

Study of Risk Factors for Development of Voice Disorders and its Impact on the Quality of Life of School Teachers in Mangalore, India

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ABSTRACT

Introduction: School teachers are most prone to the development and detrimental effects of voice disorders as a consequence of their work. The risk factors for development of dysphonia in teachers are multifactorial.

Aim: The primary aim of our study was to investigate the various risk factors that influence the onset and progression of voice disorders in school teachers in the Indian context. We wanted to assess the effect of voice problems on the physical, psychosocial and functional aspect of a teacher's life.

Materials and Methods: It was a cross-sectional study conducted across three English medium institutions. A total of 105 teachers consented to participate in the study and they had to answer a semi-structured, pre-tested questionnaire, which included demographic details, living habits (drug intake, smoking and alcohol intake) health condition [any Deviated Nasal Septum (DNS), Gastroesophageal Reflux Disease (GERD), stress, etc., or any history of surgery], teaching characteristics, voice symptoms and physical discomforts and quality of life assessment. The completed questionnaires were collected and analyzed based on the responses obtained.

Results: It was found that 81% of the study population had voice problems at some point of their career. A total of 26% of them fell into the voice disorder category. The association of upper respiratory infections DNS and GERD with voice disorders was found to be statistically significant. We also found that a significant number of teachers with voice disorders had changed their teaching styles and were planning to opt for an early retirement. Most importantly, it was also seen that teachers with voice disorders were more likely to have a poorer quality of life as compared to those without a voice disorder ($p < 0.001$).

Conclusion: Voice disorders had a significant bearing on all the spheres of a school teacher's life. The affected teachers were more likely to take sick leaves, change overall job opinions, retire early, reduce overall communications, repeat statements and avoid talking to people in person as well as over the telephone. It reduced their overall social abilities and made them avoid social activities. They got easily upset and were dissatisfied with their job performance. All these in turn deteriorate the quality of life in these individuals.

Keywords: Occupational voice disorder, Preventive voice care, Voice problems

INTRODUCTION

Teachers are the backbone of any civilized society as they are the keepers of knowledge, wisdom and values. In a country as large as ours and a population as vast, diverse and illiterate as ours, teachers are often the only source of learning available to a child. Lack of infrastructure, manpower and resources mean that the voice is the most important and sometimes, the only tool a teacher in India has.

It is a fact that teachers are confronted with one of the highest demands of any professional group to use their voice at work and are considered to be professional voice users [1,2]. School teachers are most prone to the development and detrimental effects of voice disorders as a consequence of their work [3-5]. According to American data, at least one in three teachers claims that teaching has a detrimental effect on their voice, and sometimes even forces them to change their profession [6]. The risk factors for development of dysphonia in teachers is multifactorial; in the Indian context, it could be due to prolonged use of voice, long teaching hours, dust and noise pollution, lack of acoustic amplification, stressful environment, or excessive consumption of spicy food, coffee, tobacco and carbonated drinks [5,7,8]. On an average, a full time school teacher is likely to take 30 classes per week, the duration of each class being 40 minutes [9].

Our voice is an extremely sensitive indicator of our general health and emotional status [2]. Voice disorders are deviations in terms of quality, pitch, loudness or flexibility in voice from the voices of others of similar age, sex and cultural groups [10] and disorders of voice have been suggested to contribute to psychological symptoms

such as stress, depression and anxiety [11]. It also exerts its negative impact on teaching performance, communication and emotion which in turn results in lesser quality of teaching and increased absenteeism [10]. Voice disorders, hence not only affect the personal and professional life of the teacher but also contribute to financial burden for the society as a whole [12].

Quality of life measurement is one way to assess the overall outcome of the physical, mental and social well being of a patient after a health related problem like a voice disorder. Currently, there is no quality of life assessment tool for voice disorders in India [7]. This study is unique in itself as our questionnaire was designed to elicit risk factors in the causation of voice disorders amongst teachers in India. It was also designed to assess the impact of voice disorder on the quality of life of school teachers taking into consideration their physical, social and emotional dimensions. In a country where there are millions of school teachers, there is unfortunately a dearth of information on this aspect.

The objectives of this study were to; 1) to investigate the various risk factors that influence the onset and progression of voice disorders in school teachers; 2) to assess the effect of voice problems on the physical, psychosocial and functional aspect of a teacher's life; and 3) to identify avoidable risk factors and hence, formulate measures to prevent voice disorders in teachers.

MATERIALS AND METHODS

It was a cross-sectional study conducted over a period of two months. Institutional Ethics Committee approval was obtained and

permission from the school's principals was obtained. The teachers in this study were primary and secondary school teachers from three English medium schools in the city of Mangalore, Karnataka, India. They taught subjects like mathematics, languages, drama, commerce etc., and included sports and music teachers as well. Some teachers taught multiple subjects. Only teachers who had more than six months of teaching experience were included in the study. A total of 105 teachers from across the three schools consented to participate in the study. The sample size of the study was obtained by using the formula,

$$n = \frac{Z_{\alpha}^2 pq}{E^2}$$

Where: n= Sample size

p= Proportion of individuals having voice disorder in previously studied population.

q=100-p

E=Allowable error

$$n = \frac{(1.96)^2 \times 50.4 \times 49.6}{\left\{ \frac{50.4 \times 20}{100} \right\}^2}$$

n= 95 with 10% default

Hence, n= 105 (with 95% confidence level, 80% power and with reference range of 50.4) [13]. The study was conducted in two months starting from first July to 31st August, 2012.

The teachers were informed about the study and all the 105 teachers who consented to participate signed a written informed consent. A semistructured pretested questionnaire [7,13] was given to them which included demographic details, living habits (drug intake, smoking and alcohol intake) health condition (any DNS, GERD, stress, etc., or any history of surgery), teaching characteristics, voice symptoms and physical discomforts, and quality of life assessment which included questions on the physical, emotional and functional domains. The completed questionnaires were collected and analyzed based on the responses obtained.

Based on the frequency of voice problems, the subjects were divided into two groups; a four point response was used to score the question where never=0, sometimes=1, often=2 and always=3. Subjects with a score equal to or more than '2' were placed in the voice disorder group and the others were placed in a non voice disorder group. The various risk factors were analyzed. In addition to this, their health seeking behaviour was also assessed. Finally, the effects of voice problems on their daily life and their perceptions about it were analyzed and compared to that of the subjects in the non voice disorder category.

STATISTICAL ANALYSIS

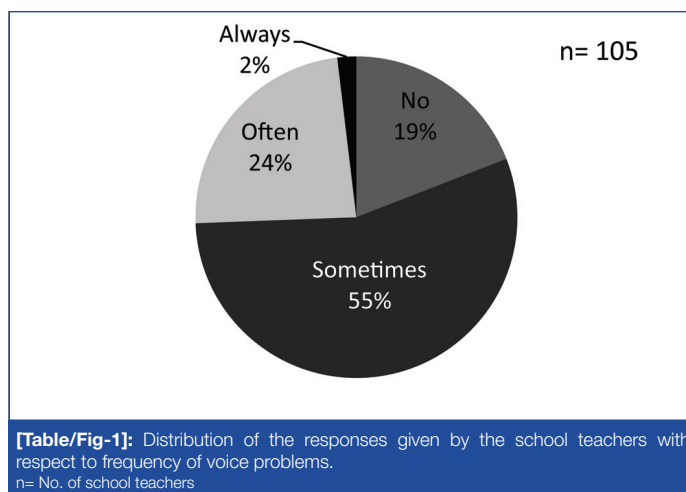
Data analysis was done by using Chi-square test. A statistical package SPSS version 17.0 was also used to do the same. The p-value<0.05 was considered significant.

RESULTS

Out of the study population comprising of 105 school teachers, the total proportion of teachers who experienced voice disorders was found to be 81% [Table/Fig-1].

Teachers who had no voice problems (19%) and those who experienced it sometimes (55%) were allotted the 'Non-voice Disorder Group' (NVD Group) whereas teachers who experienced voice problems either often (24%) or always (2%) were included in the 'Voice Disorder Group' (VD Group). Therefore 74% of the population fit into the NVD Group and 26% of the population in the VD group.

After thorough analysis of data and meticulous comparison and correlation of various parameters in the two groups for risk factors for voice disorders and its impact on the quality of life, the following observations were made.



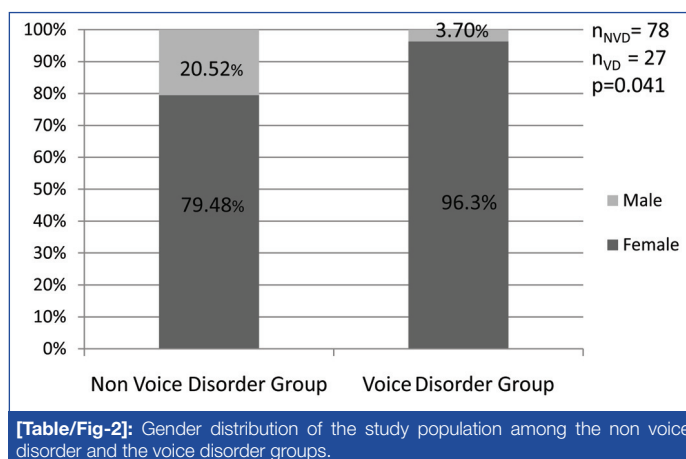
[Table/Fig-1]: Distribution of the responses given by the school teachers with respect to frequency of voice problems.
n= No. of school teachers

Demographic Details: Females dominated our study: 88 females and 17 males; the subjects in the VD group were mostly women. This was found to be statistically significant ($p=0.041$). Demographically, the mean age in the VD Group was found to be 39.05 and 34.3 in the NVD Group with a non-significant p-value of 0.224 [Table/Fig-2].

No significant difference was found between the two groups in terms of caffeine consumption ($p=0.582$), drug intake ($p=0.656$) and alcohol consumption ($p=0.567$). There were no smokers in either of the groups [Table/Fig-2].

Health Condition: Three common medical conditions encountered in day to day life were found to be significant- Upper respiratory tract infection ($p=0.004$), DNS ($p=0.021$) and GERD ($p=0.002$).

GERD was the most common medical condition reported among the individuals of the VD Group. When taking into consideration the entire study population, 12.4% of the subjects suffered from GERD out of which 61.5% were individuals in the VD Group and 38.5% belonged to the NVD Group. Stress and anxiety were the



[Table/Fig-2]: Gender distribution of the study population among the non voice disorder and the voice disorder groups.

next most common medical conditions in the VD group which, however, was not statistically significant ($p=0.461$; $p=0.947$ respectively).

Teaching Characteristics: The effect of years of teaching on voice disorders was not found to be significant ($p=0.117$). The majority of the individuals in the VD Group (40.74%) had taught for less than five years. There was no significant correlation between the grades taught and voice disorders ($p=0.870$). The number of subjects taught was not found to be significant. Loudness of voice was not found to be significantly associated with voice disorders ($p=0.095$). However, it was statistically significant ($p<0.001$) that a substantial number of teachers in the VD Group, 48.14%, used microphones in the classroom as opposed to 7.7% in the NVD Group [Table/Fig-3].

Symptomatology: A total of 81 of the 105 teachers experienced

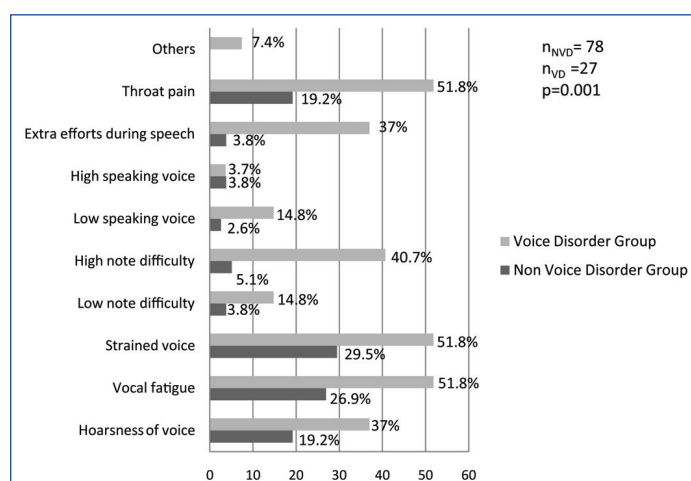
vocal symptoms constituting 77.14% of the total study population [Table/Fig-4]. The predominant symptoms in the VD Group were throat pain, strained voice and vocal fatigue (51.8% each) followed by high note difficulty (40.7%), extra efforts during speech (37%) and chest pain (7.4%). In the NVD Group, the most common symptoms were strained voice (30.8%) followed by vocal fatigue (26.9%). Subjects in the VD Group were reported to have a higher occurrence of vocal symptoms such as vocal fatigue ($p=0.018$), strained voice ($p=0.036$), low note difficulty ($p=0.049$), low speaking voice ($p=0.018$), chest pain (0.015), high note difficulty and extra efforts during phonation ($p<0.001$ for each) in comparison to individuals in the NVD Group. In women, the most predominant vocal symptom was vocal fatigue (37.5%) and strained voice among the men (18.5%).

Physical Discomfort: In the VD Group, dryness and strain were the two major discomforts experienced by the individuals (59.25% each). Up to 42.3% of the NVD Group experienced dryness of throat. Teachers in the VD Group were found to strain their voices more than their counterparts.

Health Seeking Behaviour: We found that 82% of the teachers

	VD Group	NVD Group	p
Characteristics	%	%	
Teaching experience			0.117
≤5	32.4	67.6	
6-10	22.2	77.8	
11-15	33.3	66.7	
16-20	41.7	58.3	
>21	7.7	92.3	
Grade taught			0.870
1-4	16.7	83.3	
5-7	30	70	
8-10	28.6	71.4	
11-12	27.3	72.7	
Multiple subjects	25.7	74.3	
Loud voice	44.4	23.07	0.095
Use of amplification	48.14	7.7	<0.001

[Table/Fig-3]: Teaching characteristics of the VD Group and NVD Group.



[Table/Fig-4]: Comparison of vocal symptoms in the voice disorder and non voice disorder groups.

did not seek professional help when they experienced voice disorders. However teachers in the VD Group (14.8%) who sought professional help outnumbered the teachers in the NVD Group (3.8%) ($p=0.02$).

The most common reason for not seeing professional help in the VD Group was use of traditional remedies (63%) followed by self resolution (48.1%) and due to busy schedule at work (44.4%). In

the NVD Group, 46.1% of the teachers did not approach a medical consultant in the hope of self resolution as well as traditional remedies and busy schedules.

Impact of Voice Problems: Of the teachers with voice disorders, 66.6% changed their teaching methods in comparison to 22% of those without. This was strongly significant ($p<0.001$). Teachers in the VD Group were also found to take more days of leave ($p=0.003$).

Of the teachers with voice disorders, 14.8% had a change of opinion on the teaching profession. The common agreement was to change their current job and to retire early (7.4% each). In the NVD group, the most common view was the increased pressure at their job. Nearly, 26% of the teachers in the VD Group avoided conversations as opposed to 3.7% of the NVD Group. Overall, it was found that teachers with voice disorders had problems in communication as compared to their counterparts in the other group ($p<0.001$). They were found to have higher chances of repeating their statements ($p=0.001$), avoiding conversations ($p=0.001$) and reducing the number of phone calls ($p<0.001$). Individuals in the NVD Group did not have any adverse effect on their social life. On the contrary, 22.22% of the teachers with voice disorders experienced an unpleasant social life, the major consensus in this group being avoidance of social activities constituting 11.11% of the VD group. It was found that reduction in social abilities ($p=0.015$) and avoidance of social activities ($p=0.003$) were more likely to be found in teachers with voice disorder as compared to those without. This is represented in [Table/Fig-5].

Extra Classes and Voice Disorder: More teachers in the VD Group (26%) gave tuitions or coaching classes for students apart from their regular school teaching as compared to the NVD Group (8.9%). The teaching session would last from a minimum of 30 minutes to two hours. This was statistically significant ($p=0.026$).

Quality of Life: The Voice Disorder Outcome Profile for evaluating Quality of Life [9] consisted of 32 questions. The total score could be maximum of 320 indicating poor quality of life and minimum of 0 indicating excellent quality of life. The scores were divided into four groups based on the total score obtained; where 0-80 was Good, 80-160 was Fair, 160-240 was Poor and 240-320 was Very Poor. In the NVD Group, the minimum score was 0 whereas, the maximum score was 120 with an average score of 29.97 (SD=27.73). In the VD Group the minimum score was 14 and the maximum was 208, giving an average value of 94.37 (SD=57.033). Individuals with

Problems	VD Group n=27	NVD Group n=78	p-value
Repeating statements	26 %	3.7%	<0.001
Avoiding conversations	22.2%	2.5%	0.001
Reduced phone calls	18.5%	nil	<0.001
Avoidance of social activities	11.1%	nil	0.003
Reduction of social abilities	7.4%	nil	0.015

[Table/Fig-5]: Impact of voice problems on communication.

good quality of life constitute 85.1% of NVD Group and 14.9% of the VD group. A 26.7% of the NVD group and 73.3% of VD Group appear to have a fair quality of life. An important observation is that 100% of the individuals with a poor quality of life belong to the voice disorder group. Hence, it was strongly significant, $p<0.001$, that teachers with voice disorders are more likely to have a lower quality of life. This is depicted in [Table/Fig-6].

DISCUSSION

This study is unique because it studied various risk factors by comparing teachers with voice disorders and those without. We were able to elucidate several factors which contribute to voice disorders and their impact on day to day life.

Out of our study population of 105 school teachers, 81% had

experienced voice disorders at some time or the other. This is in keeping with several other studies [14-16] which reported a higher prevalence of voice disorders in a teachers' lifetime as compared

		Good	Fair	Poor
Non voice disorder group (n=78)	Count	74	4	0
	%	85.1%	26.7%	0
Voice disorder group (n=27)	Count	13	11	3
	%	14.9%	73.3%	100%

[Table/Fig-6]: Comparison of quality of life among the VD Group and the NVD Group.
 $\chi^2=31.758$, $p<0.001$

to the general population.

The minimum age in our study was 23 whereas, the maximum was 64, giving an average age of 37.75. No significant association was found between age and voice disorders, a finding consistent with Chen SH et al., study in school teachers of Taiwan [13]. However, in the studies by Roy N et al., Smith E et al., and Russell A et al., it was found that teachers older than 50 had a higher prevalence of voice disorders [14-16]. This was attributed to the cumulative effect of long periods of vocal use as well as hormonal changes and aging.

There was a female preponderance of 84% in contrast to males which was 16% in our study. It was found that females had a significantly higher chance of developing voice disorder as compared to their male colleagues (96.3% vs 3.7%). This correlation was in accordance to a number of studies which proved that female gender predisposes to voice disorders [3,5,12,15,17,18]. In the females of our study population, the most predominant vocal symptom reported was vocal fatigue constituting 37.5% of the females as opposed to strained voice which was the most common complaint among the males constituting 18.5% of the males. The female predilection is probably due to the smaller larynx in females [5,7] and higher frequency of vibration of the cords resulting in greater vocal trauma [5].

Habits such as alcohol, smoking and caffeine consumption or use of medications were not considered significant in causing a voice disorder. Similar results were found by Roy N et al., [14]. However, a higher incidence of upper respiratory tract infections, DNSs and GERD were reported amongst the teachers having voice disorders in our study. This finding was consistent with the investigations of Lee SY et al., [7]. GERD was strongly associated with voice disorders which were in agreement with Preciado J et al., [5]. Stress and anxiety were the most important in the NVD Group.

The relationship of years of teaching, grades taught and subjects taught was not found to be significant in our study. This is in accordance with the study of Chen SH et al., [13]. At large, it is a belief that school teachers with more years of teaching experience are susceptible to develop voice disorders. Even Roy N et al., hypothesized that long durations of vocal use has got a cumulative effect on the voice giving rise to a voice disorder [14]. However, in a study conducted by Nèrière E et al., teachers who were new to the teaching profession had a higher prevalence of voice disorder as compared to those who have been in the job for long; this finding was attributed to coping strategies and greater tolerance to vocal problems in the experienced teachers [17]. In our study, these effects were not seen probably owing to the relatively smaller sample size in comparison to the above mentioned studies.

Our study also identified giving extra classes after school hours as a significant risk factor for voice disorders ($p=0.026$). This may be because the teacher continuously uses her voice without giving any time for the voice to recover [5]. The average number of students in our study was found to be 69.9 but this did not show any association with voice disorders. This is in accordance with the investigations of Preciado J et al., [5].

Another interesting observation made in this study was the relationship between use of loud voice and voice disorder. Our study does not show statistical significance between the two parameters. The available literature, however mentions loud voice to be commonly seen in teachers with voice disorders [13,15]. This may probably be because the loudness level of voice is mainly subjective and is self-reported by the teachers in the questionnaire. In order to come to an accurate conclusion, objective measurements are necessary to provide reliable and scientifically verifiable data [9]. Moreover, speaking loudly alone doesn't result in voice disorders but other factors such as speaking continuously, inadequate vocal rest and speaking against background noise also leads to voice disorders [7].

We found that teachers who had experienced voice problems were more likely to use microphones in class as compared to teachers not affected by it. This finding was consistent with Chen SH et al., [13]. This may be because of the benefits of this device such as reduction in the loudness of the teacher, decreased phonatory effort and overall reduction in the vocal load thereby alleviating the troublesome vocal symptoms [13].

Overall, teachers with voice disorder were likely to experience vocal symptoms in comparison to their healthier counterparts ($p=0.001$). The most predominant vocal symptoms in the teachers with voice disorder were throat pain, strained voice and vocal fatigue. Individuals in the voice disorder group were reported to have higher chances of experiencing vocal fatigue, strained voice, low note and high note difficulty, chest pain and extra efforts during phonation ($p<0.05$ for all mentioned parameters).

Significantly higher number of teachers with voice disorder sought medical attention in comparison to those with no voice disorder ($p=0.02$). These findings were consistent with the study of Roy N et al., [14]. However, 85.2% of the teachers in the VD Group did not approach health professionals as they tried traditional remedies and were unable to go due to busy schedule at work. A probable explanation to this attitude towards professional help may be because the teachers may ignore their condition thinking it is an occupational hazard or because they might be unaware of the help that can be offered to them [16]. Da Costa V et al., reported that teachers were unaware that a physician could help their dysphonia and unaware about treatment options such as voice therapy [19]. Some teachers even viewed dysphonia as a normal part of their profession [19].

The importance of identifying vocal disease is because phonatory demand on an individual beyond their capacity causes laryngeal, pharyngeal and respiratory tension manifesting in milder cases as temporary vocal fatigue and if not addressed may progress to permanent structural lesions of the vocal cords [5].

It was found that teachers with voice disorders had significantly higher chances of changing their overall job opinions, early retirement, reduction in their overall communicative ability as well as avoiding talking to others in person or over the telephone and also avoided social activities owing to their voice problems ($p<0.05$ for all). The teachers with voice disorders were also more likely to get upset and be dissatisfied with their job performance ($p<0.001$ for both). Similar results were obtained with many of the previous studies on this issue [7,9,15]. It was also found that 22.2% of the teachers with voice disorders took a leave of absence as compared to 3.8% of the teachers without voice disorder thereby, indicating a strong association between voice disorder and leave of absenteeism ($p<0.001$). It is corroborated by similar findings in Russell A et al., and Nèrière E et al., study [16,17].

On comparison of quality of life among the two categories, it was concluded that individuals with voice disorders had a poor quality of life as in comparison to the individuals with no voice disorder ($p<0.001$). As mentioned above, teachers undergo psychosocial and functional adverse effects which could result in deterioration of the quality of life [13].

The implications of voice disorder in a teacher are far reaching. Not only does it erode the quality of life in a teacher but it also has an impact on the student. A study by Morton V and Watson DR which evaluated the effect of disordered voice quality on children's ability to process spoken language found that the negative effects of a dysphonic voice, combined with voice related disruptions on students' learning may be substantial [20]. Moreover, the financial burden on the economy also cannot be ignored.

Keeping the results of this study in mind, we formulated some strategies which could help in reducing voice disorders amongst teachers:

1. Vocal training which is to be given to the teachers as a part of their professional training [5]. This should include basic techniques to ensure maximum effective voice with minimal effort and strain [8].
2. Use of microphones is strongly recommended as it reduces the vocal load and ensures comfortable level of sound thereby, maximising the efficacy of the lectures [14].
3. Teachers are also advised to approach the doctor if not for regular check-ups, at least whenever they experience any vocal symptom in order to prevent irreversible damage to the cords [5].
4. Treatment of underlying GERD, upper respiratory tract infections etc.,
5. Voice rest is absolutely essential. They are advised not to immediately give tutorials following end of teaching hours at school or to teach continuously without a break.

LIMITATION

Due to the cross-sectional design of the study, temporal relationship could not be assessed. Due to the same reason, the cause and consequence could not be evaluated accurately. A prospective cohort study would help overcome these limitations. Secondly, assessment of a loud voice was subjective. In order to establish a precise relationship, use of objective measurements is proposed.

CONCLUSION

The important risk factors in the causation of voice disorders isolated from the study were: female gender, coexisting medical conditions such as GERD, upper respiratory tract infections, DNS and giving extra classes after regular school hours. Voice disorders had a significant bearing on all the spheres of a school teacher's life. The affected teachers were more likely to take sick leaves, change overall job opinions, retire early, reduce overall communications, repeat statements, avoid talking to people in person as well as over the telephone, reduce overall social abilities and avoid social activities, get easily upset and be unsatisfied by their job performance. All these in turn deteriorate

the quality of life in these individuals. Hence, it is vital to initiate changes in the training programme which teachers undergo and to increase awareness among all teachers. Voice disorders are a real and treatable condition and with the right training, they can be avoided.

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