

# **PREVALENCE AND RISK FACTORS OF BENIGN LARYNGEAL LESIONS AMONG TEACHERS**

By

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## **Abstract**

**Introduction:** Subjects using their voice as the main professional instrument often develop vocal disorders. Teachers present a high prevalence of vocal problems in comparison to other professional categories depending on their voice as professional tool; voice changes could be assigned to the interaction between occupational (vocal loading), behavioral and lifestyle factors. Voice disorders due to professional overuse are usually chronic and can lead to an increase in sick absenteeism. **Aim of work:** To determine the prevalence of abnormal laryngeal findings among public-school teachers in Menoufia Governorate, Egypt using stroboscopy. **Materials and methods:** A case-control nested into a cross-sectional study was held from March 1<sup>st</sup> to May 1<sup>st</sup>, 2019. The sample is composed of four hundred and fifty-seven (457) teachers of public schools in Menoufia Governorate, Egypt. **Results:** The prevalence of vocal lesions among the studied group was 22.1% with (17.79-26.41) 95% confidence interval. On stroboscopic evaluation, vocal nodules were the most common structural lesion affecting the larynx; it was present in 42 (9.1%) of teachers. Other structural abnormalities included the presence of swollen arytenoids, vocal cords paresis, vocal polyps, vocal cord cyst, and epiglottic mass in a percentage of (5.9, 3.7, 1.7, 1.1, 0.4) respectively. There was higher prevalence of vocal cord lesions among older teachers with increase duration of employment/years, number of classes /days, smokers and teachers of primary school; although it didn't show statistically significant difference. A significant relationship was reported between laryngoscopic findings and

laryngopharyngeal reflux (15.1% vs 28.7% with 0.002 p-value) and water intake/day ( $t = 2.41$ ,  $df = 2$ ,  $p = .047$ ). **Conclusion:** Results of the current work highlighted the need for large-scale regular educational programs to minimize vocal cord lesions among teachers.

**Keywords:** Teachers, Vocal cord, Voice, Laryngoscopy and Videostroboscopy

### Introduction

Excessive use of voice at work may result in voice disorders (Williams, 2003). The American Speech-Language-Hearing Association (ASHA) outlined voice disorders as abnormal vocal quality, loudness, resonance, pitch and duration of daily voice use that exceeds 40 hours/week that might be inappropriate for an individual's age and sex (ASHA, 1993).

Teachers, are at high risk for voice problems. Several studies have targeted teachers and discovered that frequency of vocal dysfunction considerably more evident among teachers (11% - 81.0%) in comparison with non-teachers group (1.0% - 36.1%) (Alrahim et al., 2018).

Vocal loading was defined as “a combination of the duration of voice use and environmental factors”, teachers are compelled to use loud voice without amplification for many hours every day (Luce et al, 2014). Problems of voice have unfavorable effects on the teacher's performance and communication ability that could impair the daily activities

and social wellbeing (Luce et al, 2014). Such effects could cause lower work achievement than expected, increase absence and might oblige teachers to stop working because of vocal problems (Kooijman et al., 2007 and Luce et al., 2014). Economic impact of vocal pathology among teachers is big such as, lost wages, lost days of work (sickness absenteeism), and the cost of hiring substitute teachers. The social impact of vocal lesions among United States' teachers nearly about \$2.5 billion yearly, taking into consideration the sick absence days and treatment costs (Rosow et al., 2016)

Several studies have stressed on occupational risk factors to vocal cords. Duration of work are well known risk factors due to the voice overuse (Thibeault et al., 2004 and Moy et al, 2015). The number of students within the school class conjointly showed to be important, since teaching a larger group needs extra vocal effort (Irwig et al, 2017). Ample noise levels and schoolrooms with unhealthy phonics aide compel teachers to talk more

loudly, that raises the risk. Different unsuitable working conditions, as dry air, temperature changes, dust and smoke might irritate the mucous membranes and influence voice (Verdolini and Ramig, 2001). Psycho emotional related factors and stress are apparently associated with vocal disorders (Alrahim et al., 2018). Emotions could negatively affect voice production, in sensitive persons. High-stress levels could change the phonation pattern due to the increased voice load (Nerriere et al., 2009).

Stroboscopy and objective voice measurements are important for diagnosis and treatment of patients suffering from vocal problems. Stroboscopy sorts worthy information related to anatomy and performance of the vocal folds, as supraglottic and subglottic components. The slow-motion analysis of the mucosal layer of the front of the vocal folds assists to observe asymmetrical vibration, structural changes, tiny masses, submucosal scars and different abnormalities which can't be observed beneath ordinary light. Moreover, there is a need for skilled explanation of findings. Some persons with no complaints have an abnormal

vocal fold finding (Sataloff et al., 2012).

The current study focuses on the assorted factors that would contribute to dysphonia among teachers and detects the frequency of abnormal findings of the larynx throughout stroboscopy of school teachers.

### **Aim of work**

To determine the prevalence of abnormal laryngeal findings among public-school teachers in Menoufia Governorate, Egypt using stroboscopy.

### **Materials and methods**

**Study design:** A case-control nested within the cross-sectional study.

#### **Place and duration of the study:**

Representative public schools, preparatory, intermediate, secondary and technical, in Menoufia governorate, Egypt; during the duration from March 1st to May 1st, 2019.

#### **Study sample:**

A total of four hundred and fifty-seven (457) teachers of public schools within the Menoufia governorate, Egypt were enrolled in the study.

A stratified random sample technique was chosen to get an appropriate sample size. A frame of all schools obtained from the board directors of Education in Menoufia Governorate. Schools were classified into primary, preparatory, secondary and technical. One school was selected randomly as a representative to each section. All teachers working in the enrolled schools were involved with a total number of 636 teachers.

Exclusion criteria like (work experience less than one-year, previous throat and chest surgeries, endotracheal intubation, repeated infection of the upper respiratory tract, allergy of the nasal mucosa, deviation of the nasal septum, hormonal disturbances and gastrointestinal reflux disease) were applied. Inclusion criteria including being a teacher for a duration more than one year, free from any of the above-mentioned exclusion criteria and who agreed to participate in the study.

Four hundred and fifty-seven participants were competent for sharing representing 71.86% of the total number of teachers.

### **Study methods:**

The study was conducted in two phases:

**Phase I: A self-designed well reviewed questionnaire** was written into clear Arabic language was fulfilled during personal interview. The interviewer started with full explanation of the aim of this study and warranted the confidentiality of personal information of the participants. The questionnaire included different sections: sociodemographic characteristics (sex and age), occupational history (duration of working/years, number of classes/day, teaching hours/day), and health-related habits (smoking, water intake, types of food taken).

**Phase II:** All enrolled teachers were subjected to **indirect laryngoscopy examination and videostroboscopic evaluation**. Topical anesthesia (10mg/dose spray, Lidocaine 10% and Astra Zeneca AB) was applied before every procedure. Laryngeal morphology was examined in a normal white light source followed by examination using 70-degree rigid laryngoscope (Shenda, China) linked to locally-fabricated video camera system (Muracam Endoscopic Camera System, Quezon City, Philippines). Vocal function was assessed using a stroboscope while the patient's pronunciation of the vowel (i) and the frequency was assessed in

addition to evaluating the vocal folds. The examiner reviewed the recorded videos separately from the participant profiles

### **Consent**

A clear and informed consent form was taken from the participants before collecting any information. To assure anonymity, participant's names weren't collected and merely the patient's ID. To maintain confidentiality, all data will be stored directly onto an Excel spreadsheet, which will be held in a password-protected laptop. All gathered information through a data collection sheet was used solely for research purposes.

### **Ethical approval**

The Faculty of Medicine, Menofia University Ethical Committee approved the work. After clarification of the study purpose, main objectives and step by step procedures to the committee. Potential benefits to participants and also, the community from this research

were elaborated. Possible risks that would be raised from this research were discussed clearly. The required official approvals were obtained before starting work.

### **Data management**

Data were analyzed and processed using SPSS (statistical package of social sciences version 23) (SPSS Inc., Chicago, IL, USA). Proper statistical tests were applied. The normality of data was checked using a one-sample K-S test. Quantitative data were presented using mean and standard deviation (SD), otherwise if abnormally distributed, median and interquartile range (IQR) were used and compared using Wilcoxon–Mann–Whitney test. Qualitative variables were expressed as frequencies or percentages. Categorical variables were compared using the Chi-square test or Fisher exact tests. Data were presented in frequency tables and/or graphs as appropriate. P-value < 0.05 presents statistical significance.

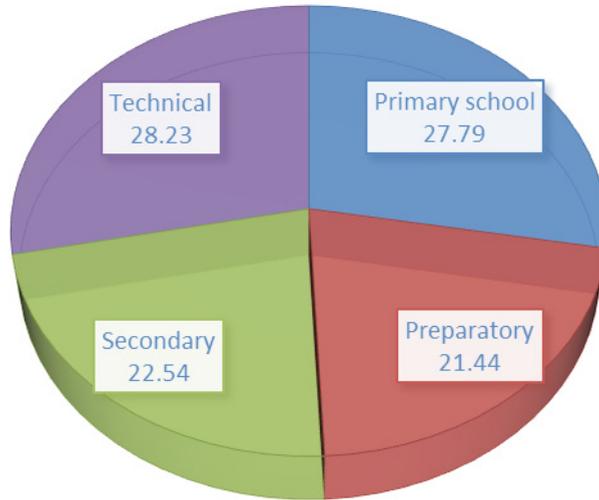
## Results

**Table (1): Sociodemographic characteristics of the participating teachers.**

Variables	Studied teachers (No:457)
<b>Age in years</b>	
Mean± SD	39.6±10.81
Range	24-59
<b>Sex</b>	
Male	230(50.33%)
Female	226(49.67%)
<b>Smoking</b>	
Yes	148(33.38%)
NO	309(67.61%)
<b>Water intake</b>	
Cups/ day	
Mean± SD-	5.13±1.87
Range	2-9
<b>Duration of work /years</b>	
Mean± SD-	17.60±10.83
Range	2-37
<b>Classes / day</b>	
Mean± SD-	3.78±1.04
Range	2-6

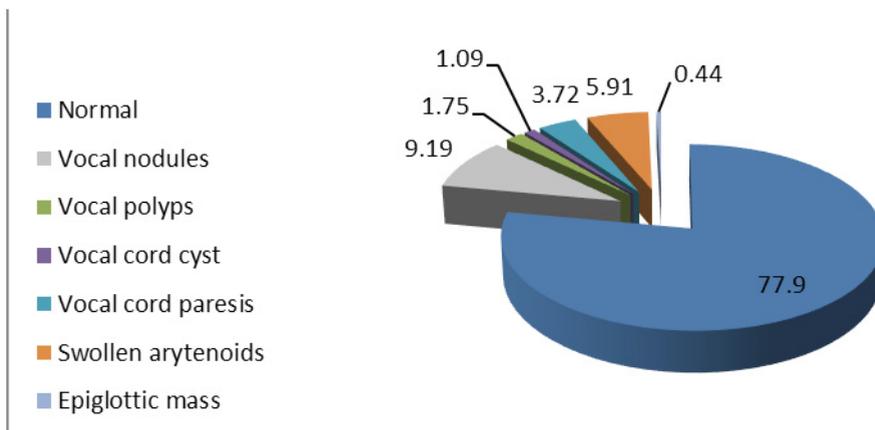
Table 1 showed that four hundred and fifty-seven teachers of public schools in Menoufia governorate, Egypt, participated in the current study. Out of 457 participants, 230 (50.3%) were male. The mean age of teachers was 38.6 years (range 24–59 years). Most teachers lecture 2 to 6 classes /day and have up to 25 students per class. They have 2 to 37 years of teaching experience. Regarding smoking history, about one-third of participants were smokers 32.3% (148/457). The teachers in the study group took an average of 7 glasses of water per day.

## TEACHERS DISTRIBUTION

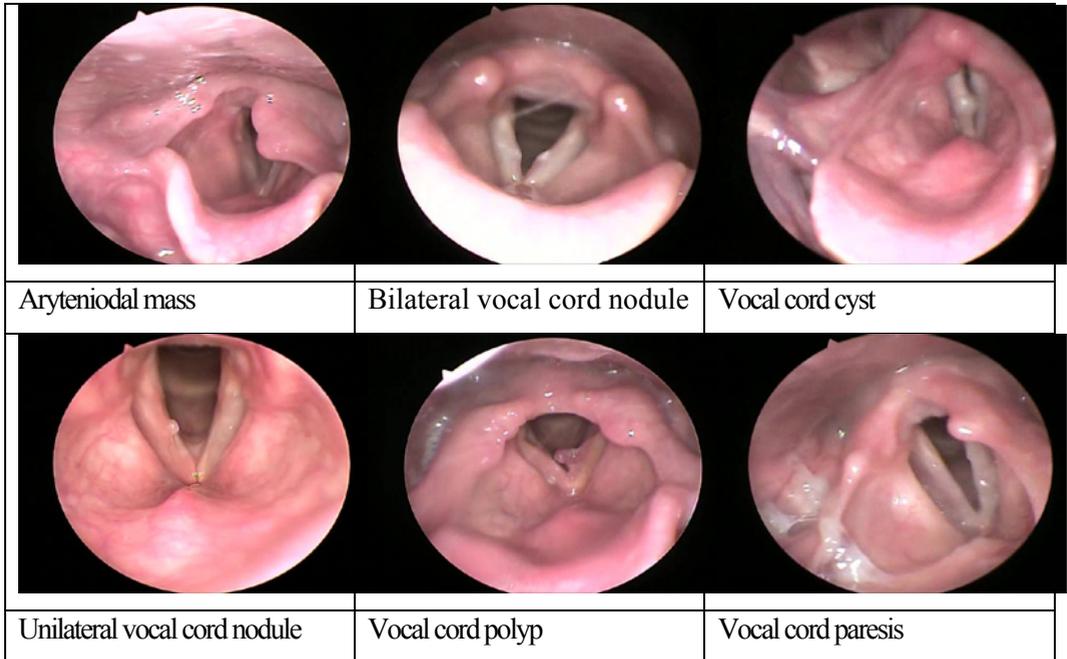


**Figure (1): Participants distribution among schools.**

Figure 1 showed that the highest number of participants was working at the technical school (28.2%). Teachers who were working in primary school accounted for 27.7% and those working-in secondary school for 22.5% and preparatory school for 21.4%.



**Figure (2): Vocal cord lesions among participants.**



**Figure (3) Vocal cord lesions on laryngostroboscopic examination among participants.**

The prevalence of tired voice was (54%) and weak voice was (43%) are the main vocal cord problems observed in most of the participants.

The prevalence of vocal lesions was 22.1% with (17.79-26.41) 95% confidence interval. On stroboscopic evaluation, vocal nodules were the most common structural lesion involving the larynx. It was present in 42 (9.1%) of teachers belonging to the study group. Other structural abnormalities included the presence of swollen arytenoids, vocal cords paresis, vocal polyps, vocal cord cyst, and epiglottic mass in a percentage of (5.9, 3.7, 1.7, 1.1, 0.4) respectively, [Figures 2, 3].

**Table (2): Comparison between normal and abnormal vocal cords groups regarding contributing factors.**

<b>Contributing factors</b>	<b>Normal vocal cord No=356 (77.99%)</b>	<b>Abnormal vocal cord No= 101 (22.01%)</b>	<b>Test of significance</b>	<b>p-value</b>
<b>Age/ years</b> Mean± SD Range	38.34±10.72 24-59	44.01±10.42 31-59	1.48 T-test	0.146
<b>Sex</b> Male Female	171(48.03%) 185(51.97%)	59 (58.42%) 42 (41.58%)	3.39 Chi square	0.065
<b>Smoking</b> Yes NO	105(29.49%) 251(70.51%)	38 (37.62%) 63 (62.38%)	2.42 Chi square	0.119
<b>Smoking index</b> Mean± SD Range	230.00±162.48 70-540	340.00±282.84 140-540	0.868 Mann-Whitney U test	0.385
<b>Water intake</b> Cups/ day Mean± SD- Range	5.43±1.88 2-9	4.10±1.52 2-7	2.04 T-test	<b>0.047*</b>
<b>Spicy food</b> Yes NO	180(50.56%) 176(49.44)	58(57.43%) 43 (42.57%)	1.49 Chi-square	0.223
<b>Type of the school</b> Primary Preparatory Secondary Technical	95(26.69%) 77(21.63%) 81(22.75%) 103(28.93%)	32 (31.68%) 21 (20.80%) 22 (21.78%) 26 (25.74%)	1.05 Chi square	0.789
<b>Duration of work/ years</b> Mean± SD Range	16.34±10.73 2-37	22.15±10.42 9-37	1.395 Mann-Whitney U test	0.163
<b>Classes /day</b> Mean ± SD- Range	3.742±1.01 2-5	3.90±1.19 2-6	0.417 T-test	0.679
<b>Laryngopharyngeal reflux</b> Present Absent	54(15.17%) 302(84.83%)	29 (28.71%) 72 (71.29%)	9.71 Chi square	<b>0.002*</b>

\*: Statistically significant

Table 2 showed the comparison between teachers of normal vocal cords with others of vocal cords lesions, the significant contributing factors were water intake per day (5.43 vs 4.1 cups respectively with 0.047 p-values) and laryngopharyngeal reflux (15.1% vs 28.7% with 0.002 p-values). There was higher prevalence of vocal cord lesions among teachers with older age, increase duration of employment/years, number of classes/day, smokers and teachers of primary school; although it didn't show statistically significant difference

### Discussion

In Egypt, we have few studies concerning vocal problems among teachers. Neither nationalistic nor large-scale researches reported the problem of professional voice affection although it presents the most repeatedly recorded job-related problems (Ewis and Abo Haseeba, 2013). The current study purposes to spotlight the health disorders among such job category, that presents a great percentage of the occupational sector.

In the current study it was evident that elderly teachers and 58.4 % of male had vocal cord lesions although it didn't show statistically significant difference (Table 2). This was similar to the results obtained by Rameshkumar and Rosmi, 2016 in their study on the prevalence of age, gender and pathological conditions of vocal cords in a tertiary care hospital and detected that male predominance and elderly age group were affected and

concluded that tobacco smoking could be the etiologic factor. This finding was confirmed by García and her colleagues (1999) who explained the main factor for the vocal fold nodule was voice abuse or misuse, whereas for the polyps and edema was smoking.

On contrast to our work; an Egyptian study on teachers done by (Ewis and Abo Haseeba, 2013) who stated that female teachers have higher incidence rate of acquiring dysphonia in comparison to male teachers (OR=1.53). Roy et al., 2005, Martins et al., 2016 and Vasconcelos et al, 2019 stated that the prevalence of voice disorders was higher among adult females compared to adult males, with a reported ratio of 1.5:1.0.

The current work showed that 22.1% of the studied group (Table 2) had vocal cord lesions, a finding coinciding with that of (Rameshkumar and Rosmi, 2016) who revealed that the incidence of vocal nodules associated

hoarseness was the highest (22%) type of vocal lesions among their studied subjects. Also the results of the present study was lower than that of the work done by Thibeault et al, (2004) on the occupational risk factors associated with voice disorders among teachers where they surveyed 1243 teachers, 58% out of them notified a voice problem.

The present work showed that vocal cord lesions were higher among smokers and who have high smoking index (although statistically non-significant) (Table 2). This was similar to the study done by Alrahim and his colleagues (2018) on hoarseness among school teachers: A cross-sectional study from Dammam; revealed that smoking index was higher among teachers with vocal cord lesions. Smoking represents significant association with vocal exhaustion. Also, Al-Saleem and Al-Saleem, 2013 on their work the on epidemiology of voice disorders among male school teachers in Khamis Mushayt city, Saudi Arabia reported that “the most frequently experienced unhealthy habit that could harm voice among teachers was smoking”.

The comparison between participants working in primary, preparatory, secondary and technical

schools regarding voice-related vocal cords lesions did not reveal notable statistical difference (Table 2). It might be due to the similarity of teaching methods within the Egyptian public schools including different educational levels regarding schoolrooms density, lack of resources and aiding technologies like microphones and speakers to assist the educational process. Although the prevalence of teachers complaining of vocal cord lesions was higher among primary school one although it was statistically non-significant (Table 2). The teaching level might influence the degree of vocal cord use by teachers e.g. Kindergarten and elementary level teachers might experience vocal symptoms rather than teachers of the middle or high school education levels. A result supported by the findings of (Lee et al, 2018) who found that primary school teachers experienced higher frequency of voice disorders . Moy et al., 2015 explained this finding by the fact that Kindergarten teachers needs larger vocal demands to cope with their students' needs while they are still learning alphabet.

The findings of the current study detected that there was higher prevalence of vocal cord lesions among

teachers with increase duration of employment and number of classes / day (Table 2) although it didn't reach a significant level. This was in accordance with the results of Lee et al, 2018 who detected that the frequency of voice disorders was higher with increased duration of employment ( $P = 0.034$ ) and in the group working for long hours ( $> 52$  h/week, 27.3%). Risk factors for developing dysphonia among teachers could be, prolonged hours of use, often more than 40 hours weekly and large number of pupils/schoolrooms (Moy et al., 2015).

The results of the current study revealed increased prevalence of vocal cord lesions related to Laryngopharyngeal reflux (28.71 %) (Table 2). Similar results were documented by Moy et al., 2015 on their study on determinants and effects of voice disorders among secondary school teachers in Peninsular Malaysia and detected that during the high daily efforts, many teachers may substitute ordinary foods for snacks and junk foods, boosting gastrointestinal problems, as gastroesophageal reflux, which presents an important risk factor of acid irritation. Also, Pendleton et al., 2013 in their study on posterior

laryngitis: a disease with different etiologies affecting health-related quality of life; detected the same results.

According to the results of the current research work; vocal nodules were the most common structural lesion involving the larynx (Table 2) which was present in 42 (9.1%) of teachers. Other structural abnormalities included the presence of swollen arytenoids, vocal cords paresis, vocal polyps, vocal cord cyst, and epiglottic mass. Similar results were detected by Tavares and Martins 2007 who performed video laryngoscopic testing among 80 teachers and reported that 42.5% was normal, 30% with vocal nodules, 7.5% with vocal polyps and 6.25% with sulcus vocalis in addition to different less frequent lesions.

Also, these results were following, Abdul Majeed and Haneefa, 2017 who performed stroboscopic evaluation of a group of 80 teachers and revealed that vocal nodules were the most common structural lesion of the larynx. It was present in 9 (22.5%) teachers belonging to the study group and in one teacher from the control group. In addition to other structural abnormalities which included the presence of vocal polyps in 3 (7.5%) teachers from the study group,

congestion and thickening of the vocal cords.

### **Limitations of the study:**

Few Egyptian publications regarding vocal problems as an entity of occupational health was published. Obviously, the definition of vocal abnormalities and the identification of risk factors suggest the requirement of more investigation. Finally, as a cross-sectional study data, it didn't clarify causes and consequences to be evaluated, also, follow up research is required to spot risk factors associated with vocal problems.

### **Conclusion and recommendations:**

The prevalence of vocal lesions among the studied group was 22.1%. It was more common among male teachers. On stroboscopic evaluation, vocal nodules were the most common structural lesion involving the larynx. Other structural abnormalities included the presence of swollen arytenoids, vocal cords paresis, vocal polyps, vocal cord cyst, and epiglottic mass. There was higher prevalence of vocal cord lesions among older teachers with increase duration of employment, number of classes /day and smoking and teachers of primary school; although it

didn't reach a statistically significant difference. A significant relationship between laryngoscopic findings; laryngopharyngeal reflux and water intake/day was reported.

Current study clarified the necessity of periodic screening, implementation of a vocal care awareness program on a wide range to assist reducing such frequent problems, minimizing disorders and disabilities, raising teacher's achievements in spite of the unavoidable working environment problems facing teachers. Also, suggests that school teachers could benefit from treatment of laryngeal reflux and increase of water intake.

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### **Conflict of interest**

No potential conflict of interest.

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