

Voice problems among Slovenian physicians compared to the teachers: Prevalence and risk factors

Hripavost med slovenskimi zdravniki v primerjavi z učitelji: Pogostost in dejavniki tveganja

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Ključne besede:

poklicna hripavost, zdravniki, učitelji, vzroki, dejavniki tveganja

Key words:

professional dysphonia, physicians, teachers, aetiology, risk factors

Citirajte kot/Cite as:

Zdrav Vestn 2012; 81: 626–33

Prispelo: 5. dec. 2011, Sprejeto: 2. jul. 2012

Short description of the manuscript

The prevalence of voice disorders among outpatients' physicians is high and is comparable to the incidence of voice problems in Slovenian teachers. Respiratory-tract infection is the most common cause of their voice problems. Lessons on correct vocal technique and vocal hygiene should be included in their postgraduate education.

Abstract

Background: Physicians are classified as non-vocal professionals. However, they do have a certain vocal load during one-to-one communications with patients. In addition, they are also exposed to respiratory infections that can cause voice problems.

Aims: The aim of our study was to investigate the prevalence of voice problems in physicians in Slovenia and to identify some of the risk factors for their voice disorders, and to compare them with Slovenian teachers.

Methods: Questionnaires were sent to 300 randomly chosen physicians working at outpatient departments in Slovenia to collect information about the prevalence and causes of voice disorders, vocal load, vocal habits, and certain diseases influencing voice quality. Data were analyzed for a total of 145 physicians and compared to the results of a previous study in Slovenian teachers.

Results: A total of 82.8 % of the physicians reported having voice problems during their career, with 7.6 % of them experiencing frequent voice problems, which was comparable to the incidence of voice problems in Slovenian teachers. Upper-respiratory-tract infection (URI) was the most common cause of the physicians' voice problems (58.6 %). The following significant risk factors for their voice problems were found: age over 40 years, signs of gastroesophageal reflux

disease (GERD), improper vocal habits and allergy. Frequent voice problems in physicians were connected with frequent throat clearing and no voice rest during dysphonia.

Conclusions: The prevalence of voice disorders among outpatients' physicians in Slovenia is high and is comparable to the incidence of voice problems in Slovenian teachers. URI is the most common cause of these voice problems. GERD, allergies and an age over 40 years were stated as the risk factors for voice disorders. In order to reduce the extent of voice problems, lessons on vocal hygiene, and additional information about diseases causing voice disorders should be included in their postgraduate education.

Kratek opis članka

Pogostost glasovnih težav med slovenskimi zdravniki, ki opravljajo ambulantno delo, je velika in je primerljiva s pogostostjo glasovnih težav pri slovenskih učiteljih. Najpogostejši vzrok hripavosti med zdravniki so okužbe zgornjih dihal. V okviru podiplomskega izobraževanja bi morali vključiti tudi glasovno higieno in vaje pravilne glasovne tehnike.

Izvleček

Izhodišča: Zdravnike glede na pomen glasu v poklicnem udejstvovanju razvrščamo v tretjo od štirih skupin. Tisti, ki opravljajo ambulantno delo, pretežno del svojega delovnega časa govorijo, poleg tega so izpostavljeni pogostim okužbam dihal, ki so dodaten dejavnik tveganja za razvoj glasovnih težav.

Namen: Z raziskavo smo želeli ugotoviti pogostost glasovnih težav med zdravniki v Sloveniji in ugotoviti dejavnike tveganja zanje ter jih primerjati s slovenskimi učitelji.

Metode: 300 naključno izbranim zdravnikom v Sloveniji, ki opravljajo pretežno ambulantno

delo, smo poslali vprašalnik o glasovnih težavah in navadah ter spremljajočih boleznih, ki bi lahko vplivale na kakovost glasu. Na vprašalnik je odgovorilo 145 zdravnikov. Rezultate raziskave smo primerjali z rezultati predhodne raziskave med slovenskimi učitelji.

Rezultati: 82,2 % zdravnikov je navajalo, da so že imeli glasovne težave v času opravljanja svojega poklica, od tega jih ima 7,6 % pogoste glasovne težave, kar je primerljivo s pogostostjo glasovnih težav slovenskih učiteljev. Najpogostejši vzrok za glasovne težave med zdravniki so okužbe zgornje dihalne poti (58,6 %). Kot dejavniki tveganja za nastanek glasovnih težav so se izkazali še: starost nad 40 let, znaki gastroezofagealne refluksne bolezni, nepravilne glasovno-govorne navade in alergija. Pogoste glasovne težave so imeli zdravniki, ki pokašljejejo oz "čistijo grlo" in tisti, ki ne

upoštevajo navodil o glasovnem počitku med hripavostjo.

Zaključek: Pogostost glasovnih težav med zdravniki v Sloveniji, ki opravljajo pretežno ambulantno delo, je velika in primerljiva s pogostostjo glasovnih težav pri slovenskih učiteljih. Najpogostejši vzrok za nastanek hripavosti so akutne okužbe zgornjih dihal. Dejavniki tveganja za nastanek hripavosti so tudi gastroezofagealna refluksna bolezen, alergije in starost nad 40 let.

Da bi zmanjšali pogostnost glasovnih težav med zdravniki, bi bilo potrebno v program podiplomskega izobraževanja vključiti znanja o vokalni higieni in pravilni glasovni tehniki ter podati zdravnikom dodatne informacije o dejavnikih tveganja za nastanek glasovnih težav.

Introduction

In modern societies about one-third of the labour force works in occupations in which voice is the primary tool.¹ Some authors classify voice users with respect to the importance of voice quality in their profession.^{2,3} According to Koufman and Isaacson, the elite vocal performers are professional singers and actors. Professional voice users are lecturers, teachers, barristers, clergy and telephone operators. Non-vocal professionals are doctors, businessmen, receptionists, and lawyers. The non-vocal non-professionals are those without important voice demands.² Other authors classify voice professionals on the basis of vocal load and the demand for voice quality in their occupation.¹ Sataloff considers that professional voice users are all those whose ability to earn a living is impacted negatively by a loss of vocal quality and endurance. In his opinion, professional voice users are not only singers and actors, but also clergy, teachers, receptionists, sales personnel and physicians.⁴

Voice problems are common in occupations with a heavy voice load. Professional voice users cannot perform their jobs properly because of vocal dysfunction and frequently seek medical help.⁵ In a Belgian survey, professional voice users accounted for almost one half of the active population seeking consultation in an ENT department because

of dysphonia, with teachers being the main subgroup.⁶ Teachers are the most frequent visitors to the otorhinolaryngologist's office, followed by social workers, lawyers and clergy.⁷ Recent reviews of the literature identify teachers, singers, lawyers, and telemarketing workers as the groups that are at risk of occupational health-and-safety voice problems.^{8,9}

There have been many studies on the prevalence of voice problems in teachers in Europe, America and Australia. The percentage of teachers reporting voice problems ranged from 19 % to 89 %.¹⁰⁻¹⁴ In other professions voice problems were reported only by 1 %¹² to 28.8 %¹⁵ of those surveyed. Voice problems in teachers occur more often in women^{11,14,15} in persons over 40 years of age^{14,15}, in those having an allergy, in teachers at high schools¹⁴ or in junior classes of primary schools¹⁶, in those with voice problems during their training^{17,18}, and in persons with certain physical and psycho-emotional factors.^{18,19}

There are few studies about voice problems in other occupations with a vocal load other than teachers. A study including catholic priests showed that 85.6 % of the priests reported having voice problems during their career, with 15.9 % of them experiencing frequent voice problems. Respiratory-tract infection was the most common cause of their voice problems. A history

of voice problems during their education, frequent throat clearing, not having lessons on proper vocal use and vocal hygiene, and allergies were stated as the risk factors for their voice disorders.²⁰

Call-centre workers have long periods of voice use and heavy vocal loading. Telemarketers report twice as many symptoms of vocal strain or voice problems than the general population. Impaired work productivity due to voice problems occurs in almost one-third of telemarketers.^{21,22}

To the best of our knowledge there have been no studies on the prevalence of voice problems among physicians. Physicians are classified as non-vocal professionals.^{1,2} However, physicians working at outpatient departments speak with patients most of their working time. Physicians are also exposed to upper-respiratory-tract infections. For these reasons, physicians are at a high risk of suffering from voice disorders.

The aim of our study was to investigate the prevalence of voice problems among physicians in Slovenia, to identify some of the risk factors for these voice disorders and to compare them to the Slovenian teachers and their voice problems.

Methods

In a previous study a prevalence and risk factors for voice disorders were studied in a population of teachers working at nurseries, primary and secondary schools in Slovenia.¹⁴ The same questionnaire as used in the study among teachers was sent to 300 randomly chosen physicians working at outpatient departments in Slovenia (35 % of all general practitioners in Slovenia). The 23 questions sought information about age, gender, length of career, voice disorders, causes of voice disorders (vocal load, respiratory-tract infections or others), daily vocal

Table 1: Prevalence of voice disorders and parameters affecting voice quality in physicians (N=145) and teachers (N=1509).

| Parameter | No. of physicians (%) | No. of teachers (%) | p |
|--|-----------------------|---------------------|-------|
| Voice disorders in the current year | 77 (53 %) | 989 (65 %) | 0.001 |
| Voice disorders in career | | | 0.002 |
| - no | 25 (17 %) | 170 (11 %) | |
| - occasional | 109 (75 %) | 1065 (70 %) | |
| - frequent | 11 (8 %) | 273 (18 %) | |
| Voice disorders during training | 29 (20 %) | 109 (7 %) | 0.000 |
| Cause of voice disorders | | | 0.000 |
| - vocal load | 17 (12 %) | 695 (53 %) | |
| - respiratory-tract infection | 85 (59 %) | 428 (32 %) | |
| - vocal load and respiratory-tract infection | 23 (16 %) | 200 (15 %) | |
| -other | 20 (14 %) | / | |
| No voice rest during voice problems | 76 (53 %) | 880 (65 %) | 0.309 |
| Speaking loudly | 80 (55 %) | 741 (50 %) | 0.234 |
| Shouting frequently | 13 (9 %) | 144 (10 %) | 0.786 |
| Fast speaking rate | 66 (46 %) | 572 (38 %) | 0.079 |
| Frequent throat clearing | 42 (29 %) | 568 (38 %) | 0.020 |
| Symptoms of gastroesophageal reflux | 62 (43 %) | 405 (27 %) | 0.000 |
| Vocal load during spare time | 29 (20 %) | 389 (26 %) | 0.054 |
| Smoking | 10 (7 %) | 275 (18 %) | 0.002 |
| Sufficient hydration | 114 (79 %) | 747 (50 %) | 0.000 |
| Allergy | 27 (19 %) | 212 (14 %) | 0.154 |

load, vocal habits (speaking loudly, shouting frequently, fast speaking rate, vocal rest when having voice problems), allergies, typical and atypical symptoms of gastroesophageal reflux (GER) (heartburn, regurgitation, pyrosis, and frequent throat clearing), sufficient hydration and smoking.

The questionnaires were collected for 3 months and then analysed. In order to identify the factors causing voice problems, a subgroup of physicians with frequent voice disorders was compared to the group of other physicians. The results of the questionnaires obtained from the physicians were compared to the results of the previous study including the same questionnaire and answers from 1509 Slovenian teachers.¹⁴ The data were statistically analyzed using the t-test, the nonparametric Mann-Whitney test, the χ^2 -test, and logistic regression test, included in the program package SPSS 16.0 (SPSS Corporation, USA).

Our study was in accordance with the ethical standards laid down in the Declaration of Helsinki.

Results

Data were analysed for a total of 145 physicians (48.3 % response rate), which represented 17 % of general practitioners working at outpatient departments in Slovenia. There were 33 males and 112 females, mean age 45 years (range 27–66 years, standard deviation 7.6 years). A total of 104 of the physicians were over 40 years old.

The group of teachers from a previous study consisted of 1509 subjects, 196 males and 1313 females, mean age 40 years (range 25–61 years, standard deviations 6.3 years). There was a significant difference between the physicians and the teachers regarding gender ($p=0.002$) and age ($p=0.000$).

Table 2: Prevalence of risk factors for voice disorders in physicians with (N=11) and without frequent voice disorders (N=134).

| Parameter | Physicians with frequent voice disorders (N=11) | Physicians without frequent voice disorders (N=134) | p |
|--|---|---|-------|
| Age > 40 years | 8 | 95 | 0.185 |
| Gender male / female | 0/11 | 32/102 | 0.054 |
| Career length < 15 years | 3 | 46 | 0.166 |
| Family practitioner / others | 9/2 | 120/14 | 0.161 |
| Voice disorders during training | 3 | 25 | 0.486 |
| Having instructions on correct voice use during training | 0 | 18 | 0.194 |
| Voice rest during voice problems | 1 | 52 | 0.049 |
| Speaking loudly | 9 | 71 | 0.065 |
| Shouting frequently | 2 | 11 | 0.266 |
| Fast speaking rate | 6 | 59 | 0.500 |
| Frequent throat clearing | 7 | 35 | 0.008 |
| Typical symptoms of gastroesophageal reflux | 7 | 54 | 0.132 |
| Vocal load during spare time | 1 | 27 | 0.637 |
| Smoking | 2 | 6 | 0.156 |
| Sufficient hydration | 8 | 109 | 0.486 |
| Allergy | 2 | 27 | 0.875 |

The physicians had worked in their profession for 1 to 38 years; the mean career length was 18.2 years; the standard deviation was 9 years. A total of 128 of the physicians worked as family practitioners (88.5%), 4 were paediatricians (2.7%), 10 were emergency doctors (7.1%), and 3 worked as occupational medicine doctors. The physicians estimated that they must talk when performing their job on average 6.8 h per day and 4.8 days per week.

The prevalence of voice disorders, the causes of voice disorders and the prevalence of the factors influencing voice quality among the physicians and the teachers are presented in Table 1. The results showed a significantly lower prevalence of smoking in the physicians' group than in the teachers' group, and significantly more GER symptoms in the physicians' group than in the teacher' group. The groups also differed with regard to the cause of their voice problems and the length of their career.

The comparison of the physicians with frequent voice problems and the physicians without frequent voice problems is represented in Table 2. The number of physicians not considering voice rest when having voice problems, and physicians with frequent throat clearing was significantly larger in the group with frequent voice problems than in the other group.

The probability of frequent voice disorders was calculated using a logistic regression test. Physicians who had improper vo-

cal habits (talking loudly and/or shouting frequently) have a 5.6 times greater risk; physicians with an allergy, a 3.2 times greater risk; and physicians with GER symptoms, a 2.8 times greater risk of frequent voice problems than physicians without these risk factors—Table 3.

Discussion

Our results show that more than one half of physicians (53%) working at outpatient departments had suffered voice problems in the current year and almost 83% had suffered at some point in their career; figures that are comparable with the prevalence of voice problems in teachers in Slovenia (66% and 89% respectively).¹⁴ Physicians use their voice in their occupation for almost the same length of time per day as professional voice users, e.g., teachers and priests.^{14,20} The difference between teachers' and physicians' vocal load is that teachers talk to a group of children, whereas physicians have mostly one-to-one communications in their everyday work. Therefore, it was an expected result of a survey on the prevalence of voice problems in teachers in Slovenia that a majority of Slovenian teachers (53%) reported vocal load being the main cause of their voice problems.¹⁴ The results of our study showed that the physicians have more frequent voice problems due to respiratory-tract infection (in 58.6%) than due to vocal load (in 11.7%). Of course, the combination of infection and the vocal load as a cause of hoarseness cannot be overlooked as well (in 15.9%).

It is interesting to compare our results with the results of the study among priests. In a study on the prevalence of voice problems in Slovenian priests, respiratory-tract infection was the most important cause of voice problems in almost 49% of priests. Vocal load was reported in only one-third of the priests as being the reason for voice problems.²⁰ Priests deliver regular sermons, sing during services and have large vocal load when whispering in the confessional, although the rest of their vocal load is one-to-one communication. We suppose that the difference in the causes of voice pro-

Table 3: Probability of frequent voice problems in physicians with regard to different risk factors (N=145).

| Risk factor | p | B |
|----------------------------------|--------|------|
| Allergy | < 0.05 | 3.2 |
| Symptoms of GERD | < 0.05 | 2.8 |
| Improper vocal habits | < 0.01 | 5.6 |
| Age over 40 years | < 0.01 | 0.8 |
| Career length more than 15 years | NS | 0.9 |
| Gender | NS | 0.9 |
| Smoking | NS | 0.66 |
| Vocal load during spare time | NS | 0.4 |

blems between the priests and the physicians is attributable to a greater vocal load in priests than in physicians’.

The mean age of patients visiting outpatient departments in Slovenia is more than 50 years.²³ It is very probable that for a certain proportion of such patients their hearing ability is less than perfect. The medical staff communicating with them is thus forced to speak loudly in order to be understood. We suppose that this is an important reason for speaking loudly, which was reported by as many as 55.2 % of physicians, even though most of their vocal load is one-to-one communication.

There was a significant difference between the physicians and the teachers with regard to smoking habits ($p = 0.000$) and symptoms of GERD ($p = 0.000$). Taking into account their profession, physicians are expected not to smoke. It is disappointing that one sixth of the teachers smoke. The teachers should not just transfer the information on noxiousness of smoking to their students. They should also serve as a paragon of healthy life habits for their students.

Typical symptoms of GERD were more frequently present in the physicians than in the teachers ($p = 0.000$). We suppose that the physicians’ profession is more closely linked with stress than the teachers’ one. Stress can be a serious cause of GERD symptoms.

A significant difference between the physicians with frequent voice problems and those without them was associated with frequent throat clearing. Allergy, GERD and retronasal drip can cause chronic inflammation of the laryngeal and pharyngeal mucosa, leading to frequent throat clearing.²⁴ Throat clearing and coughing represent a non-vocal load for the larynx. During these manoeuvres the vocal folds snap together vigorously, causing mechanical trauma to the vocal folds’ mucosa, resulting in epithelial changes as well as voice fatigue and voice problems.

We attempted to identify the risk factors for voice disorders, and particularly for frequent voice disorders, among physicians working in outpatient departments. Smoking, GERD, insufficient hydration, fast speaking rate, speaking loudly and shouting

are known to be factors that adversely affect voice quality.^{5,25} Our study has shown that allergy, symptoms of GERD, improper vocal habits (speaking loudly, shouting frequently, and fast speaking rate) and an age over 40 years were significant risk factors for frequent voice problems. Obviously, the physicians receive limited information about the factors affecting voice quality during their training. It is, however, very pleasing to note that – according to our results – only 6.9 % of the physicians were smokers. In contrast, only a minority of them received information about proper vocal technique (12.4 %). We suppose that adequate knowledge about vocal hygiene and technique, early diagnosis and proper treatment of GERD and allergy would probably decrease the prevalence of voice disorders among physicians.

We should be concerned about the data that indicates that only 34.5 % of physicians considered voice rest when experiencing voice problems. We found that only 13.1 % of physicians missed work because of voice problems. Among the physicians with frequent voice problems there were significantly more of those who continued with talking in spite of hoarseness than in the group of physicians without frequent voice problems. No voice rest during respiratory-tract infection can be a reason for the development of secondary functional dysphonia. The motorical patterns of laryngeal muscles change when the inflammation oedema of the vocal folds appears. The hyperfunction of the laryngeal muscles can be detected due to an increased mass of vocal folds and changed laryngeal biomechanics. When the respiratory-tract infection ends and the mucosal oedema decreases, the hyperfunctional motorical pattern dysphonia can remain and functional dysphonia becomes a chronic state.^{2,26} A shortage of physicians in Slovenia and their lack of knowledge about vocal hygiene could be two reasons for not considering voice rest when experiencing voice problems.

As the great majority of studies on professional voice disorders include teachers, we attempted to compare our group of physicians to teachers in some particularities. With teachers, voice disorders were asso-

ciated with females.^{11,14,15} The anatomic and physiologic characteristics of the female larynx make women more susceptible to vocal load. Female vocal folds are shorter and vibrate twice as fast as male vocal folds, which means that the mechanical forces exerted on their vocal folds are twice as strong during vibration.²⁷⁻²⁹ There was a significant difference between the physicians and teachers regarding gender. Besides greater vocal load in teachers, greater female predominance in teachers can also be the reason for more frequent voice problems in their group than in the physicians' group.

In our study among physicians, gender was not identified as a significant risk factor for frequent voice disorders. On the other hand, among physicians with frequent voice problems there were only women, and the difference between the group of physicians with frequent voice disorders and the others was close to significant. For physicians, respiratory-tract infection was identified as the main reason for hoarseness. Only 11.7 % of Slovenian physicians reported having voice problems after vocal load, and that is probably the reason why gender was not identified as a risk factor for frequent voice disorders.

An age over 40 years was also detected as a risk factor for frequent voice problems in physicians. The same result was found for teachers in other studies.^{14,15} As a matter of fact, more than two thirds of the physicians included in the study were older than 40 years. In general, in an older population, more chronic and degenerative diseases occur than in a younger one. The physicians, of course, are not an exception.

The significant difference between the physicians with frequent voice disorders and those without them was frequent throat clearing, which can be a result of some chronic diseases (allergy, GERD, chronic sinusitis and retronasal drip). Therefore, it was not surprising that significant risk factors for frequent voice disorders in physicians were also GERD and allergy.

In conclusion, the prevalence of voice disorders among physicians working in outpatient departments in Slovenia is very high. Their working-day voice load reaches the

load of professional voice users, although this is mostly one-to-one communication. Respiratory-tract infection is the most common cause of their voice problems. GERD, allergies and an age over 40 years are stated as risk factors for voice disorders. In order to reduce the occurrence of voice problems, lessons on correct vocal technique, vocal hygiene, and additional information about diseases causing voice disorders should be included in the postgraduate education of outpatient physicians.

References

1. Vilkmán E. Voice Problems at Work: A Challenge for Occupational Safety and Health Arrangement. *Folia Phoniatr Logop.* 2000; 52: 120–5.
2. Koufman JA, Isaacson G. The Spectrum of Vocal Dysfunction. *Otolaryngol Clin North Am.* 1991; 24: 985–8.
3. Sataloff RT, Abaza MM. Impairment, disability and other medical-legal aspects of dysphonia. *Otolaryngol Clin North Am.* 2000; 33: 1143–1152.
4. Sataloff RT. Professional voice users: the evaluation of voice disorders. *Occup Med.* 2001; 16 (4): 633–47.
5. Child DR, Johnson TS. Preventable and nonpreventable causes of voice disorders. *Seminars in Speech and Language.* 1991; 12 (1): 1–13.
6. Van Houtte E, Van Lierde K, D Haeseleer E, Claeys S. The prevalence of laryngeal pathology in a treatment-seeking population with dysphonia. *Laryngoscope.* 2010; 120 (2): 306–312.
7. Fritzell B. Voice disorders and occupations. *Log Phon Vocol.* 1996; 21: 7–12.
8. Ruotsalainen J, Sellman J, Lic P, Lehto L, Verbeek J. Systematic review of the treatment of functional dysphonia and prevention of voice disorders. *Otolaryngol Head Neck Surg.* 2008; 138: 557–565.
9. Williams NR. Occupational groups at risk of voice disorders: a review of the literature. *Occup Med (Lond).* 2003; 53: 456–460.
10. Titze IR, Lemke J, Montequin D. Populations in the U.S. workforce who rely on voice as a primary tool of trade: a preliminary report. *J Voice.* 1997; 3: 254–9.
11. Russell A, Oates J, Greenwood K. Prevalence of voice problems in teachers. *J Voice.* 1998; 12 (4): 467–479.
12. Smith E, Lemke J, Taylor M, Kirchner LH, Hoffman H. Frequency of voice problems among teachers and other occupations. *J Voice.* 1998; 12 (4): 480–8.
13. de Jong FICRS, Kooijman PGC, Thomas G, Huinck WJ, Graaman K, Schutte HK. Epidemiology of voice problems in Dutch teachers. *Folia Phoniatr Logop.* 2006; 56: 186–198.
14. Soklic T, Hocevar-Boltezar I. Voice disorders among teachers in Slovenia: prevalence and some risk factors. *Zdrav Vestn.* 2004; 73: 493–7.
15. Roy N, Merrill RM, Thibeault S, Parsa RA, Gray SD, Smith EM. Prevalence of voice disorders in teachers and the general population. *J Speech Lang Hear Res.* 2004; 47: 281–293.
16. Munier C, Kinsella R. The prevalence and impact of voice problems in primary school teachers. *Occup Med (Lond).* 2008; 58 (1): 74–6.
17. Thomas G, Kooijman PGC, Cremers CWRJ, de Jong FICRS. A comparative study of voice complaints and risk factors for voice complaints in female students and practising teachers early in their career. *Eur Arch Otorhinolaryngol.* 2006; 263: 370–380.
18. Kooijman PGC, de Jong FICRS, Thomas G, Huinck W, Donders R, Graamans K, et al. Risk factors for voice disorders in teachers. *Folia Phoniatr Logop.* 2006; 58: 159–174.
19. Sliwinska-Kowalska M, Niebudek-Bogusz E, Fiszler M, Los-Spychalska. The prevalence and risk factors for occupational voice disorders in teachers. *Folia Phoniatr Logop.* 2006; 58(2): 85–101.
20. Hocevar Boltezar I. Prevalence and risk factors for voice problems in priests. *Wien Klin Wochenschr.* 2009; 121: 276–281.
21. Jones K, Sigmon J, Hock L, Nelson E, Sullivan M, Ogren F. Prevalence and risk factors for voice problems among telemarketers. *Arch Otolaryngol Head Neck Surg.* 2002; 128 (5): 571–7.
22. Hazlett DE, Duffy OM, Moorhead SA. Occupational voice demands and their impact on the call-centre industry. *BMC Public Health.* 2009; 9: 108.
23. Švab I, Petek Šter M, Kersnik J, Kalan Živcec G, Car J. A cross sectional study on performance of Slovene general practitioners. *Zdrav Var.* 2005; 44: 183–192.
24. Pribuisiene R, Uloza V, Jonaitis L. Typical and atypical symptoms of laryngopharyngeal reflux disease. *Medicina (Kaunas.)* 2002; 38(7): 669–705.
25. Murry T, Rosen CA. Vocal education for the professional voice user and singer. *Otolaryngol Clin North Am.* 2000; 33: 967–981.
26. Vilkmán E. Occupational safety and health aspects of voice and speech professions. *Folia Phoniatr Logop.* 2004; 56: 220–53.
27. Titze IR. Mechanical stress in phonation. *J Voice.* 1994; 2: 99–105.
28. Hocevar Boltezar I. Muscle tension dysphonia. *Zdrav Vestn.* 2004; 73: 605–9.
29. Methieson L. The voice and its disorders. 6th Edition. London, Philadelphia: Whurr Publishers; 2001.