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Dysphonia prevalence and its relationship with risk factors among teachers

Öğretmenlerde disfoni prevelansı ve risk faktörleri ile ilişkisi

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Abstract

Purpose: The aim of this study was to determine the relationship between the prevalence of and risk factors for dysphonia among teachers.

Materials and methods: According to the questionnaire results of 167 teachers, 87 teachers who described dysphonia were included in the patient group and 80 teachers who did not describe dysphonia were included in the control group. For both groups, statistical evaluations were performed using non-parametric statistical methods.

Results: 87 (52.1%) of 167 teachers included in the study had the complaint of dysphonia. The presence of laryngopharyngeal reflux and allergic diseases caused increase in the risk of dysphonia. The risk of dysphonia was also increased with increasing stage of education that the teachers were responsible for. Laryngeal endoscopy revealed no organic lesion in 65.5% of the patients, whereas showed laryngopharyngeal reflux findings in 26.4%, vocal cord nodule in 6.8% and vocal cord polyp in 1.1%.

Conclusion: This study showed that dysphonia is a common disorder among teachers and while evaluating these subjects the presence of laryngopharyngeal reflux and allergic diseases should primarily be considered.

Keywords: Dysphonia, risk factors, laryngopharyngeal reflux, allergic diseases.

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Öz

Amaç: Öğretmenlerde disfoni prevelansını ve disfoni yapan risk faktörleri arasındaki ilişkiyi tesbit etmek.

Gereç ve yöntem: Araştırmaya alınan 167 öğretmenin anket sonuçlarına göre disfoni tarifleyen 87 öğretmen hasta grubu, disfoni tariflemeyen 80 öğretmen anketi ise kontrol grubu olarak alındı. Her iki grup için non parametrik istatistiksel yöntemler kullanılarak değerlendirmeler yapıldı.

Bulgular: Çalışmaya alınan 167 öğretmenin 87'sinde (%52,1) disfoni şikayeti saptandı. Larengofarengeal reflü varlığının ve alerjik hastalık varlığının disfoni riskini arttırdığı belirlendi. Öğretmenlerin sorumlu olduğu eğitim-öğretim kademesinin arttıkça disfoni riskinin de arttığı görüldü. Larenks endoskopisinin %65,5'inde organik bir lezyon saptanmazken, %26,4'ünde larengofarengeal reflü bulguları, %6,8'de vokal kord nodülü ve %1,1'de vokal kord polibi olduğu görüldü.

Sonuç: Çalışmamız, öğretmenlerdeki ses kalite bozukluğunun yaygın görülen fiziksel bir rahatsızlık olduğunu ve bu kişilerin değerlendirilirken larengofarengeal reflü ve alerjik hastalık varlığının öncelikle sorgulanması gerektiğini düşündürmektedir.

Anahtar kelimeler: Disfoni, risk faktörleri, larengofarengeal reflü, alerjik hastalıklar.

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Introduction

Voice complaints are known to be more frequent in those who perform their profession with their voice compared with the general population [1]. Teachers, among professional voice users, are in a high-risk group due to a high incidence of voice problems, and the teachers who present with various voice problems to ear, nose and throat clinics are frequently encountered [2-7]. The most common voice symptoms among teachers are hoarseness, vocal fatigue, voice coarsening and bifurcation, throat clearing requirement, fading out at the end of a sentence, throat soreness, dryness and sensitivity, difficulty in hearing, and insufficiency of breath while speaking [2, 5-11].

The voice of the teachers has been found to be exposed to different risk factors. These are grouped under four main headings: Voice burden, physical risk factors, psychosocial risk factors, and environmental risk factors [12-14]. Different situations that increase voice complaints are of a different importance. Studies that address all the risk factors about the increase and emergence of voice complaints have revealed that physical and psycho-emotional factors are more important than voice burden and environmental risk factors. Knowing the effects of risk factors and their combinations is closely related to the diagnosis, treatment, prevention, and economic loss [15].

The hypotheses of this study are that the frequency of dysphonia will increase in teachers and that this frequency is increased by laryngopharyngeal reflux, allergic rhinitis, allergic asthma, hearing loss, hypothyroidism, previous head and neck surgery, chemical inhaler exposure, and smoking and alcohol use. According to this hypothesis, the purpose of this study was to determine the relationship between the prevalence of and risk factors for dysphonia and to identify pathologies that cause dysphonia among teachers who are the occupational risk group.

Materials and methods

The study was designed prospectively. In order for the data to be generalizable, data were collected between September 2006 and February 2007 from 3 different socioeconomically known lower, middle, and upper regions of Denizli. This study was conducted by filling out survey forms of 176 teachers in Denizli. The survey form questioned teachers' socio-demographic characteristics, voice complaints, and potential risk factors (The survey form Annex-1).

Of 167 teachers who completed the survey, 87 with a variety of voice complaints underwent endoscopic laryngeal examination. 9 teachers who completed the survey but were unable to attend the later stages of the study for various reasons were excluded. A hearing test was performed on those who had a complaint of hearing loss.

Statistical analysis

For both groups, statistical evaluations were performed using non-parametric statistical methods. The differences between the two groups in terms of categorical variables, such as gender distribution, working hours, presence of upper respiratory tract infections associated with voice symptoms, hearing loss and diagnostic symptoms of reflux disease, accompanying allergic diseases, and smoking status were investigated by using the Chi-square (χ^2) test. As the level of class that teachers are responsible for was increased, the evaluation of voice symptoms was performed using the χ^2 test for trend. When calculating the average age between the two independent groups, an independent t-test was used. Frequency analysis was conducted for the diagnostic distribution of the group with voice symptoms that underwent examination.

Approval for the study was obtained from Pamukkale University Non-Invasive Clinical Research Ethics Committee in 2006. This research is based on a master's thesis.

Results

The study group included 105 female and 62 male teachers between the ages of 22 and 56. The four most common voice symptoms were questioned. The group of teachers who answered ''yes'' to even one of these questions was evaluated as having dysphonia. Table 1 shows comparisons of sociodemographic and occupational characteristics properties of dysphonia and non-dysphonia groups. There was no statistically significant difference between the groups with and without dysphonia in terms of gender and average age.

ANNEX - 1

THE SURVEY FORM

1) **Do you have a complaint about your voice, for example hoarseness or talking fatigue?**

Yes 0 No 0

2) **Do you have tickle the throat, dry cough, or suffering from a feeling of obsession?**

Yes 0 No 0

3) **Do you suffer from stomach contents or brackish, sour water coming in your mouth?**

Yes 0 No 0

4) **Do you have a systemic disease?**

Yes (Thyroid diseases 0, Other ….) No 0

5) **Have you had a recent upper respiratory tract infection?**

Yes 0 No 0

6) **Do you have a hearing loss?**

Yes 0 No 0

7) **Did you have a surgical operation or an accident?**

Yes (Tonsilectomy 0 / Adenoidectomy 0 / Both are 0 / No 0
Neck mass removal 0 / Other 0….)

8) **Do you have an allergic illness has been determined?**

Yes (Asthma 0 / Allergic rhinitis 0) No 0

9) **Do you use cigarettes and alcohol?**

Yes (cigarettes 0 alcohol 0 Both are 0) No 0

10) **Have you been exposed to an irritating agent in your breath**?

Yes 0 No 0

11) **Have you consulted a doctor because of hoarseness?**

Yes 0 No 0

Table 1. The comparisons of sociodemographic and occupational characteristics properties of dysphonia and non-dysphonia groups

	Dysphonia (+) S: 87	Dysphonia (-) S: 80	Total S: 167	Test Statistic	*p*
Age	40.91±7.29	38.7±8.26	39.85±7.82	t=1.844	0.067
Gender					
Woman	58 (66.7(%)	47 (58.8(%)	105 (62.9(%)	x^2=1.119	0.290
Male	29 (33.3(%)	33 (41.2(%)	62 (37.1%)		
Education Stage					
Kindergarten teachers	16 (18.4%)	30 (37.5%)	46 (27.5%)	Trend χ2 7.626	0.022*
Primary school (classroom) teachers	34 (39.1%)	24 (30.0%)	58 (34.7%)		
Specialist teachers	37 (42.5%)	26 (32.5%)	63 (37.7%)		
Weekly Working-Hours					
Less than 30 hours per week	25 (28.7%)	20 (25%)	45 (26.9%)	x^2=0.295	0.587
More than 30 hours per week	62 (71.3%)	60 (75%)	122 (73.1%)		

*: p<0.05, t:independent samples t test, x^2: Chi square test, Mean±Standard deviation values were shown for age

All teachers in the study group were divided into three main groups according to the education level that they were responsible for. The first group consisted of kindergarten teachers responsible for children aged 4 to 6 years. The second group consisted of classroom teachers responsible for the first five years of primary school. The third group consisted of specialist teachers responsible for the last three years of primary school. In particular. In general, the age of the students that the teachers were responsible for increased gradually from the first group to the third group. When the three groups were compared in terms of a history of dysphonia symptoms, a significant difference was found between them (X^2=7.626, df=2, p=0.022). Pairwise comparisons revealed that the significant differences were between the first group and the second group (X^2=5.840, df=1, p=0.016), as well as between the first group and the third group (X^2=6.104, df=1, p=0.013).

For all the teachers icluded in the study, active working hours per week were recorded. Frequency analysis revealed a range of weekly working hours between 10 and 54 hours with 44.3% (74 teachers) working 30 hours per week. The median weekly working hours were 30, while the mean value was 31.29±7.58 hours. Weekly working hours were divided into two groups based on a threshold of 30 weekly working hours, and the effect of working hours on voice symptoms was investigated. No significant difference was found between the two groups in terms of weekly active working hours (Table 1).

Table 2 shows the comparisons of dysphonia and non-dysphonia groups with regard to allergic diseases and laryngopharyngeal reflux. In this study, laryngeal endoscopic findings of all patients with dysphonia and LPR (laryngopharyngeal reflux) symptoms were consistent with the findings of reflux disease. For this reason, all of the patients with LPR symptoms were considered to have the diagnosis of LPR. The concurrent presence of laryngopharyngeal reflux symptoms in the group with dysphonia was statistically significant. In this study, allergic diseases, including allergic rhinitis and allergic asthma, were questioned together with dysphonia. Of 87 subjects with dysphonia, 7 (8.05%) had allergic rhinitis, 3 (3.44%) had allergic asthma, and 2 (2.29%) had both allergic asthma and rhinitis. In other words, a total of 12 (13.8%) subjects had diagnoses related to allergic diseases. 2 (2.5%) of the 80 subjects without dysphonia had allergic rhinitis. Frequency analysis was used for these assessments. Comparisons between the two groups were performed by the “Chi-square test’’. The presence of allergic disease reached statistical significance in the group with dysphonia.

Table 2. The comparisons of dysphonia and non-dysphonia groups with regard to allergic diseaese and laryngopharyngeal reflux

	Dysphonia (+) S: 87	Dysphonia (-) S: 80	Total S: 167	Test Statistic	*p*
Allergic diseases (-)	75 (86.2%)	78 (97.5%)	153 (91.6%)	χ^2 =6.920	0.009*
Allergic diseases (+)	12 (13.8%)	2 (2.5%)	14 (8.4%)		
Laryngopharyngeal reflux (-)	39 (44.8%)	69 (86.2%)	108 (64.7%)	χ^2 =31.298	0.001*
Laryngopharyngeal reflux (+)	48 (55.2%)	11 (13.8%)	59 (35.3%)		

*: $p<0.05$, $x^{2:}$ Chi square test

In this study, the relationship between dysphonia and past history of recent upper respiratory tract infection was questioned. 32 (36.8%) of 87 subjects with dysphonia and 26 (32.5%) of 80 subjects without dysphonia had positive results. This difference was not statistically significant, and no relationship was found between dysphonia and past history of recent upper respiratory tract infection (p=0.562).

In this study, the evaluation addressed the relationship between dysphonia and smoking status. 19 (21.8%) of 87 subjects with dysphonia were smokers, while 24 (30%) of subjects without dysphonia were non-smokers. Statistical analysis of the results revealed no significant relationship between voice symptoms and smoking status (p=0.228).

Hypothyroidism, history of surgical operation and trauma that may cause dysphonia, alcohol use, and exposure to chemical inhalants, which were questioned in the questionnaire form, could not be evaluated since no effect on voice symptoms was found.

All the subjects with voice symptoms underwent laryngeal examination with a 90-degree rigid endoscope. The frequency analysis revealed normal laryngeal examination in 65 (65.5%) subjects, supporting findings of laryngopharyngeal reflux in 23 (26.4%) subjects, vocal cord nodules in 6 (6.8%) subjects, and vocal cord polyp in 1 (1.1%) subject.

Discussion

The frequency of voice complaints is known to be higher in teachers than in the general population [1, 3, 5, 12]. Although specific calculations depend on the definition of voice problems and examination approaches, 3 to 9% of the general population was found to have voice anomalies [16]. This prevalence is higher in teachers, and 87 (52.1%) of 167 teachers in our study had at least one existing voice symptom. This result was considered as close to the rate of 47.5%, which was obtained from the query of hoarseness, the most common voice symptom, in Smith et al.'s [2] survey study and to the rate of 42%, which was the rate of at least one symptom per week and/or day in Smolander et al.'s [10] study on 76 teachers. A phoniatric and stroboscopic study [17] conducted in Poland on 425 female teachers working full-time indicated deterioration in voice quality in 37.4% of teachers. In another study [18] conducted in the Netherlands on 214 female teacher candidates who were still students, the rate of at least one existing voice symptom was 56%. In our study, we could not evaluate the subjects according to their symptom numbers. Hence, our results may appear to be higher than the results of other studies that reported more than one symptom. However, our results are compatible with the results of different survey studies in the literature on the prevalence of voice symptoms among teachers.

The mean age of the teachers with voice symptoms in our study was 40.9 years, whereas the mean age of the teachers without voice complaints was 38.7 years. There was no statistically significant difference between the two groups. When considered that the age of teachers is correlated with the seniority in their job [19], this result suggests that working time in the teaching profession has no effect on voice symptoms. In a study of Roy et al. [20] on American teachers about voice problems, they divided teachers with voice symptoms between the ages of 20 and 60 years into 5 different groups, each containing 10 subjects. In this study, in which the mean age was 43.2±11.6

years, there was no significant relationship between prevalence of voice symptoms and age range. Again, the results of the study of de Jong et al. [13] on Dutch teachers about voice problems and epidemiologic data showed a median age of 38 (21 to 62) years in teachers with voice burden and 41 (21 to 64) years in teachers without voice burden. The difference was not significant. As a result, the results of Roy et al. [20] and de Jong et al. [13] were compatible with our results. Yet, there is an increasing use of voice among teachers in the practice of their profession compared to other occupational voice users [21]. Their voice gradually decreases in advancing course hours while performing their duties, and reducing the use of voice due to voice problems in their profession is often not practical and possible [12]. At this point, different studies in which students can participate with their feedback about their teachers should perhaps be planned. However, it can be said that teachers indeed develop voice preventive techniques either consciously or unconsciously over the years or reduce energy they expend in the first years of their profession at the expense of reducing their productivity.

There was no statistically significant difference between groups in terms of gender. Although the present assessment in which gender is not a risk factor for voice symptoms has been supported by some studies [10], the publications reporting that female gender is a risk factor for voice symptoms are in the majority [2, 3, 8, 13, 15, 20]. The factors that make the female gender a risk factor are that they use their voices worse than their male colleagues and that they are affected more from the voice problems that arise [8]. In addition, an important point that should not be ignored is that the structure of the male vocal cords is different than that of female vocal cords. In a study of normal human vocal cords in America, it has been found that the amount of hyaluronic acid in the central part of the lamina propria layer of vocal cords is greater in amount in males than in females in particular [22]. Given that hyaluronic acid is a key ingredient for creating resistance against the compression of the lamina propria, as well as its role in proliferation, regeneration, and tissue repair, it is not surprising to see in many studies that female gender constitutes a risk group for voice symptoms [22].

All teachers in the study were divided into three main groups according to the stage of education that they were responsible for. In general, the age of the students that the teachers were responsible for was increased gradually from the first group to the third group (Table 1). The first group was compared with the other two groups; the history of voice symptoms increased from the first group to the other groups. Results were statistically significant. This shows that specialist teachers and classroom teachers are at more risk than kindergarten teachers. In the literature, the stage of education has not been considered as a risk factor in large-scale studies based on the stage of education among teachers. In Russell et al.'s study [3], the school types have been classified as kindergarten, primary, secondary, and area schools (schools located in rural areas in which the students between the ages of 5 and 12 years are trained), and no relationship was found between school types and voice problems of the teachers. However, our results are seen to be different than the result of Russell et al.'s study [3]. It is not difficult to understand that teachers' voice complaints are increased with the increasing age range of the students. Kindergarten teachers educate the same class every day. This also allows better recognition of the group of students under responsibility and time allocation for themselves for voice rest later in the day according to the curriculum. However, primary school and specialist teachers who have to enter into a separate class for each course are expected to give the same performance up to the last hours. In addition, participation of these teachers in courses about prolonged voice use due to the Secondary Schools Student Placement Examination in Turkey increases the voice burden they are exposed to. As shown in our study, increasing stage of education and the specialization lead to an increase in voice symptoms.

The concurrent presence of laryngopharyngeal reflux symptoms in the group with voice symptoms reached statistical significance. The risk analysis showed that LPR caused a 4.7-fold increase in voice symptoms. In the literature, several publications indicating that voice disorders are the most common symptoms of reflux at the laryngeal level are in agreement with our results [23, 24]. In Koufman et al.'s [25] study conducted on 113 patients with

laryngeal reflux and voice disorders, the patients underwent dual-probe 24-hour esophageal pH monitoring, and findings were consistent with laryngopharyngeal reflux in 78 (69%) patients. 69 (88%) of these 78 patients complained about hoarseness, which indicates that this symptom is the most common laryngeal and voice symptom. Years ago, Morrison and Rammage [26] defined gastroesophageal reflux (the term laryngopharyngeal reflux became common at that time) as one of the four internal factors that affect phonation processes. Again, in Perez Fernandez et al.'s [27] study on a teacher group who had vocal cord nodules and was healthy, reflux has been shown as one of the four factors associated with personal factors in the pathologic group. In our study, the subjects with laryngopharyngeal reflux symptoms underwent concurrent direct laryngoscopic examination, and the results were consistent with reflux laryngitis.

Mucosal problems, which were found to be effective on both the general population and study groups among the teachers, were not effective in our study. Perhaps conducting future studies by separating the term ‘’upper respiratory tract infection” into sub-groups may give us more meaningful results. Because in a study conducted by Roy et al. [28] on the general population, it was determined that frequent colds and sinus infections are an increased risk for chronic voice disorders, in which chronic postnasal drips constitute the major cause.

The presence of allergic disease reached statistical significance in the group with voice symptoms. In the literature, in Gotaas and Starr’s [29] study, which is very similar to our study and results, 22 teachers with the complaint of voice fatigue and 17 teachers without complaints were compared, and it was concluded that allergy causes the complaint of voice fatigue via mucosal edema and inflammation. In the study of Roy et al. [20] on voice disorders in the general population, the rate of voice disorders was 41.84% in patients with respiratory tract allergies, whereas this rate was 27.23% in patients without respiratory tract allergies. The difference was considered significant. Given that allergies are a risk factor for voice symptoms even in the general population, it is anyway inevitable to think that allergies are a factor that enhances the complaints of teachers at risk of occupational voice disorders.

Harmful effects of smoking are evident. However, the high rate of smoking in society and the groups being compared, the emergence of the effects of smoking occurs in the long term, and studying multiple factors in the studies has influenced not only the results of our study, but also the results of many other important studies in the literature [11, 20]. For this reason, no significant correlation was found between smoking and dysphonia.

All the subjects with voice symptoms underwent laryngeal examination with a 90-degree rigid endoscope, which revealed normal laryngeal examination in 65 (65.5%) subjects, reflux laryngitis in 23 (26.4%) subjects, vocal cord nodules in 6 (6.8%) subjects, and vocal cord polyp in 1 (1.1%) subject. A comparison of our results with similar studies in the literature revealed differences in methods and approaches.

In Ma and Yiu’s [30] study, the survey forms about voice complaints were distributed to two different groups, including 40 subjects with dysphonia and 40 healthy individuals. Then, the group of dysphonia was subtyped according to the laryngeal pathology. 40 individuals with dysphonia; 12 (30%) had vocal cord nodules, 3 (7.5%) had vocal cord polyps, 9 (22.5%) had chronic laryngitis, 6 (15%) had thickened vocal cords, 3 (7.5%) had vocal cord paralysis, and 7 (17.5%) had different laryngeal pathologies. Here, the most common organic cause of dysphonia was identified to be vocal cord nodules. The rates seem to be higher according to our results. Because dysphonia cases in Ma and Yiu’s [30] study were selected from volunteers from Hong Kong hospitals who had applied for healing.

In a larger study conducted by Preciado et al. [31], the prevalence of voice disorders was found to be 57%. Of this ratio, 20.3% were diagnosed as organic lesions (14% nodules, 2% polyps, 1.4% submucous accumulation, 1.2% Reinke edema, 0.4% sulcus vocalis, 0.6% scar, 0.02% leukoplakia, and 0.02% vocal cord paralysis), whereas 8.1% was chronic laryngitis (3.9% smoking, 2.8% non-specific, 2.5% reflux laryngitis), and 29% was functional impairment. In this study, a questionnaire, vocal cord examination, acoustic analysis, and video-stroboscopy equipment were used as a diagnostic tool. The results show that

the most common cause of voice disorders is functional dysphonia. To diagnose the functional dysphonia, a physiological evaluation with an acoustic analysis and video stroboscopy, as well as the survey studies and examination [32]. In our study, the dysphonia cases with normal vocal cord examination have not been evaluated in terms of functional dysphonia. For this reason, the rate of the cases considered as healthy was higher in our study.

We have applied laryngoscopic examination for at least one existing voice symptom in our study. But this application was insufficient for the diagnosis of functional voice disorders, as stroboscopic examination was not performed. This constitutes the limitation of our study. In our study, the most important etiologic factor has been reflux laryngitis. According to Koufmann [23], who is an author on this subject, laryngopharyngeal reflux has been shown to be the underlying cause or etiological cofactor in two-thirds of patients with laryngeal or voice disorders. On the other hand, the diagnosis of reflux laryngitis has been ignored in studies about the voice symptoms of teacher groups [7, 11, 30, 31].

In conclusion, our study suggests that one of the two teachers has a symptom of dysphonia, and the presence of laryngopharyngeal reflux and allergic diseases must primarily be questioned.

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