**SUBJECTIVE SELF-ASSESSMENT OF VOICE HANDICAP AND VIDEO LARYNGOSCOPIC FINDINGS: A COMPARATIVE STUDY OF TEACHING AND NON-TEACHING STAFF IN NIGERIAN SCHOOLS**

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**Abstract**

**Background**: Teachers experience high vocal load and if voice quality deteriorates, their livelihoods are affected.

**Aim and Objective:** This study assessed teachers perceive their voices and related this self-perceptionto video-laryngoscopic findings.

**Design of the study**: A community-based, cross-sectional, comparative study conducted among 280 teaching and 280 non-teaching staff (controls)selected from public schools in Ilorin, Kwara State, Nigeria.

**Materials and methods**: Participants completed the Voice Handicap Index-10 (VHI-10) questionnaire; another questionnaire was usedto obtain socio-demographicvariables. Video-laryngoscopy was then carried out on each participant. Data analysis was performed using SPSS version 20.Descriptive statistics (means, standard deviations, frequencies and proportions) were calculated for all measures. Categorical variables were compared using chi square tests and numeric variables compared using student t-tests. Differences were considered significant if p-value < 0.05.

**Results:** There were no significant differences in the sex ratios and the mean ages between the teachers and controls. Teachers had significantly higher prevalence of self-perceived voice handicap, 15.4% than controls, 1.8% (p<0.001). Their mean VHI-10 score, 4.34 (SD7.07) was significantly higher than that of controls, 0.39 (SD2.32), p<0.001. For each of the individual items in the VHI-10 score the mean for the teachers was significantly higher than that for the controls. Prevalence of laryngeal abnormalities on videolaryngoscopy in teachers was 29.6% against 8.2% in controls (p<0.001), with chronic non-specific laryngitis including vocal nodules being the most

common abnormality in both teachers and controls. Among those who had abnormal video-laparoscopic findings 74 (89.2%) out of 83 in the teachers group and 18 (78.3%) in the control group had chronic non-specific laryngitis including vocal nodules; the difference was not significant, p=0.153. Fourteen of 15 teachers with severe perceived self-handicap had normal video-laparoscopy.

**Conclusion:** Teachers in Ilorin have significantly higher prevalence of self-perceived voice handicap and of video-laryngoscopic abnormalitiesthan non-teaching staff. Most teachers with severe self-perceived handicap had normal video-laryngoscopic findings and may require follow up.

**Key words**: Teachers, VHI-10, Video-laryngoscopy, Subjective, Self-assessment.

**Introduction**

A professional voice user is defined as an individual who depends on a consistent and appealing voice quality as a main tool in his/her employment.1 Teachers are among the most common occupational groups that seek medical advice for problems associated with the voice.2, 3 In the occupation of teachers, the voice assumes an outstanding importance, influencing their relationship with students and colleagues.4

The impact of voice problems on an individual does not depend merely on the severity of the impairment. In addition, it also depends on how an individual perceives, and reacts and adjusts to the problem.5 The prevalence of reporting of a current voice problem is significantly greater in teachers compared with non-teachers (8.7% vs. 2.9%).6 The lifetime prevalence of voice disorders among teachers is higher than that of non-teachers (51.4% vs. 25.9%).6 Emirati and Jordanian teachers were found to have higher perception of voice handicap when compared to non-teachers.7, 8

Similarly, Nerrière*et al*.9 reported that teachers, as professional voice users, are at particular risk of voice disorders. They also reported that one in two female teachers have voice disorders (50.0%) compared to one in four males (26.0%).9 The structure of vocal folds is considered the main reason why women are more likely to have vocal symptoms than men.10,11

The vocal cord abnormalities resulting from voice misuse include vocal cord nodules, chronic non-specific laryngitis, vocal cord polyp and submucous haemorrhages with contact ulcers of the vocal cords.12Alabi*et al.* reported prevalence of laryngeal abnormalities in school teachers in Surulere, Lagos Nigeria to be 23.5% with chronic non-specific laryngitis been the most common, accounting for 22% (females 19.4%, male 2.6%).13 Similarly, Nwaorgu*et al.*14 reported chronic non-specific laryngitis including vocal nodules as the most common cause of hoarseness in adult Nigerians with prevalence of 55.6%. Of this, 60.88% was found among professional voice users like teachers.

The mental health implications of enduring a vocal disability are enormous. Teachers who continue to work while suffering a vocal disability, and those who are forced to take disability leave or early retirement from teaching often suffer anxiety and depressive equivalent symptoms that require medical intervention.5

Two types of measures are available for voice evaluation namely objective which is a measure of the degree of vocal incapacity and subjective self-assessment of the extent to which the vocal incapacity affects the individual’s social functioning and quality of life.15 Voice disorder and treatment assessment has hitherto focused on the objective voice measurements.16 However, the objective voice measures alone cannot assess the level of handicap a person experiences as a result of a voice disorder.17Rather, the measurement of voice handicap in a teacher must take into account whether or not that a teacher can teach all day and throughout the week.18

The VHI-10 is a patient-based self-assessment tool which consists of 10 items. These items are distributed over three domains: functional (“impact of a person’s voice disorders on daily activities”), physical (“self-perceptions of laryngeal discomfort and the voice output characteristics”) and emotional (“affective responses to a voice disorder”) aspects.16 The VHI-10 is for assessing initial patient based voice handicap and longitudinal follow-up after treatment. The total VHI-10 score could range from 0 – 40 points where 0–10 points indicate normal voice quality or socially acceptable quality, 11–20 points; moderate abnormalities and more than 20 severe abnormalities.19, 20

Visual inspection of the larynx is mandatory for diagnosis or exclusion of laryngeal disease. The simplest method of examining the larynx and vocal folds is with a mirror.21 Although excellent views can be obtained by an experienced examiner, the images are relatively small, of brief duration and frequently the anterior glottic region is not well visualized. Better views of the larynx can generally be obtained using a flexible fibreoptic laryngoscope in addition to photographic documentation which improves case comparison between clinicians.22

The Committee of the European Laryngological Society on Phoniatrics recommended a guideline in voice assessment which includes five different approaches: perception (grade, roughness, breathiness), videostroboscopy (closure, regularity, mucosal wave and symmetry), acoustics (jitter, shimmer, Fo-range and softest intensity), aerodynamics (phonation quotient), and subjective rating by the patient. Two of the dimensions are considered objective: aerodynamics and acoustics; two other dimensions are objective but rated subjectively by the examiner or a panel: recording of a voice sample and videostroboscopy; and one dimension remains totally subjective (self-rating by the patient).23 However, this is beyond the scope of this study.

Because teachers occupy a significant position in nation building, the need to research into what will promote the performance of their most valuable asset, the voice, cannot be over emphasised. This study therefore aimed to assess the voice of teachers using video perceptual measure and subjective self-assessment tool.

**Patients and Methods**

A community-based, cross sectional, comparative study was conducted among teachers selected from public primary and secondry schools in Ilorin, Nigeria from April, 2015 to March, 2016.

The minimum sample size for this study of **560** (280 teachers and 280 controls) was determined using the formula for comparison of two proportions as follows:24

 =

Where;

 = the minimum sample size required for each group

Zα = the standard normal deviate corresponding to 5% level of significance for a tail test = 1.96

Zβ = the standard normal deviate corresponding to 80% power of the test to detect differences between the 2 populations = 0.84

p1 = the prevalence of voice problem among teachers, 8.7% (0.087)6

q1 = (1- 0.087) = 0.913

p2 = the prevalence of voice problem in non-teachers, 2.9% (0.029)6

q2 = (1- 0.029) = 0.971

= ≈ 251

 With non-response set at 10%; = = **278**

Teachers with at least one year teaching experience who consented to participate were recruited. Those excluded were teachers involved in other voice-demanding activities like singing, (e.g. in choirs) or preaching, those who had hadprevious throat or neck surgeries e.g. thyroidectomy, those with goitre and teachers who had had upper respiratory tract infection in the preceding two weeks.

The sampling technique adopted was a probability, multistage sampling method. The controls were made up of non-teaching staffin the same schools as the teachers, with the same exclusion criteria applied to them.

Approval was obtained from the University of Ilorin Teaching Hospital (UITH) Ethical Committee. A written informed consent was also obtained from each participant.

The subject after completing the questionnaire designed by the researchers to obtain socio-demographic variables and VHI-10 questionnaire was comfortably seated on a chair in the ENT clinic facing the examiner and his/her head supported by a nurse and the nasal cavity sprayed with Xylocaine (10mg) spray and 10 minutes was allowed for the local anaesthetic agent to take effect.25 The stem of the scope was lubricated with K-Y jelly to enhance easy passage.25 Subsequently, white balancing was done after connecting the PENTAX FNL-10RP2 to the Telecam 20212030 camera and Tele pack 20043020. The flexible fibreoptic laryngoscope was gently passed into the nasal cavity under direct visualization and gradually advanced along the anaesthetized floor of the nasal cavity into the nasopharynx.

Once the endoscope got into the postnasal space, the subject was asked to inspire through the nose, this opens the postnasal sphincter allowing negotiation of the endoscope into the oropharynx and subsequently a step-wise assessment of the larynx was done .26 The vocal cords were visualised and examined for position and mobility at both quiet breathing and phonation when subject said ‘eee’ and findings documented. All the subjects were examined by the investigator in order to remove inter-observer error. After each use, the instrument was cleaned and disinfected by a chemical soak system using peracetic acid (perasafe) bath in between use, according to the guidelines for decontaminating ENT fibreoptic scopes.27

The control group (280 non-teaching staff) from the selected schools were subjected to the above procedure. Participants identified with voice disorders or vocal pathologies were referred to ENT clinics for further evaluation and treatment.

Data analysis was carried out using SPSS-20. Categorical variables were described using frequencies and percentages; continuous variables were described using means (with standard deviations). Categorical variables were compared using the chi square test and continuous variables compared using the student t-test. Differences were considered significant if p< 0.05.

**Results**

**Socio-demographic Characteristics of the participants (Table1)**

There were no significant differences, between the two groups, in the mean ages, sex ratios, and proportions that used alcohol or smoked cigarettes.

**Table 2** shows the frequency distribution of the occupations of the controls. Cleaners formed the largest group, followed by clerks, secretaries, security men and messengers.

The range of VHI-10 scores for controls was 0-20 and for teachers 0-37. The mean score for teachers, 4.34(SD7.07) was significantly higher than that for controls, 0.39(SD2.32), p<0.001. **(Table 3)**

For each of the 10 items scored in the VHI-10 the mean score for the teachers was significantly higher than the mean score for the controls (**Table 4**).

From **Table 5,** 237 (84.6%) teachers and 275 (98.2%) controls had normal voice quality or socially acceptable voice handicap (0-10, p< **0.001**). Therefore, teachers reported higher proportion of voice handicap (**15.4%**) than the control group (**1.8%**), p**<**0.001.

**Table 1: Socio-demographic characteristics of teachers and controls**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Non-teachers****N (280)****n (%)** | **Teachers** **N (280)****n (%)** | **p-value** |
|  |  |  |  |
| **Age Groups**≤ 30 | 34 (12.1) | 38 (13.6) |  |
| 31 – 40 | 109 (38.9) | 114 (40.7) |  |
| 41 – 50 | 73 (26.1) | 72 (25.7) |  |
| 51 – 60 | 54 (19.3) | 53 (18.9) |  |
| ≥ 61 | 10 (3.6) | 3 (1.1) | 0.377 |
| **Mean Age ± SD** | **40.9 ± 10.9** | **40.5 ± 9.3** | 0.641\* |
| **Sex** |  |  |  |
| Male | 111 (39.6) | 119 (42.5) |  |
| Female | 169 (60.4) | 161 (57.5) | 0.472 |
| **Smoking** |  |  |  |
| No | 278 (99.3) | 277 (98.9) |  |
| Yes | 2 (0.7) | 3 (1.1) | 0.653 |
| **Alcohol consumption** |  |  |  |
| No | 280 (100.0) | 277 (98.9) |  |
| Yes | 0 (0.0) | 3 (1.1) | 0.082 |

Considering the whole group, 330 (58.9%) were females and 230 (41.1%) were males.

**Table 2: Frequency distribution of occupations of the controls**

|  |  |
| --- | --- |
| **Occupations** | **Number** **n (%)** |
| Cleaners | 58 (20.7%) |
| ClerksSecretariesSecurity Men | 36 (12.9%)32 (11.4%)28 (10.0%) |
| MessengersCaregivers StorekeepersICT Laboratory ManagersSchool Laboratory AttendantsSchool InspectorsBursarsTypists Librarians | 26 (9.3%)18 (6.4%)16 (5.7%)12 (4.3%)12 (4.3%)11 (3.9%)11 (3.9%)11 (3.9%)9 (3.2%) |
|  |  |

**Table 3: Mean VHI-10 scores of teachers and controls**

|  |  |  |  |
| --- | --- | --- | --- |
| **VHI-10 Scores** | **Non-teachers (N=280)** | **Teachers****(N=280)** | **p-value** |
| Mean | 0.39 | 4.34 |  |
| S D | 2.32 | 7.07 | **< 0.001** |
| Range | 0 – 20 | 0 – 37 |  |

On video-laryngoscopy, 197 (70.4%) teachers had normal findings and 83(29.6%) abnormal findings. In the control group 257 (91.8%) had normal and 23 (8.2%) abnormal findings. Thus teachers had significantly higher prevalence of video-laryngoscopic abnormalities than controls, p<0.0001. The commonest abnormality found in both teachers and controls was chronic non-specific laryngitis including vocal nodules.**(Table 6)**

When only those who had abnormal video-laryngoscopy are considered, 74 (89.2%) out of the 83 among the teachers and 18 (78.3%) out of the 23 in the control group had chronic non-specific laryngitis including vocal nodules; the difference was not statistically significant, p=0.153(Fisher Exact Test). This means that there was no significant difference, between teachers and controls, in the proportions of those who had chronic non-specific laryngitis including vocal nodules among subjects who had abnormalities on video-laparoscopy.

**Table 7** shows that 2 (0.8%) of the 257 controls that had normal laryngoscopic findings reported voice handicap while 3 (13.0%) of the 23 with abnormal findings had voice handicap. Out of the 197 teachers with normal laryngeal finding, 30 (15.2%) reported voice handicap. However, out of the 15 teachers with severe self-perceived voice handicap only 1(6.6%) had abnormal laryngeal finding.

**Table 4: Mean scores for each item on the VHI-10 of teachers and controls**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Variables** | **Non-teachers (N=280)** | **Teachers****(N=280)** |  |
| **VHI-10 Item** |  | **Mean (SD)** | **Mean (SD)** | **p-value** |
| **F1** | My voice makes it difficult for people to hear me | 0.05 (0.39) | 0.49 (0.92) | **<**0.001 |
| **F2** | People have difficulty understanding me in noisy room | 0.03(0.23) | 0.56 (0.96) | **<**0.001 |
| **F8** | My voice difficulty restrict personal and social life | 0.04 (0.28) | 0.44 (1.01) | **<**0.001 |
| **F9** | I feel left out of conversation because of my voice | 0.03 (0.25) | 0.39 (0.84) | **<**0.001 |
| **F10** | My voice problem causes me to lose income  | 0.02 (0.16) | 0.33 (0.88) | **<**0.001 |
| **P5** | I feel as though I have to strain to produce voice | 0.05 (0.33) | 0.43 (0.87) | **<**0.001 |
| **P6** | The clarity of my voice is unpredictable | 0.05(0.37) | 0.54(0.99) | **<**0.001 |
| **E4** | My voice problem upsets me | 0.05 (0.39) | 0.35 (0.82) | **<**0.001 |
| **E6** | My voice makes me feel handicapped  | 0.01 (0.12) | 0.28 (0.74) | **<**0.001 |
| **P3** | People ask, “what is wrong with your voice?” | 0.06 (0.45) | 0.54 (0.93) | **<**0.001 |
| **Total VHI-10 Score: Mean(SD)** | 0.39(2.32) | 4.34 (7.04) | **<**0.001 |

**Table 5: Degree of self-perceived voice handicap of teachers and controls**

|  |  |  |  |
| --- | --- | --- | --- |
| **VHI-10 Scores** | **Controls (N=280)** **n (%)** | **Teachers****(N=280)****n (%)** | **p-value** |
| 0 – 10 | 275 (98.2) | 237 (84.6) | **<**0.001 |
| 11 – 20 | 5 (1.8) | 28 (10.0) | **<**0.001 |
| ≥ 21 | 0 (0.0) | 15 (5.4) | **<**0.001 |

**Table 6: Video-laryngoscopic findings in Teachers and Controls**

|  |  |  |  |
| --- | --- | --- | --- |
| **Laryngoscopic findings** | **Controls (N=280)****n (%)** | **Teachers** **(N =280)****n (%)** | **p-value** |
| NormalAbnormal | 257 (91.8%)23(8.2) | 197 (70.4%)83(29.6%) | **<0.001** |
| (Chronic non-specific laryngitis/Vocal nodules | 18  | 74  |  |
| Vocal polyp | 0  | 2  |  |
| Unilateral vocal cord palsy | 1  | 2  |  |
| Vestibular folds hypertrophy | 3  | 3  |  |
| Supraglottictumour | 1  | 1  |  |
| Laryngeal web) | 0  | 1  |  |

**Table 7: Video-laryngoscopic (V-L) findings and VHI-10 scores of teachers and controls**

|  |  |  |
| --- | --- | --- |
|  | **V-L Findings****Controls (N=280)** **(n, % of group total)** | **Teachers (N=280)** **(n, % of group total)** |
| **VHI-10 Scores** | **Normal** | **Abnormal**  | **Normal** | **Abnormal** |
| 0 – 10 | 255 (91.1) | 20 (7.1) | 167 (59.6) | 70 (25.0) |
| 11 – 20 | 2 (0.7) | 3 (1.1) | 16 (5.7) | 12 (4.3) |
| ≥ 21 | 0 (0.0) | 0 (0.0) | 14 (5.0) | 1 (0.4) |
|  |  |  |

**Discussion**

Many patients with vocal pathologies work in professions requiring extensive use of the voice, for many of such patients, the vocal dysfunction represents a significant problem. In some cases, the patients perceive their voice disorder as an alteration of critical capacity, causing emotional distress and/or functional incapacity in social and work contexts. Indeed, these perceptions are often the reasons for consultation with the Otorhinolaryngologist.

**Socio-demographic pattern of the respondents**

Females constituted **58.9%** of the entire 560 participants in this study. Also, for each of the group, there were more female participants. In a study on prevalence of hoarseness and vocal cord abnormalities among teachers in Surulere LGA, Lagos, Nigeria, Alabi*et al.13*reported more female (71.8%) participants. This may be because there could be more females in the teaching profession.

**VHI-10 scores of teachers and non-teachers**

Teachers had higher VHI-10 scores in the total mean and the sub-scale scores than the controls. This shows that teachers have more self-perceived voice handicap. Similarly, teachers also recorded higher number of participants with voice handicap (moderate and severe voice handicap) with prevalence of 15.4% against 1.8% in the control group. This result is not unexpected because teachers are professional voice users and often over use their voices by speaking loudly to project their voices especially in overcrowded classrooms, even yelling for over extended periods of time. Such behaviours may eventually result in voice problems.10, 28 This finding is similar to the report by Roy *et al*.9 that teachers are at particular risk of voice disorders. They reported prevalence of 57.7% in teachers and 28.8% in non-teachers. In addition, teachers when compared with prospective teachers on perception of their voice handicap have higher self-perceived handicap.7, 18

**Video laryngoscopic findings and VHI-10 scores in teachers**

The prevalence of abnormal laryngeal findings as found in this study is about 4 times higher in teachers (29.6% vs.8.2%) with the most common being chronic non-specific laryngitis including vocal nodules.

 Several studies have reported varying prevalence of laryngeal abnormalities in teachers. Lira-Luce *et al*.29 reported higher prevalence of abnormalities at laryngostroboscopic examination in teachers than in the control group (51.6% vs. 16%, respectively). Though, this is about twice the prevalence reported in this study, the prevalence in their study was still about four times higher in teachers. However, the prevalence found in this study is a little higher than what Alabi*et al.* reported (23.5%) at indirect laryngoscopy as they also reported chronic non-specific laryngitis as the most common abnormality (22%) among teachers in Lagos, Nigeria.13

Nwaorgu*et al.* reported prevalence of chronic non-specific laryngitis including vocal nodules to be 55.6% in adult Nigerians presenting with hoarseness.14Ogunleye*et al.*30 reported prevalence of vocal cord nodules among all patients that had direct laryngoscopy in Ibadan for various indications between January 1995 and December 2004 to be 8.6%. The difference could be in the varying sensitivity and specificity of the diagnostic modalities used. Video laryngoscopy gives better and more excellent views of the larynx than mirror examination.22

Two cases each of vocal polyp and right vocal cord palsy were found among teachers. Laryngeal abnormalities like nodules, polyp or laryngitis have been found to be more common in individuals in certain occupations, such as singers and school teachers.31 Lira-Luci*et al.* reported prevalence of vocal nodules in teachers to be 7.1% against 13-14% reported by Preciado et al.29. Van Houtte*et al*.32 reported 15% prevalence of vocal nodules among teachers while Fuess and Lorenz33 reported 26.5% vocal nodules. The differences in prevalence could partly be as a result of varying expertise of the observers, the modalities of examination used and the differences in the study populations.

Three (13.1%) of the 23 controls with abnormal laryngeal findings in this study reported voice handicap. However, worthy of note is that out of 15 teachers (8.3%) with severe self-perceived handicap, only one (1.2%) was found to have abnormal laryngoscopic finding. The implication of this is that were it not for the self-assessment of voice handicap, 14 (93.3%) out of the 15 teachers would have been considered ‘normal’ after video laryngoscopy and offered no form of treatment. This shows that video laryngoscopic evaluation alone in teachers may not be adequate: a lot of teachers with vocal complaints would have been left untreated simply because they would have had “normal laryngoscopicfindings”. This is not unexpected since video-laryngoscopy, a visual perceptual examination, is not a test of vibratory function of the vocal cords. As a result, a combination of video-laryngoscopy and VHI-10 will improve clinical evaluation of the teachers’ voice in a resource-limited setting like ours where stroboscope and acoustic analysis are not readily available. Therefore, teachers with abnormal VHI-10 scores but normal video laryngoscopic findings must have their self-perception of voice handicap respected. They should be followed up in ENT clinics as their handicap could be a pointer to a sinister laryngeal pathology yet to manifest and may not require more than vocal hygiene to improve their voice performance. If this follow up is done for a reasonable length of time without any untoward findings, the teacher can be reassured and allowed to continue with their normal life without any concerns.

The fact that the prevalence of laryngeal abnormalities in teachers was 29.6% but only 15.4% had self-perceived voice handicap suggests that not all abnormalities of the larynx result in perceived voice handicap, e.g. unilateral vocal cord paresis or palsy. However, those with clinically significant abnormalities in this study were referred to ENT clinic for treatment.

**Conclusion**

The prevalence of self-perceived voice handicap was significantly higher in teachers than in the control group**.** Similarly, the prevalence of laryngeal abnormalities among teachers on video laryngoscopy was significantly higher than in the control group, with chronic non-specific laryngitis including vocal nodules being the most common abnormality. Teachers with self-perceived voice handicap without any detectable laryngeal abnormality should be followed up for a reasonable period of time to diagnose early any abnormality of the larynx that may develop.

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