



Epidemiology of Voice Disorders Among Government School Teachers - An Analytical Cross-Sectional Study from Kanchipuram District

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ABSTRACT

Background: Voice disorders cause undesirable effects on school teachers such as reducing their quality of life, decrease in work performance affecting the quality of education, job absenteeism, and reduced social activities as well.

Methodology: Voice disorder among teachers was assessed through the "Voice handicap Index", which was developed by Jacobson et al in 1997 to self-assess the severity of voice disorder in dysphonia patients

Results: The overall prevalence of voice disorder among government school teachers was found to be 46.5% with a 95% confidence interval from 41.5% to 51.5%. Using Backward Wald, the binary logistic regression analysis showed that female teachers (AOR 1.6, $p < 0.01^*$), teaching experience less than 10 years (AOR 2.4, $p < 0.01^*$), and teaching hours more than 21 hours per week (AOR 6.7, $p < 0.01^*$) had a significant association with voice disorders.

Conclusion: The prevalence of voice disorder was found to be high since teachers are professional voice users. The study also recommends that teachers must receive the required health education on the ergonomic risk factors that they will come into contact with in their daily lives as part of their jobs.

Keywords: School teachers, Voice disorders, Prevalence, Dysphonia, Risk factors

INTRODUCTION

With different types of employment, there is always some sort of occupational danger. The teaching field is not unique in this regard. Teachers have often been crucial to society's transformation. Their welfare is always of utmost importance in this societal change. The basic role of teachers as well as their well-being are widely ignored. The teachers were often referred to as occupational voice users as the usage of voice is predominant for the job performance itself. Their income depends upon their voice endurance. All teaching professionals required a functional

voice to provide effective teaching for the students and also to maintain strict discipline in the classroom.¹ Also, they require distinctive communicative abilities to get the student's constant attention. Therefore, the demand for voice is increasing making them more emphatic and louder throughout the day in their job resulting in severe forms of voice disorder. Along with that, extra voice loads were also placed over them during their non-occupational voice use (e.g., rearing their kids at their home) after their school and during weekends.² Because of their heavy voice loading their workability is constantly threatened by these voice disorders. Voice disorders

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cause undesirable effects on school teachers such as reducing their quality of life, decrease in work performance affecting the quality of education, job absenteeism, and reduced social activities as well.^{3,4}

Voice disorders are due to the excessive misuse of voice such as speaking with excess loudness against high background noise, a frequent changeover from low to a high pitch, and speaking with excessive muscular tension. An individual is considered to have a healthy voice when they are capable of producing their voice with ease thereby meeting his/her personal, professional, and social expectations and when it is affected, it leads to voice disorders.⁵ In simple terms, voice disorders are a group of problems characterized by absence of voice (Aphonia), abnormality in quality of voice (hoarseness), low pitch or too high pitch, greater than usual loudness or softness, impaired nasal resonance, inadequacy in voice support to produce intelligible speech⁶. It refers to any form of change in voice concerning the usage of voice during professional activity affecting both communication and performance of the working individual either with or without a change in the larynx.⁷ The most common symptoms of work-related voice disorder are dry mouth, throat ache, fatigue and hoarseness in the voice, break in the voice, a tremor in the voice, weakness in the voice, and sometimes loss of voice. These symptoms usually appear insidiously. Voice disorder in the teaching profession arises after an average of 14 years of work. However other factors such as emotional stress, environmental factors, and organizational factors may promote the early changes in the voice.⁸ These symptoms usually persist until the end of that working day or at the end of that working week. But relieved after taking the rest over nightly or at the end of the week. But gradually, these symptoms tend to occur more vigorously and continuously throughout the entire day or entire working hours without relieving even after taking the rest. This stage is said to be the stage of severe dysphonia where the worker loses his/her vocal efficiency.^{7,9}

Government school teachers work under more demanding conditions than their counterparts in private schools, including more classes per day, larger class sizes, continuous classes without proper breaks, managing several subjects, and a shortage of teaching resources. The government school teachers in need of responding to these demands or lack of knowledge, and fear of losing his/her job sometimes force them to continue to work with these symptoms until his/her condition deteriorates.⁷ Many studies show the prevalence of voice disorders among school teachers ranges between 11% to 81%.¹⁰⁻¹⁶ Wider variation in the prevalence is attributed to the difference in selecting the study population, the methodology they used, and the variation in the operational definition. However, the high prevalence indicates that teachers do not receive any formal training exercises regarding their proper usage of voice. Previous studies reported the risk factors for voice disorder

were female sex, duration of employment, and maximum hours of teaching. But there is less evidence of the other factors such as handling more than one subject and inadequate breaks in between the classes. Therefore, more insight is needed regarding the risk factors contributing to voice disorders among school teachers. In this study estimating the prevalence of voice disorder in the local population and the risk factors associated with them may help in the proper planning to prevent and manage this occupational hazard. In our study, we are concentrating on the prevalence of voice disorders and the risk factors associated with it using a questionnaire survey.

METHODOLOGY

This cross-sectional study was carried out among government school teachers in Kundrathur block, Kancheepuram district. The study took almost two years to complete, starting with the planning phase. Teachers above the age of 20, including both sexes, and teachers who provided informed consent were the inclusion criterion. There were no exclusion criteria. Data was gathered from October to November 2019 over two months.

Sample size: Based on the intense review of the literature, the prevalence of voice disorders was found to be 37.5%.⁵ Taking it as prevalence, with a limit of accuracy as 5% and with a Z value of 1.96, the sample size calculated was 360. About 10% of the sample size of 18 was added to take care of any refusal to participate in the study and the total minimum sample size arrived for the study was 378. All the government school teachers working in Kundrathur block, who met the criteria and gave informed consent were included in this study.

Study tool: The study tool consists of a questionnaire for obtaining information on sociodemographic and teaching-related characteristics. Voice disorder among teachers was assessed through the "Voice handicap Index", which was developed by Jacobson et al in 1997 to self-assess the severity of voice disorder in dysphonia patients.¹⁷ VHI consist of 30 questions, grouped into three domains functional, emotional, and physical. The functional subscale is to assess the impact of a voice disorder on his/her daily activities. The emotional subscale is to evaluate the person's affective responses to a voice disorder. The physical subscale measures the self-perception of vocal discomfort and voice outcome characteristics (high-pitch or low-pitch voice), each subscale has 10 questions, and each question can be scored from zero (never) to 4 (always). The score was expressed in terms of sub-score (for each subscale, ranges from 0 to 40) and the total score (ranges from 0 to 120). The higher the score, the more severe the patient's perception of voice disorder.¹⁷ VHI was already tested for internal consistency, test-retest reliability, and construct validity during its construction. It was designed to encounter all types of voice disorders in-

cluding tracheoesophageal speakers. Tamil version of VHI was available and permission for using the study tool was duly obtained.

Data collection process: A total of 488 participants were invited to the study. Out of 488 participants, 88 did not give informed consent due to time constrain and other concerns about the study. Hence 400 were included in the study. The day before data collection, the head teachers of the particular school were contacted by phone about the visit and briefed about the importance and usefulness of the study. On the day of data collection, each teacher was contacted in person and a written consent form was given. After informing the details of the study, the teachers were requested to sign the consent form, only if they are willing voluntarily to participate in the study. After getting the signed written consent forms, the questionnaires were administered and data was collected. Each day, around 10 to 12 teachers from a particular school were contacted in person for collecting the data. Teachers who took leave on the day of data collection were contacted again a week later. After the completion of questionnaires by each teacher, health education on the management and prevention of voice disorders was given.

Ethics: Ethical clearance was obtained from the Institutional Ethics Committee of Sri Ramachandra Medical College and Research Institute (SRIHER) [CSP-MED/19/JUN/53/63]. Permission to do the study was also obtained from Chief Education Officer, Kancheepuram District, Tamilnadu for conducting Interviews in Government Schools.

Data compilation and statistical analysis: Data compilation and analysis were done using the statistical package for social sciences (SPSS) version 16 software. Descriptive statistics were calculated for background variables and the various risk factors. Prevalence and 95% confidence intervals were calculated. The odds ratio was calculated for finding the association and the Chi-square test was done for the test of statistical significance. Statistical significance was set at a two-sided p-value <0.05. Binomial logistic regression was done using the backward Wald method with the prevalence of voice disorder as a dependent variable and adjusted odds ratios (AOR) were calculated to account for the impact of possible confounders.

RESULTS

This current cross-sectional study included 400 teachers from government schools in the Kundrathur block. The mean age of the school teachers was 45.7 years (SD \pm 7.5 years). The percentage of male teachers was 21.3% (85) and females were 79.7% (315). Most of the teachers 74.8% (299) were postgraduate and almost all of them are married 91.5% (366). Among the teachers, 2.8% (11) were currently smoking and only a handful of them was consuming alcohol 4.8% (19). Most of the teachers 40.5% (162) had 10 to 19 years of teaching experience with an overall

mean of 17.88 years (SD \pm 8.08 years). The maximum number of teachers 66.5% (266) reported the average number of students per class was more than 40, and several teachers 24% (96) were handling more than 1 subject. 90.2% (361) of school teachers disclosed 21 to 30 hours of teaching per week. About half of the teachers 51% (204) were involved in continuous teaching for less than 45minutes. A greater percentage of teachers 53% (212) had a shorter duration of 5 to 10 minutes break in between the classes. The Background, personal details, and teaching-related characteristics of the participants were given in Table no.1

Table 1: Background characteristics, personal details and teaching related characteristics of the participants

Characteristics	Participants (%)
Age in years	
21-30	18 (4.5)
31-40	86 (21.5)
41-50	184 (46)
51-60	112 (28)
Sex	
Male	85 (21.3)
Female	315 (79.7)
Education	
Undergraduate	
Postgraduate	
Marital status	
Single	32 (8)
Married	366 (91.5)
Divorced	1 (0.3)
Widowed	1 (0.3)
Current smoker	
Yes	11 (2.8)
No	389 (97.2)
Alcohol consumption	
Yes	19 (4.8)
No	381 (95.2)
Teaching experience (years)	
1-9 years	66 (16.5)
10 - 19 years	162 (40.5)
20 - 29 years	129 (32.2)
>30 years	43 (10.8)
Average students per class	
\leq 40 students	134 (33.5)
>40 students	266 (66.5)
No. of subjects teaching	
1 subject	304 (76)
>1 subject	96 (24)
Hours of teaching per week	
\leq 20 hours	36 (9)
21-30 hours	361 (90.2)
>30 hours	3 (0.8)
Hours of continuous teaching	
\leq 45min	204 (51)
>45min	196 (49)
Breaks between classes	
<5min	173 (43.2)
5- 10min	212 (53)
>10 min	15 (3.8)

Table 2: Prevalence of Voice disorder as per sex and age group

Variables	Participants (%)	95% CI	P Value
Sex			
Male	17 (20)	12.1-30.0	0.01*
Female	169 (53.6)	47.9-59.2	
Age group			
21 – 30 yrs	11 (61.1)	35.7 – 82.7	0.06
31 – 40 yrs	44 (51.1)	40.1 – 62.1	
41 – 50 yrs	90 (48.9)	41.4 – 56.3	
>51 years	41 (36.6)	27.7 – 46.2	

*Statistically significant values

The overall prevalence of voice disorder was found

to be 46.5% with a 95% confidence interval from 41.5% to 51.5%. Among the study participants, the prevalence of moderate voice disorder was 42% with a 95% confidence interval from 37% to 47% and the prevalence of severe voice disorder was 4.5% with a 95% confidence interval from 2.6% to 7%. The prevalence of Voice disorder was greater in Females (53.6%) when compared to the males and this difference was found to be statistically significant ($p < 0.05$). The prevalence of Voice disorder was greater in the age group of 21 – 30 years (61.1%) when compared to other age groups and the difference in prevalence was not statistically significant. The details were given in Table no.2.

Table 3: Association between Various risk factors and voice disorders

Particulars	Voice disorder		Odds ratio	95% CI	P value for χ^2
	Present (%)	Absent (%)			
Age					
≤50 years	145(50.3)	143(49.7)	1.7	1.1-2.7	<0.01*
>50 years	41(36.6)	71(63.4)			
Sex					
Female	169(53.7)	146(46.3)	4.6	2.6-8.2	<0.01*
Male	17(20)	68(80)			
Educational status					
Postgraduate	54(53.5)	47(46.5)	1.4	0.9-2.2	0.10
Undergraduate	132(44.1)	167(55.9)			
Currently smoking					
Yes	2(18.2)	9(81.8)	0.2	0.05-1.2	0.06
No	184(47.3)	205(52.7)			
Consuming alcohol					
Yes	5(26.3)	14(73.7)	0.3	0.13 - 1.1	0.07
No	181(47.5)	200(52.5)			
Number of years of teaching					
≤10years	51(56)	40(44)	1.6	1.02-2.6	0.03*
>10years	135(43.7)	174(56.3)			
Teaching hours per week					
>21hours	169(66)	87(34)	14.5	8.2-25.6	<0.01*
≤21hours	17(11.8)	127(88.2)			
Number of subjects being taught					
>1 subject	57(59.4)	39(40.6)	1.9	1.2-3.1	<0.01*
1 subject	129(42.4)	175(57.6)			
Number of students in each class					
>40	126(47.3)	140(52.7)	1.1	0.7-1.6	0.62
≤40	60(44.8)	74(55.2)			
Continuous teaching					
>45min	132(67.3)	64(32.7)	5.7	3.7-8.8	<0.01*
≤45min	54(26.5)	150(73.5)			
Breaks between the class					
<5min	107(61.8)	66(38.2)	3.0	2.0-4.5	<0.01*
≥5min	79(34.8)	148(65.2)			

*Statistically significant values

The univariate analyses of associations between voice disorders and various risk factors were shown in table no.3. Those who are aged 50 and less than that had a higher risk of developing voice disorder by 1.7 times. Female teachers had an increased risk of developing voice disorder compared with male teachers (OR = 4.6, 95% CI: 2.6 – 8.2). Teachers with teaching experience of fewer than 10 years had an increased risk of developing voice disorder by 1.6 times compared with the teachers who had teaching

experience of more than 10 years. Teachers who had teaching hours more than 21 hours per week had a 14.5 times risk of developing voice disorder compared with those teaching less than 21 hours. Teachers handling more than one subject were found to have a 1.9 times risk of voice disorder. Among the participants, who are being continuously taught for more than 45 minutes had an increased risk of developing voice disorder by 5.7 times. Teachers who took breaks less than 5 minutes in between classes

were found to have 3 times the risk of developing voice disorder compared to those who took breaks more than that.

Only variables with $p \leq 0.05$ in the univariate analyses were included in the logistic regression model. Using Backward Wald, the logistic regression model showed that female teachers (AOR 1.6, $p < 0.01^*$), teaching experience less than 10 years (AOR 2.4, $p < 0.01^*$), and teaching hours more than 21 hours per week (AOR 6.7, $p < 0.01^*$) had a significant association with voice disorders. Those who are continuously teaching for more than 45 minutes had an increased risk of developing voice disorders (AOR 3.8, $p < 0.01^*$). The teachers with a duration of break less than 5 minutes had an increased risk of developing voice disorder (AOR 3.8, $p < 0.01^*$). The details were given in table no.5

Table 4: Adjusted odd ratios (AOR) of risk factors for voice disorder

Variable*	AOR	95% CI	P Value [^]
Age			
≤50 years	1.6	0.9-2.9	0.09
>50 years	Ref		
Sex			
Female	4.6	2.3-9.2	<0.01*
Male	Ref		
Number of years of teaching			
≤10years	2.4	1.2-4.6	<0.01*
>10years	Ref		
Teaching hours per week			
>21hours	6.7	3.4-13.3	<0.01*
≤21hours	Ref		
Number of subjects being taught			
>1 subject	0.6	0.3-1.2	0.21
1 subject	Ref		
Continuous teaching			
>45min	3.8	2.0-7.3	<0.01*
≤45min	Ref		
Breaks between the class			
<5min	3.8	2.1-6.7	<0.01*
>5min	Ref		

[^]Binary logistic regression analysis (Backward Wald)
Ref= Reference group

DISCUSSION

In this study, the overall prevalence of voice disorder was found to be 46.5% (95% CI: 41.5% to 51.5%). A study was conducted in Kerala to estimate the prevalence of voice disorder among the teacher's community where the prevalence was found to be 45.4% which was almost similar to our study.¹⁸ In another Indian study, done by Boominathan et al, the prevalence of voice disorders among teachers was found to be 49%, which is also in concordance with our study.¹⁹ In our study, the prevalence of voice disorder among teachers was found to be high because in general, teachers have to use their voice consistently over a longer period with varying intensity.

In this study, 42% of teachers were found to have

moderate voice disorder and 4.5% were affected by severe voice disorder. A study conducted by Lee et al among Hong Kong school teachers reported 43.4% were affected by moderate voice disorder and 12.1% had severe voice disorder which was similar to our study.²⁰ On assessing the association between voice disorder and the age of teachers, those who are aged less than 50 years had a higher risk of developing voice disorder by 1.75 times when compared to those aged more than 50 years with a statistically significant p-value ($p < 0.05$). similar to our finding, the study conducted by Moy et al on Malaysian school teachers also found out teachers aged between 40 to 49 years had a high risk of developing voice disorder by 1.2 times when compared to those aged 50 years or older.²¹ The study conducted among Bela Horizonte teachers, Brazil showed that teachers aged between 40 to 49 years were 1.08 times higher risk of developing voice disorder when compared with teachers aged 50 years or more.¹⁴ This is due to the fact, older teachers tend to use their voice softly and consistently when compared with younger teachers while teaching students.

On assessing the sex and risk of voice disorder, female teachers were at 4.6 times the high risk of developing voice disorder. Similar to our study, the New Zealand study also showed female teachers were at 1.85 times the risk of developing voice disorder compared to male teachers.²² The study conducted by Marçal CCB et al showed female teachers had an increased risk of developing voice disorder when compared with the males with a statistically significant p-value ($p < 0.05$).²³ Female teachers were found to be at higher risk of voice disorder because of the existing anatomical and physiological differences between males and females and also due to some sociocultural factors, making them more prone to a voice disorder.²⁴

The current study identified those with teaching experience of fewer than 10 years had an increased risk of developing voice disorder by 1.6 times than those who had teaching experience of more than 10 years. The study conducted in Bela Horizonte school teachers also showed teachers with teaching experience of 15 to 19 years were 1.66 times at risk of developing voice disorder compared to those who had teaching experience of more than 20 years which was closer to our study.¹⁴ A study conducted in Italy comparing vocal cord findings using laryngostroboscopy with years of teaching experience, it was found that teachers with less teaching experience had more vocal cord abnormalities, but it was statistically not significant.²⁵ Teachers with more teaching experience develop certain compensatory behaviour to maintain their vocal hygiene throughout their carrier, decreasing their susceptibility to voice disorder than those who had less teaching experience

In this study, it was found teachers who had teaching hours more than 21 hours per week had a 14.5 times risk of developing voice disorder than those who teach less than that with a statistically significant p-

value ($p < 0.05$). Ceballos, A.G.C et al reported teachers with teaching hours more than 20 hours per week were at 1.66 times the high risk of developing voice disorder and the results were found to be statistically significant.²⁶ Because of weeklong working hours, teachers were continuously exposed to vocal strain making the teachers more prone to a voice disorder. In our study, it was found teachers who are handling more than one subject were found to be at high risk of developing voice disorder by 1.9 times with a statistically significant p-value ($p < 0.05$). Alva et al conducted a study among Mangalore teachers and reported teachers handling multiple subjects had more voice disorders, but the finding was not statistically significant²⁷

In this study, it was found teachers who are being indulged in continuously teaching for more than 45 minutes were found to be at high risk of developing voice disorder by 5.7 times with a statistically significant p-value ($p < 0.05$). On assessing the duration of breaks and risk of Voice disorder, teachers who took breaks less than 5 minutes in between the classes were found to be 3 times more at risk of developing voice disorder. Korn et al reported, teachers with more duration of continuous teaching and fewer minutes of the break had the risk of voice disorder, but the findings were not statistically significant.²⁸ Teachers with a lesser duration of break decreases their chance for the proper hydration of their vocal cord, leading to dry throat and voice tiredness, provoking their susceptibility to voice disorder. The present study did not find any significant association between voice disorder and teacher smoking status, alcohol consumption and their educational status which are inconsistent with other studies.^{14,29}

CONCLUSION

The prevalence of voice disorder was found to be high since teachers are professional voice users. In this present study, the risk factor associated with voice disorder was found to be the teacher's age, sex, teaching experience, hours of teaching, number of subjects being taught, and continuous classes without break. Their Job merely depends on the usage of their voice for a longer duration with often some changes in the intensity to reach everybody in the classroom and also against the high background noise. This causes considerable changes in their voice by inducing voice strain that may recover by giving proper voice rest and other voice hygiene practices such as frequent hydration, maintenance of consistent voice without variation in intensity, and avoiding smoking

The results of this study will help school administrators and policymakers better understand this occupational hazard that teachers experience in the workplace and will encourage them to take the necessary precautions to prevent it. The study also recommends that teachers must also receive the required health education on the ergonomic risk fac-

tors that they will come into contact with in their daily lives as part of their jobs.

LIMITATION

This analytical study has a few limitations. Due to a lack of authorization, this survey does not include government primary and middle school teachers. Hence generalizing the result to the overall government school teachers is the issue.

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