hoarseness of voice due to prolonged use of their voices, frequently in less than ideal acoustic and environmental conditions (1). If left untreated, this condition can lead to long term vocal damage, lower a teacher's quality of life, and seriously impair their ability to teach (2). Therefore, in this vulnerable group, early detection and treatment of hoarseness are essential to maintaining vocal health and professional functionality.

According to research, between 20% and 50% of teachers worldwide will experience voice disorders at some point in their careers, which leads to significant morbidity and financial burden (2). Numerous risk factors, such as lifestyle choices, psycho-emotional stressors, occupational and environmental exposures, patterns of voice use and perception, and socio-demographic traits, have been linked to the emergence of voice issues in this population (3). According to studies, 65% of teachers experience high levels of background noise and 70% are exposed to unfavorable working conditions, both of which are major causes of hoarseness (4). Voice disorders have been reported to affect 57.1% of teachers in Saudi Arabia, which is

significantly higher than the general population's rate (5).

The use of efficient and trustworthy screening instruments is necessary for the early detection of voice disorders in educators. The Voice Handicap Index (VHI) and the Voice Symptom Scale (VoiSS) are two well-known self-assessment tools frequently used for this purpose. The VHI evaluates the effects of voice disorders in three areas: emotional, physical, and functional (6). It is widely used in clinical and research settings and has undergone extensive validation. The VoiSS, on the other hand, focuses primarily on screening rather than assessing the wider impact on daily life and consists of subscales that measure emotional, physical, and impairment-related aspects of voice symptoms (7). It is especially well suited for spotting early and subtle indications of voice issues because of its multifaceted structure.

Despite the fact that the VHI and VoiSS have both been used with teacher populations, there is still a dearth of comparative studies evaluating how well they detect hoarseness in school teachers in particular. To guide the implementation of successful voice screening programs and lessen the long term effects of undiagnosed voice disorders, it is crucial to assess the sensitivity and specificity of these tools in educational settings. Therefore, the goal of this study is to evaluate the diagnostic value and effectiveness of the VHI and VoiSS in screening school teachers for hoarseness of voice. Thus, the purpose of this study is to compare the diagnostic performance and usefulness of the VHI and VoiSS scales for school teachers' hoarseness of voice screening. We aimed to compare the diagnostic performance of Voice Health Index (VHI) and Voice Symptoms Scale (VoiSS) as screening tools for hoarseness of voice among school teachers in Bisha, Saudi Arabia.

2. Materials and Method

After receiving ethical approval from the Institutional Review Board of the Asir Region, Ministry of Health, Saudi Arabia, this cross-sectional study was carried out at schools in Bisha, Asir Region.

The principal investigator selected 15 schools by using stratified sampling technique including primary and secondary schools belong to Ministry of education. A total of 101 school teachers were randomly selected and interviewed after assigned a serial number prior to their

consultation. From each of the selected schools, weighted samples were collected. 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.

Pre-tested, self-administered, validated questionnaires were filled by the data collectors which include Voice Handicap index and Voice Symptom Scale. The questionnaires were based on previous studies by researchers (8-10). VHI checklist 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 (6). VoiSS checklist were based on previous studies by researchers is used as a survey tool to addresses hoarseness of voice in relation to three aspects including impairment, emotional and physical symptoms. This patient reported self-assessment tool comprises 30 items, each with a score ranging from 0 (Never) to 4 (All of the time). These items are evenly distributed throughout three domains. The primary objective of the VoiSS is to evaluate perceived impact of handicap on daily life. Each aspect rated in a 5-point scale: never (0); occasionally (1); some of the time (2); most of the time (3); and all of the time (4) (7). Participant's voices were evaluated by a trained speech language pathologist to determine the presence or absence of hoarseness. This served as the clinical reference standard.

Data were analyzed using software of Statistical package of Social Sciences (SPSS version 27). Data were initially imported from Microsoft Excel into the SPSS software. Appropriate coding was applied to variables within the variable view. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of both tools were calculated using the clinical voice assessment as the gold standard. The Receiver Operating Characteristic

(ROC) curve was plotted for both the VHI and VoiSS to determine their diagnostic accuracy. The area under the curve (AUC) was used to compare performance.

3. Results

Table 1 showed mean scores of VHI and VoiSS by presence and absence of hoarseness of voice. A total of 101 teachers, 38 (37.6%) were identified with hoarseness of voice while remaining 63 (62.4%) did not show any sign of hoarseness. The mean VHI score for the total sample was 21.75 ± 10.26 , while the mean VoiSS score was 24.83 ± 11.30 . Participants with hoarseness had significantly higher VHI (31.6 ± 7.8) and VoiSS (34.2 ± 8.5) scores compared to those without hoarseness (VHI: 14.9 ± 6.3 ; VoiSS: 16.5 ± 7.0), with p-values <0.001 for both comparisons.

Table 1: Mean Score of VHI and VoiSS by status of hoarseness of voice (N101)

Variables	N	%	VHI Mean (SD)	VoiSS Mean (SD)
Hoarseness of voice (Clinical Voice Assessment)				
Yes	38	37.6	31.6 (7.81)	34.2 (8.52)
No	63	62.4	14.9 (6.32)	16.5 (7.01)
Total	101	100	21.7 (10.26)	24.8(11.30)
T test (P Value*)			7.65 ($<0.001^*$)	8.02 ($<0.001^*$)

The used test was Independent Sample T test

**Significant at level 0.05*

Table 2 & Figure 1 showed ROC Analysis demonstrated that the Voice Handicap Index (VHI) obtained an area under the curve (AUC) of 0.86 (95% CI: 0.78–0.93), whereas the Voice Symptom Scale (VoiSS) produced an AUC of 0.89 (95% CI: 0.82–0.95). Both findings

showed a sensitivity of 84.4%, specificity of 78.7%, positive predictive value (PPV) of 70.4%, and negative predictive value (NPV) of 89.4% at a cutoff score of ≥ 18 . With a cutoff score of ≥ 20 , the VoiSS demonstrated better diagnostic performance, achieving 88.9% sensitivity, 81.3% specificity, 76.2% PPV, and 91.5% NPV.

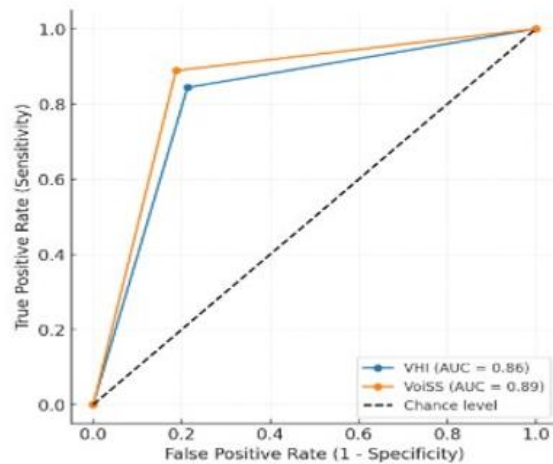


Figure 1: Receiver Operating Characteristic (ROC) curves for the Voice Handicap Index (VHI) and Voice Symptom Scale (VoiSS) in detecting hoarseness of voice among school teachers.

4. Discussion

Teachers use their voice as their primary means of communication, so hoarseness can have an impact on both their everyday routine and professional performance. Due to their demands, school teachers have been found to be more susceptible to hoarseness of voice (11). This study aimed to compare the effectiveness of the Voice Handicap Index (VHI) and the Voice Symptom Scale (VoiSS) as screening tools for detecting hoarseness of voice among school teachers in Bisha, Saudi Arabia. However, Receiver Operative

Table 2: Diagnostic Performance of VHI and VoiSS

Variables	Cut-off Score	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	AUC (95% CI)	P Value
VHI	≥ 18	84.4	78.7	72.9	88	0.86 (0.78-0.93)	0.001*
VoiSS	≥ 20	88.9	81.3	76.2	91.5	0.89 (0.82-0.95)	0.001*

demonstrated a high degree of discriminative ability in detecting hoarseness of voice in school teachers, and they were statistically significant ($p < 0.001$). The VHI

Characteristics Curve (ROC) analysis showed both the VHI and VoiSS screening tools are effective to distinguishing school teachers with hoarseness of voice

from those without. The VoiSS showed a slightly higher area under the curve (AUC = 0.89) than the VHI (AUC = 0.86), suggesting that it may provide a marginally better overall diagnostic accuracy. At the established cutoff values, the VHI (≥ 18) achieved a sensitivity of 84.4% and specificity of 78.7%, indicating its reliability in identifying teachers with hoarseness while maintaining a relatively low rate of false positives. In contrast, the VoiSS (≥ 20) demonstrated even higher sensitivity (88.9%) and specificity (81.3%), along with improved positive predictive value (PPV = 76.2%) and negative predictive value (NPV = 91.5%). These findings suggest that the VoiSS may be more robust in capturing both the presence and severity of voice disorders in a teaching population. This finding aligns with the previous studies showing that the VoiSS can detect subtle hoarseness of voice as compared to VHI due to more emphasizes on impairment, emotional and physical symptoms. (12).

The slightly higher sensitivity of the VoiSS is particularly important in occupational health settings, where early identification of voice disorders can prevent progression to hoarseness of voice and associated functional limitations. Additionally, the high negative predictive value of both instruments indicates their usefulness in ruling out hoarseness of voice among school teachers who score below the cutoff, thus reducing unnecessary clinical evaluations. Notably, the combination of high sensitivity and acceptable specificity makes these tools suitable for large scale screening initiatives in schools, where early intervention can have a meaningful impact on school teachers. Furthermore, the results of this study highlight the complementary nature of these instruments. While the VHI provides a straightforward assessment of the perceived handicap due to voice problems, the VoiSS captures a broader range of symptoms and functional limitations, which may explain its slightly superior diagnostic performance. These findings are consistent with earlier research suggesting that multidimensional tools like the VoiSS are better suited for detecting early or mild voice disorders, whereas the VHI may be more appropriate for identifying clinically significant impairments (13,14).

In summary, both the VHI and VoiSS demonstrate high diagnostic accuracy for detecting hoarseness of voice among school teachers, with the VoiSS showing a slight edge in sensitivity and specificity. Incorporating either

or both tools into routine occupational health assessments can facilitate timely detection, targeted interventions, and ultimately, better vocal health outcomes in the teaching population. Crucially, these results support the necessity of routine voice screening among educators and imply that early detection and intervention can be facilitated by incorporating validated instruments like the VHI and VoiSS into occupational health programs. Such actions could improve overall classroom communication, lessen the burden of untreated voice disorders, and improve the quality of life for teachers.

This study has several limitations that must be acknowledged. The use of a self-administered questionnaire (VHI and VoiSS) introduces potential recall and response biases, which may affect the accuracy of symptom reporting. 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

With hoarseness affecting more than one-third of the participants, this study emphasizes the substantial burden of voice disorders among Saudi Arabian school teachers in Bisha. When it came to diagnosing hoarseness, the Voice Handicap Index (VHI) and the Voice Symptom Scale (VoiSS) both performed well, with the VoiSS exhibiting marginally higher sensitivity, specificity, and predictive values. These results highlight the value of validated self-assessment instruments for early identification of speech impairments in learning environments. Using these tools to conduct routine voice screenings could be very important for maintaining teachers' vocal health, enhancing their performance at work, and lessening the long-term effects of untreated voice disorders.

Conflict of interest The author declares no conflict of interest.

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