

OCCUPATIONAL DYSPHONIA AMONG SCHOOL TEACHERS IN BENI SUEF GOVERNORATE, EGYPT

By

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Abstract:

Introduction: Occupational dysphonia or work-related voice disorders is a frequently met problem among school teachers. Worldwide, many studies have been conducted to tackle this problem; however, in Egypt, no studies had investigated teachers' dysphonia; with the epidemiology and magnitude of voice problems among Egyptian teachers is still unknown. **Aim of the work:** To assess the prevalence of work-related dysphonia and its associated factors among Egyptian school teachers. **Materials and Methods:** In this cross-sectional study, a well-designed, self-administered questionnaire had been used to inquire about the prevalence and risk factors of dysphonia among school teachers in Beni-Suef governorate. Two thousand questionnaires were sent to about 40 different randomly-selected schools, ranging from primary to secondary, (50 questionnaires per school). Additional 1000 questionnaires were distributed to individuals with occupations other than teaching to be used as a comparative group. The purpose of the study with confirming confidentiality of data were included in the questionnaires and accepting to fill out and return the questionnaire back was considered as a consent. **Results:** From the distributed 3000 questionnaires, about 1441 teachers and 832 non-teachers participated in the study with a response rate of (75.8%). Teachers were significantly more likely to report dysphonia than non-teachers; the prevalence of dysphonia during the day of the survey or within the past 7 days (current or recent dysphonia) was about 18.6% versus 9.3%, while dysphonia in the past month was (28.8% versus 12.7%), dysphonia in the past 3 months, was (46.6% versus 15.9%), respectively.

Work-related dysphonia during any time of the working life-time was (65.5% and 21.3%) for teachers and non-teachers, respectively, OR= 3.08 (2.69-3.37).

Female teachers were significantly more likely to suffer recent and working life-time dysphonia than males (21.8% versus 16.2% and 68.4% versus 63.3%), respectively; with a life-time OR= 1.53 (1.29-1.80). Additionally, our results confirmed that younger age, less years of experience, large number of students/class, increased hours of voice use, being easily aroused, teaching certain subjects (e.g., Music, English or Math), teaching in primary or secondary schools and being a current smoker are important determinants for experiencing dysphonia. **Conclusions:** Dysphonia is a prevalent occupational hazards among school teachers that can greatly affect their performance, career and income. Teachers have 3 times risk for occupational dysphonia than non-teachers. It needs to be considered with integrated programs between public and occupational health professionals as well as phoniatics specialists. Most of voice problems may be preventable; therefore, we recommend developing prevention programs including preventive voice training, oropharyngeal and voice hygiene with sanitary work conditions to combat functional dysphonia among school teachers.

Key words: Dysphonia, School teachers, Voice problems, Occupation risk factors, Prevalence.

Introduction

Nearly, one third of the labor force works in professions in which the voice is their primary tool (Vilkman, 2004). Excessive use or abuse of the voice at work carries the risk of causing dysphonia (Williams, 2003).

Vocal abuses and vocal overuses are considered precipitating factors that cause dysphonia. The most common vocal abuse behaviors are screaming, frequent throat clearing and vocalizing to create special effects (Sapir et al., 1992).

Occupational demands may contribute to vocal overuse and abuse. Occupational factors that

may contribute to the development and maintenance of voice problems include exposure to chemicals that are known to irritate the larynx, high work performance demands, elevated stress level, long periods of vocalizing without breaks and inadequate vocal training for occupational demands (Rameck and Ferreria, 1999).

Dysphonia is the most frequently met occupational complaint among school teachers as a group of professional voice users. Several studies have been conducted to examine the prevalence, causes and risk factors for this problem; however, the epidemiology of voice disorders among this group needs enormous investigation.

Despite considerable research in the area of voice problems among teachers, the prevalence of voice disorders varies greatly from country to country and from study to another depending on the definition of dysphonia, study design and methods of data collection (Mattiske et al., 1998; Williams, 2003 ; Alves et al., 2009).

American Speech and Hearing Association (ASHA) define voice disorders as the production and/or absences of vocal quality, pitch, loudness, resonance, and/or duration, which is inappropriate for an individual's age and/or sex (ASHA, 1993). Dysphonia is generally characterized by abnormalities in voice that can limit the effectiveness of oral communication (Verdolini and Ramig, 2001). Other definitions of dysphonia emphasized on the ability of the voice to fulfill the speaker's social and occupational requirements (Sataloff and Abaza, 2000).

The variations in defining dysphonia lead to variations in approaches in examining its prevalence. Thus, studies' focuses were diverse and used different terms such as, voice disorders, voice problems, voice complaints, voice symptoms, etc to evaluate the prevalence of dysphonia. This explains

the variations of prevalence rates of dysphonia and the inconsistencies in results that ranged between 4.4% to 90% (Mattiske et al.1998).

The reported prevalence rates of work-related life-time dysphonia among teachers were 57.7% in the US, 57.6% in the U.K., 51.4% in Italy, 51% in Belgium, 65% in Finland, 69% in Poland, 42% in Peru and 63% in Brazil, 74% in Hong Kong (Roy et al., 2004; Herrington-Hall et al., 1988 ; Angelillo et al., 2009 ; Van Houtte et al., 2010 ; Smolander and Huttunen, 2006; Sliwinska-Kowalska et al., 2006 ; Sala et al., 2001 ; Behlau et al., 2012 ; Chong and Chan, 2010).

However, to our knowledge, in Egypt, there are no national surveys or large scale studies that examined the prevalence or addressed the issue of occupational dysphonia among school teachers.

Aim of work

To assess the prevalence of work-related dysphonia and its associated factors among Beni Suef governorate school teachers; and compare it with non-teacher population, while focusing on the modifiable risk factors for prevention purposes.

Materials and Methods

In this cross-sectional study, a well-designed, self-administered questionnaire had been used to inquire about the prevalence, causes and risk factors of dysphonia among school teachers in Beni-Suef governorate. About 40 different schools ranging from primary to secondary were randomly selected, and 2000 questionnaires were sent to their teachers (50 questionnaires perschool). As a control group, additional 1000 questionnaires were distributed to non-teacher individuals of the same sex and age range, mainly at hospitals for physicians, nurses, paramedics and hospitals' administrative staff, or to lawyers, clerks and administrative workers at the university and other educational institutes.

The questionnaire was prepared in Arabic and a 3-point Likert scale was used for data collection. The Likert scale was adapted from Punnett et al. (2007). We developed the questionnaire after reviewing the relevant literature.

The questionnaire inquired mainly about socio-demographic characteristics and number of weekly hours of work-related voice use, a self-report of voice

problems, voice symptoms, frequency of acute and chronic work-related voice problems during the day and week of data collection, in the past month, past 3 months or during the working-life time. Additional questions were included about smoking, history of diseases, any medications and absence from work due to voice problems.

A pilot study was conducted on 50 randomly selected teachers, who were excluded from the main study since some statements were rephrased and others were merged or even dropped. Using the final version of questionnaire, a second pilot study was performed on 70 randomly selected school teachers at Al-Azhar educational institute of Beni Suef city. The answers for the 2nd pilot was checked, analyzed, and the validity of the final questionnaire was then calculated (Cronbach alpha = 0.812).

Ethical considerations:

The study was approved by the ethical committee of the Faculty of Medicine, El-Minia University. Prior to data collection, official permissions were obtained from the authorities of the education directorate of Beni Suef governorate and administration of

Beni Suef municipal, university and health insurance hospitals. However, participants from some occupations (e.g., lawyers and pharmacists) were approached, individually. The questionnaires included explanations about the purpose of the study with confirming confidentiality of data. Accepting to fill out and return the questionnaire back was considered as consent for participation in the study.

The questionnaires were sent to schools and hospitals with some research assistants who distributed and collected back the completed questionnaires, then handled to the corresponding investigator. A part of the research assistants' work was to assure the research subjects about the nature of the study and confidentiality of their information that will never be used for purposes other than scientific research.

Confidentiality of the collected data was assured by collection of the completed forms by the researchers while keeping the questionnaires anonymous.

Data analysis

Data were analyzed using the software, Statistical Package for Social Science, (SPSS) version 19. Frequency distribution with its percentage, mean and standard deviation were calculated. Chi-square, t-test, correlations were done whenever needed. P-values of <0.05 were considered the cut off point for the level of significance.

Results

From the distributed 3000 questionnaires, about 2273 were filled out and returned back with a total response rate of (75.8%). Teachers' response rate was 72.1% while that of non-teachers reached 83.2%.

Table 1: Comparison between teacher and non-teacher participants regarding their gender, age, job period, smoking index and hours of work-related voice use per week.

	Teachers		Non-teachers		P-value
	No.	%	No.	%	
Sex					
Males	817	(56.7)	445	(53.5)	0.07
Females	624	(43.3)	387	(46.5)	
Total	1441	(100.0)	832	(100.0)	
Age / years	37.3 ± 8.3		36.9 ± 7.8		0.24
Job period / years	11.4 ± 7.5		12.8 ± 7.1		0.071
Smoking index	203.1 ± 126.2		203.2 ± 121.6		0.99
Weekly job-related voice use / hours	49.9 ± 22.6		30.5 ± 13.4		0.001*

*: Significant

Table 1 shows a comparison between teacher and non-teacher participants regarding their sex distribution, mean and standard deviation of age, working period, and smoking index; where there were no significant differences between the two groups regarding those variables. As regards for the mean hours of work-related voice use/week, teachers reported a significant higher use of voice in their work than participants from other occupations, (P=0.001).

Table 2: Prevalence of dysphonia among teachers and non-teachers groups in Beni Suef governorate, 2014

	Dysphonia in teachers Number (%)			Dysphonia in non-teachers Number (%)			P-Value
	Present	Absent	Total	Present	Absent	Total	
Dysphonia in 7 days	265 (18.6)	1159 (81.4)	1424 (100.0)	77 (9.3)	748 (90.7)	825 (100.0)	0.0001*
Dysphonia in a month	407 (28.8)	1006 (71.2)	1413 (100.0)	105 (12.7)	724 (87.3)	829 (100.0)	0.001*
Dysphonia in 3 months	660 (46.6)	756 (53.4)	1416 (100.0)	131 (15.9)	695 (84.1)	826 (100.0)	0.0001*
Dysphonia in working life	931 (65.5)	490 (34.5)	1421 (100.0)	176 (21.3)	651 (78.7)	827 (100.0)	0.0001*
Phonasthenia Symptoms in a month	468 (32.9)	954 (67.1)	1422 (100.0)	137 (16.5)	694 (83.5)	831 (100.0)	0.0001*
Dysphonia-related ever absence	112 (8.5)	1203 (91.5)	1315 (100.0)	48 (7.3)	607 (92.7)	655 (100.0)	0.206
Cough in a month	340 (25.8)	980 (74.2)	1320 (100.0)	87 (13.5)	559 (86.5)	646 (100.0)	0.001*

*: Statistically significant

Table 2 presents a comparison between school teachers and non-teachers regarding the prevalence of recent dysphonia (during the day of the survey and within the past 7 days), dysphonia in the past month, three months before the survey day or during the working life-time. Results confirmed that teachers were significantly more likely to report dysphonia than non-teachers; where recent dysphonia was (18.6% vs 9.3%), dysphonia in the past month was (28.8% vs 12.7%), dysphonia in the past 3 months was (46.6% vs 15.9%) and work-related dysphonia within the working life-time was (65.5% vs 21.3%), respectively. Similarly, symptoms suggesting phonasthenia were significantly, almost double prevalent among teachers (32.9%) compared to non-teachers (16.5%), ($p=0.0001$).

We calculated the risk of developing work-related dysphonia and phonasthenia among teachers compared to non-teachers; the Odd's Ratio and 95% confidence interval was OR= 3.08 (2.69-3.37) and O.R.=1.99 (1.68-2.37), respectively.

Table 3: Comparison between male and female teachers of Beni Suef governorate regarding dysphonia prevalence

	Dysphonia in male teachers Number (%)			Dysphonia in female teachers Number (%)			P-Value
	Present	Absent	Total	Present	Absent	Total	
Dysphonia in 7 days	132 (16.2)	681 (83.8)	813 (100.0)	133 (21.8)	478 (78.2)	611 (100.0)	0.005*
Dysphonia in a month	190 (23.5)	619 (76.5)	809 (100.0)	217 (35.9)	387 (64.1)	604 (100.0)	0.001*
Dysphonia in 3 months	383 (47.5)	423 (52.5)	806 (100.0)	277 (45.4)	333 (54.6)	610 (100.0)	0.232
Dysphonia in working life	513 (63.3)	297 (36.7)	810 (100.0)	418 (68.4)	193 (31.6)	611 (100.0)	0.026*
Phonasthenia Symptoms in a month	243 (30.1)	564 (69.9)	807 (100.0)	225 (36.6)	390 (63.4)	615 (100.0)	0.006*
Dysphonia-related ever absence	94 (12.1)	684 (87.9)	778 (100.0)	18 (3.4)	519 (96.6)	537 (100.0)	0.001*

*: Significant

Comparison between male and female teachers' self-reported dysphonia is presented in (Table 3). Female teachers showed significantly higher prevalence of recent, in a month and working life-time dysphonia than males, (21.8%, 35.9% and 68.4% vs 16.2%, 23.5% and 63.3%), respectively (Table 3).

Being a female teacher increased the risk for developing dysphonia than male teachers, OR= 1.53 (1.29-1.80).

Additionally, female teachers significantly reported symptoms suggesting phonasthenia than male teachers ($p=0.006$), however, male teachers showed a significantly higher frequency of absence due to work-related voice problems than females, 12.1% vs 3.4%, respectively, (Table 3).

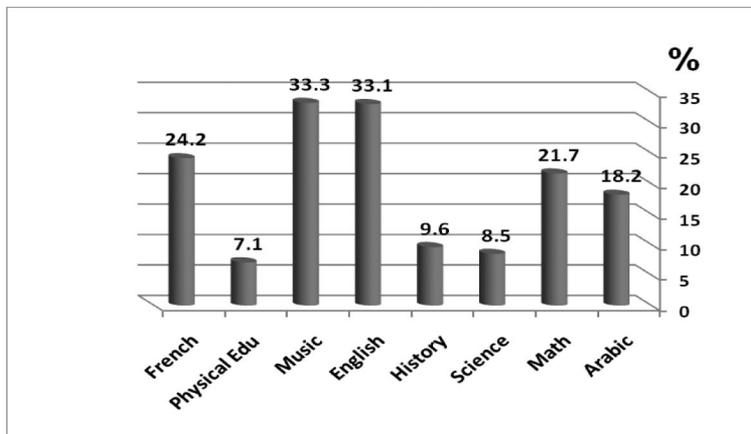


Figure 1: Dysphonia prevalence among teachers of different subjects

Our findings affirmed that the higher number of students per class and teaching some specific subjects (e.g., Music, English and Mathematics) were determinants for occurrence of voice problems (Figure 1).

Table 4: Comparison between Beni Suef teachers with and without dysphonia as regards, age, job period, number of hours of work-related voice use and number of students in class.

	Teachers with Dysphonia	Teachers without Dysphonia	P-value
Age / years	35.9 ± 7.8	37.6 ± 8.3	0.004*
Job period / years	10.1 ± 7.2	11.6 ± 7.5	0.003*
Smoking index	208.6 ± 123.9	195.8 ± 129.9	0.352
Weekly job-related voice use / hours	67.5 ± 12.1	46.1 ± 22.6	0.0001*
Number of students/class	52.6 ± 8.2	48.5 ± 12.6	0.001*

*: Significant

Table 4 compared teachers who reported dysphonia to those who did not. There were significant differences between teachers who got dysphonia and those who did not as regards their age, job-period, hours of voice use in teaching and number of students per class. Younger teachers with less job period, and those who teach classes with large number of students or those who teach for more hours/week were more prone to develop dysphonia (Table 4).

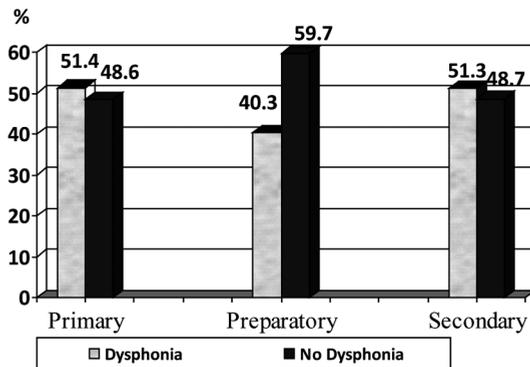


Figure 2: Comparison between primary, preparatory and secondary school teachers regarding the prevalence of self-reported work-related dysphonia.

Teaching at primary and secondary schools increased the risk of having dysphonia significantly, than teaching in preparatory schools, ($P=0.001$), (Figure 2).

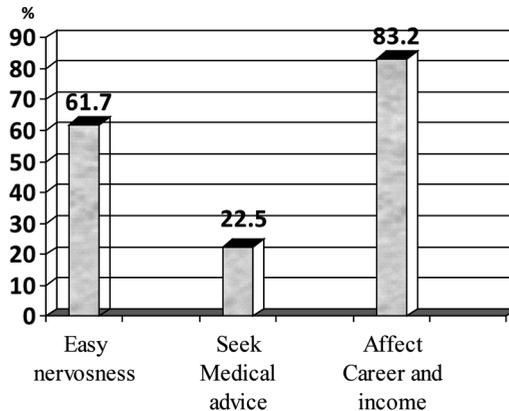


Figure 3: Percentage of teachers with dysphonia who reported that they are easily aroused, they seek medical treatment, consider that dysphonia affects career and income.

Those who reported that they are easily getting nervous were significantly higher among those who reported dysphonia (61.7%) than those who did not (32.8%), (Figure 3). Most of the teachers who suffered dysphonia (78.5%) did not visit the hospital and (83.2%) of them believed that dysphonia is a real problem that can affect their career and earnings (Figure 3).

Discussion

To study the prevalence of dysphonia among school teachers and compare it with non-teacher population we designed and implemented the current cross-sectional, self-administered questionnaire-based study. About 3000 questionnaires were sent to the randomly selected schools and to individuals in other different occupations. About 1441 school teachers and 832 non-teachers participated in the study by filling out the questionnaires and returning them to the researchers.

The questionnaire inquired about having any of the symptoms that suggest dysphonia or phonasthenia, currently or during the past month, past 3 months or at any time during the working life. These symptoms included change in voice quality, hoarseness, discomfort, exhausting voice after short use, difficulty projecting voice, troubled or interrupted voice during speaking, dryness of the throat or something adherent in the larynx, and increased effort while using voice.

In the present study, among teachers, current week dysphonia prevalence rate was 18.6% while dysphonia during the working life-time was 65.5% (Table 2). Our results affirmed that school teachers

were significantly more likely than non-teachers to report dysphonia and other symptoms suggesting phonasthenia (Table 2). Teachers' dysphonia and phonasthenia were significantly higher than non-teachers during the current week, past month, past 3 months and during the working life-time. Teachers have 3 times risk to develop dysphonia and 2 times risk for phonasthenia than non-teachers, OR= 3.08 (2.69-3.37) and O.R.=1.99 (1.68-2.37), respectively. These results suggest that teachers' dysphonia is an occupation-related problem since their job depends largely on voice use. Our Results were supported by the findings of a multicenter Polish study that showed that in the population of academic teachers the likelihood of dysphonia development was 3 times higher than the control group (Niebudek-Bogusez and Sliwinsk-Kowalska, 2006).

The distribution of voice disorders may differ by gender. Smith et al., (1998) suggested that women report voice disorders more often than men (Smith et al., 1998). In our study, female teachers were significantly more likely to suffer recent and working life-time dysphonia than males (21.8% vs 16.2% and 68.4% vs 63.3%), respectively (Table 3); with

a life time OR= 1.53 (1.29-1.80). This can be explained by factors related to the nature of females and their physical built. School students usually fear the anger of a male teacher than a female one. Therefore, controlling the noise and disordered classes is a difficult task for a female teacher who uses her voice at a maximum to control the students and overcome the noisy class environment. Additionally, our results showed that female teachers continue working while having symptoms of voice problems, where only 3.4% of female teachers who suffered dysphonia skipped going to schools while 12.1% of males with dysphonia reported absence of work (Table 3). Such an attitude of continuing work while having dysphonia, without resting voice can aggravate the symptoms and worsen the voice production and quality.

Our findings affirmed that the higher the number of students per class, the significantly higher dysphonia reporting by school teachers (Table 4). The number of students was reported by other researchers as a determinant for the occurrence of voice problems. A study in the Netherlands by Kooijman et al., (2006) showed that teachers with large class size had approximately

3 times higher voice disorders than teachers of classes smaller in number (Kooijman et al., 2006).

There are indications that stress affects voice production and progression of dysphonia. Stress is thought to cause hypercontraction of intrinsic and extrinsic laryngeal muscles which often accompany dysphonia (Roy, 2003). Teachers who reported high work pressure had more than 3 times the voice disorders of their teacher colleagues (Thomas et al., 2006 ; Chen et al., 2010). In the current study, 61.7% of teachers with dysphonia reported that they are nervous and can easily be aroused compared to 32.8% of those who did not suffer dysphonia (Figure 3). Moreover, the effect of increased work load was evident as we found that teachers who teach classes with large number of students and work for more hours/week were more prone to develop dysphonia (Table 4).

Our findings showed that there were significant differences between teachers who got dysphonia and those who did not as regards their age and years of teaching, where younger teachers and those with less years of experience reported more dysphonia (Table 4). These results were consistent with that

of Smith et al., (1997) but contradicted that of De Medeiros et al., (2008) and Da Costa et al., (2010). We can argue that, the study of Da Costa et al., was performed on a small sample size that cannot yield concrete conclusions; and De Medeiros et al., considered teachers with experience of 0-4 years as a reference group and compared other teachers with higher years of experience to them. Their results showed an O.R. of 1.43 and 1.66 for experiences of 10-14y and 15-19y, respectively. This O.R. declined to 1.21 after 20 years of experience. This explanation can be consistent with our findings, by stating that the increased years of experience could inversely correlate with occurrence of dysphonia.

Our study revealed that teaching at primary and secondary schools significantly, increased the risk of having dysphonia than teaching in preparatory schools, ($P=0.001$), (Figure 2).

It was suggested that the vocal load among primary and pre-school teachers is higher than the load for secondary teachers, because the former would have to compete against noise produced by the children during longer time periods without appropriate rest breaks

(usually they teach all the topics by themselves) (Sala et al., 2001). Another study on the level of teaching suggests that the younger the students the more often voice disorders will be prevalent among teachers (Angelillo et al., 2009).

Moreover, teaching some specific subjects was shown to be a determinant for having voice problems among school teachers. In our study, teachers of Music, English and Mathematics were significantly more likely to report voice problems than others ($P<0.05$), (Figure 1). Thibeault et al., (2004) also, found that teaching Music and Sciences is a risk factor for voice disorders; however, other studies did not show such a relationship (Thibeault et al., 2004).

Yet, in the present study, only 22.5% of teachers sought treatment for their dysphonia (Fig.3). This was higher than the findings of Roy et al., (2004) who found that only 14.3% of teachers had consulted a physician for their dysphonia. Similarly, Hamdan et al., (2007) noted that 79% of dysphonic teachers had never been medically evaluated. In our study, most of the teachers who suffered dysphonia (78.5%) did not visit the hospital, but they used hot drinks with some other

over the counter medications (OTC) directly from the pharmacies as well as brief resting of voice for few days before they got improved and resumed their work. Such an attitude of teachers regarding their dysphonia can be related to their concepts that voice problems are normal accompanying symptom of their vocally-demanding profession.

Regarding the economic effects of dysphonia in teachers, most of our teachers, who suffered voice problems (83.2%), believe that dysphonia is a real problem that affects their career and earnings (Figure 2). A previous study by Verdolini and Ramig (2001), estimated the annual losses billions of dollars due to dysphonia-related lost work days. Another study by Roy et al., (2004) concluded that voice problems have economic consequences for teachers being more likely to miss work because of their dysphonia.

Interestingly, smoking index did not vary significantly between teachers who reported dysphonia and those who did not. This can be explained by the facts that smoking itself can cause changes in voice that is considered as normal with chronic smokers, therefore, they do not report or even recognize their voice changes. It must be noted here that

smoking index was calculated for only the current smokers, with and without dysphonia.

However, by categorizing school teachers into two groups; current smokers and current non-smokers (non and ex-smokers), Chi squared test revealed a significant difference between the two groups regarding the 3 months dysphonia ($P=0.001$), with increased dysphonia reporting among currently smoking school teachers, O.R.= 1.28 (1.14-1.43). Our above results were consistent with a US study by Roy et al., (2004) and another study of voice disorders among Brazilian teachers, by Behlau et al., (2012) who failed to identify tobacco use as a unique contributor for development of dysphonia (Roy et al., 2004; Behlau et al., 2012). However, further researches for better evaluation the relationship between smoking and dysphonia is still required.

We conclude that dysphonia is one of the major occupational hazards among school teachers that can greatly affect their career and income. The prevalence of dysphonia among school teachers is significantly higher than subjects working in other occupations. Female teachers are more likely to experience

voice problems than males. Young age, less years of experience, large number of students/class, increased hours of voice use, being easily-aroused, teaching certain subjects, teaching in primary or secondary schools and being a current smoker are important determinants for experiencing functional dysphonia among school teachers. Fortunately, most of voice problems may be preventable; therefore, we recommend developing prevention programs including preventive voice training, oropharyngeal and voice hygiene with sanitary work conditions to combat functional dysphonia among school teachers.

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References

1. Alves L, Do Carmo Cruz Robazzi M, Marziale M, De Felipe A, and Da Conceicao Romano C (2009): Health disorders and teachers' voices: A workers' health issue. *Revista Latino-Americana de Enfermagem*; 17(4):566–572.
2. Angelillo M, Di Maio G, Costa G, Angelillo N and Barillari U (2009): Prevalence of occupational voice disorders in teachers. *J Prev Med Hyg*; 50(1):26-32.
3. American Speech and Hearing Association (ASHA) (1993): Definitions of communication disorders and variations. Ad Hoc Committee on Service Delivery in the Schools. <http://www.asha.org/policy>. Accessed on June, 20th, 2013.
4. Behlau M, Zambon F, Guerrieri A, and Roy N (2012): Epidemiology of Voice Disorders in Teachers and Non teachers in Brazil: Prevalence and Adverse Effects *Journal of Voice*; 26(5):9-18.
5. Chen S, Chiang S, Chung Y, Hsiao L and Hsiao T (2010): Risk factors and effects of voice problems for teachers. *Journal of Voice*; 24(2):183–190.
6. Chong E and Chan A (2010): Subjective health complaints of teachers from primary and secondary schools in Hong Kong. *International Journal of Occupational Safety and Ergonomics*; 16(1):23–39.
7. Da Costa V, Prada E, Roberts A and Cohen S (2010): Voice disorders in primary school teachers and barriers to care. *Journal of Voice*; 26(1):69–76.
8. De Medeiros AM, Barreto SM and Assunção AA (2008): Voice disorders (dysphonia) in public school female teachers working in Belo Horizonte: prevalence and associated factors. *J Voice*; 22(6):676-687.
9. Hamdan AL, Sibai AM, Srouf ZM, Sabra OA, Deeb RA (2007): Voice disorders in teachers. The role of family physicians. *Saudi Med J*; 28:422–428.

10. Herrington-Hall BL, Lee L, Stemple JC, Niemi KR and McHone MM (1988): Description of laryngeal pathologies by age, sex, and occupation in a treatment-seeking sample. *J Speech Hear Disord*; 53:57–64.
11. Kooijman P, De Jong F, Thomas G, Huinck W, Donders R, and Graamans K (2006): Risk factors for voice problems in teachers. *Folia Phoniatica et Logopædica*; 58(3):159–174.
12. Niebudek-Bogusez E and Sliwinski-Kowalska M (2006): Applicability of voice acoustic analysis with vocal loading test in diagnostics of occupational voice diseases. *Med Pracy*; 57(6):497–506.
13. Mattiske JA, Oates JM, Greenwood KM (1998): Vocal problems among teachers: a review of prevalence, causes, prevention, and treatment. *J Voice*; 12(4):489–499.
14. Punnett B, Greenidge D, Ramsey J (2007): Job attitudes and absenteeism: A study in the English speaking Caribbean. *Journal of World Business*; 42:214–227.
15. Rameck MF and Ferreria LP (1999): Aerobics instructors: vocal profile and vocal behavior. Presentation at PEVOC. Occupational voice problems. Utrecht, The Netherlands.
16. Roy N, Merrill RM, Thibeault S, Gray SD, Smith EM (2004): Voice disorders in teachers and the general population: effects on work performance, attendance, and future career choices. *J Speech Lang Hear Res*; 47(3):542–551.
17. Roy N (2003): Functional dysphonia. *Curr Opin Otolaryngol Head Neck Surg*; 11:144–148.
18. Sala E, Laine A, Simberg S, Pentti J, and Suonpaa J (2001): The prevalence of voice disorders among day care center teachers compared with nurses: A questionnaire and clinical study. *Journal of Voice*; 15(3):413–423.
19. Sapir S, Attias J and Shahar A (1992): Vocal attrition related to idiosyncratic dysphonia: Re-analysis of survey data. *European Journal of disorders of communication*; 27:129–135.
20. Sataloff RT and Abaza MM (2000): Impairment, disability, and other medical/legal aspects of dysphonia. *Otolaryngol Clin North Am*; 33(5):1143–1152.
21. Sliwinska-Kowalska M, Niebudek-Bogusz E, Fiszer M, Los-Spychalska T, Kotylo P, and Szurowska-Przygocka B (2006): The prevalence and risk factors for occupational voice disorders in teachers. *Folia Phoniatica et Logopaedica*; 58(2):85–101.
22. Smith E, Lemke J, Taylor M, Kirchner HL and Hoffman H (1998): Frequency of voice problems among teachers and other occupations. *J Voice*; 12(4):480–488.
23. Smith E, Gray S, Dove H, Kirchner L and Heras H (1997): Frequency and effects of teachers' voice problems. *J Voice*; 11(1):81–87.
24. Smolander S, and Huttunen K (2006): Voice problems experienced by Finnish comprehensive school teachers and realization of occupational health care. *Logoped Phoniatr Vocol*; 31(4):166–171.
25. Thibeault S, Merrill R, Roy N, Gray S, and Smith E (2004): Occupational risk factors associated with voice disorders among teachers. *Annals of Epidemiology*; 14(10):786–792.
26. Thomas G, Kooijman P, Cremers C and De Jong F (2006): A comparative study of voice complaints and risk factors for voice complaints in female student teachers and practicing teachers early in their career. *European Archives of Oto-Rhino-Laryngology*; 263(4):370–380.
27. Van Houtte E, Claeys S, Wuyts F, and Van Lierde K (2010): The impact of voice disorders among teachers: vocal complaints, treatment-seeking behavior, knowledge of vocal care, and voice-related absenteeism. *J Voice*; 25(5):570–575.
28. Verdolini K and Ramig LO (2001): Review: occupational risks for voice problems. *Logoped Phoniatr Vocol*; 26:37–46.

29. Vilkmán E (2004): Occupational safety and health aspects of voice and speech professions. *Folia Phoniatrica et Logopedica*; 56(4):220–253.
30. Williams N (2003): Occupational groups at risk of voice disorders: A review of the literature. *Occupational Medicine (London)*; 53(7):456–460.