

Prevalence of Voice Disorders in Iranian Primary School Students

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Summary: Objectives. The voice is the sound produced by vibration of our vocal cords and has an important role in verbal communication. A child's voice disorder may significantly impair his or her ability to be heard and understood. The purpose of this study was to determine the prevalence of voice disorders in primary school students.

Methods and Materials. In this descriptive-analytical study, a total of 501 fourth through fifth grade primary school students (boys = 51.6%, girls = 48.4%) with the age range of 10–12 years were selected from nine public school systems in Tehran that were assessed in October 2013 through March 2014. Presence of a voice disorder characterized by hoarseness was identified by a dual approach including investigator screening and parent identification. We used the grade of overall dysphonia, roughness, breathiness, asthenia, and strain scale for perceptual evaluation of voice. All children were assessed with video laryngoscopy examination by an otorhinolaryngologist. The recordings were made during spontaneous speech, counting numbers, sustained utterance of the (/a/) vowel, reading a standard passage in Farsi, and the ratio of /s/ and /z/. Statistical analysis was done *via* chi-square test and *t* test.

Results. Results indicated that the prevalence of voice disorders in primary school students is 53.2%. The results indicated significant differences between gender and subjects with lesions ($P = 0.00000$), gender and vocal disorders ($P = 0.04$), and s/z ratio and type of lesion ($P = 0.0002$).

Conclusion. Phonotrauma seems to play an important role in child dysphonia, with nodules as main diagnosis.

Key Words: voice disorders–school-age children–hoarseness–prevalence–gender.

INTRODUCTION

Communication is the primary role of speech, and the most important factor is the audibility of the speech sounds.¹ The larynx plays a vital role in the respiratory tract by allowing air to pass through it while preventing foods and drinks from blocking the airway. The larynx, also called the body's "voice box," contains the vocal cords that produce the audible sounds of speech. Therefore, any lesion found in it may cause communication problems.² Pediatric voice disorders may lead to voice problems in adulthood. This ultimately may require treatment or cause negative professional and personal consequences.

The voice acts as a carrier of words as well as a producer of music and expresser of emotions.² The voice reveals the inner self. Rosen and Sataloff³ and Allport and Cantril⁴ have shown that the pitch, loudness, and tempo of the voice can reflect a subject's personality. The speaker's voice may attract or repulse people. A soft, soothing voice is more apt to calm down an agitated person than a strident and loud voice. Also, the voice can reveal the physical state of the larynx. The weak or tremulous voice associated with illness is easily identified, and the voice altered by a laryngeal pathologic condition is identified as abnormal.¹ In other words, the voice is a powerful tool that not only delivers a message but also adds meaning. Voice problems are common among the pediatric population. Unfortunately, information on prevalence of dysphonia in children is very

limited.⁵ Also, we have very limited information about prevalence of pediatric voice disorders in Iran.⁶ The prevalence has been estimated to be anywhere from 11% to 36% among school-aged children in the United States⁷ ranging in age from 5 to 18 years, with the highest prevalence at the age of 6. Powell et al reported the prevalence rates of voice disorders in school-aged children to be between approximately 5% and 9%, but some studies placed the prevalence rate as high as 23.9%.⁸ Senturia and Wilson reported the prevalence of dysphonia to be between 6% and 38% in school-aged children.⁹

The most frequent cause of childhood dysphonia is vocal cord nodules, which have been found in 38%–78% of children evaluated for chronic hoarseness¹⁰; other vocal fold lesions, such as localized edema and irregularity at the junction of the anterior and the middle third of the vocal cords, have recently been found in 13.3% of the 617 children examined.¹¹ Saniga and Carlin believe that valid and reliable epidemiological information on pediatric voice disorders would greatly enhance our ability to plan future health-care provisions.¹² Tavares et al analyzed the voices of 363 children and found dysphonia values mildly lower at 4.4%.¹³ Duff et al investigated the prevalence of vocal disorders in 2445 children (girls = 1199; boys = 1246) from 2 to 6 years of age, and they found 95 (3.9%) children with atypical voices.¹⁴ Higher percentage values at around 13.8% were reported by Yairi et al in a vocal assessment of 1549 children.¹⁵ These discrepancies among studies may be minimized with the inclusion of other assessment methods in the studies. In the previous studies, different methods have been implemented for evaluation; for example, in the study done by Yairi et al, only investigators' judgment has been evaluated, but in Duff et al's study, children's vocal behavior has been monitored and evaluated during playing as well as during interaction with other children. Duff et al also took parents' and teachers' points of view and judgments into consideration.

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Beitchman et al argue that appropriate planning of speech and language services to children depends on adequate epidemiological data, such as prevalence. This information contributes to the development of sound theoretical models of the causes and correlations of speech and language disorders.¹⁶ Although most pediatric voice problems are not life-threatening, they often result in negative consequences including a delay in the development of communication skills; difficulty participating in classroom discussions; problems in educational performance, social interactions, and psychosocial functioning; and loss of productivity, self-esteem, and well-being.¹⁷ The purpose of this study was to determine the prevalence of voice disorders in primary school students.

MATERIALS AND METHODS

Participants

A total number of 501 primary school students (grade 4 and grade 5; boys = 259, girls = 242) from nine public schools in Tehran were screened for voice disorders from October 2013 to March 2014. The subjects were 10–12 years of age (mean age: 10.56 ± 0.76 in boys and 10.50 ± 0.70 in girls). Exclusion criteria are the following: belonging to an age range different from the established one; reporting a hearing disorder; having a genetic syndrome and/or craniofacial malformation; having a history of prolonged intubation or neck trauma; and having neurologic disorders involving voice and speech.

Laryngoscopy examination

All participants were assessed by video laryngoscopy examination that allows an objective evaluation of the superior respiratory tract, using a 70° rigid optic telescope to examine the supraglottis and glottis regions, as well as vocal folds' anatomic characteristics and the status of the epithelium.¹⁸

Voice sample

Data collection was performed by using only sound recording without videotaping. The equipment used was a TASCAM DR-100 recorder (TASCAM DR-100 MK II, TEAC corporation, US), an R-09 recorder, an AKG behind-the-ear microphone (AKG Acoustics, Vienna, Austria), and a portable loudspeaker. Before recording the samples' voices, the children were informed on how to perform the sound prolongation. We asked the children to take a deep breath and then to sustain the sound /s/ for as long as possible at a comfortable pitch and loudness on one exhalation, without straining. We used a stopwatch and recorded the time in seconds. We repeated the test for /z/. Voice samples were recorded in a quiet and empty room.

Presence of a voice disorder characterized by hoarseness was identified by a two-prong approach:

- Investigators screening: We used the grade of overall dysphonia, roughness, breathiness, asthenia, and strain (GRBAS) scale for perceptual evaluation of voice,¹⁹ which analyzes and categorizes the voice quality through subjective parameters. Each scale is rated as 0 (normal), 1 (slight), 2 (moderate), and 3 (severe). The voices were considered dysphonic when assigned scores were higher than 1 in the G parameter from the GRBAS scale.

The recordings were made during spontaneous speech, counting numbers, and sustained utterance of the (/a/) vowel; and the scale was employed by three experienced voice pathologists.

- Parent identification: We distributed 501 questionnaires among the parents and asked them to complete them. The questionnaires were in multiple-choice format to facilitate answering and analysis of the results. There were also a number of open-ended questions (Figure 1). The parents were also given a document with definitions of normal and altered voice and were invited to participate in some meetings to clear up their doubts and to receive general instructions on how to fill out the questionnaires.

Statistical analysis

Significance between groups was determined by using statistical tests: Student *t* test and chi-square test.

RESULTS

A total number of 501 primary school students aged 10–12 (boys = 51.6%, girls = 48.4%) from nine public schools in Tehran were assessed from October 2013 to March 2014, as shown in Figure 2. Results showed 53.2% (267 subjects) of the 501 examined primary school students are affected by dysphonia with a major prevalence among boys (32.6) compared with girls (20.6). Also, of the 267 subjects with dysphonia, 173 presented lesions in vocal folds (103 boys and 70 girls). Summary of the data for type of lesions is shown in Table 1. The 94 remaining subjects had dysphonia without any lesions. Out of 173 subjects who presented with lesions, 52.6% had bilateral nodules, 34.1% had edema, and 13.3% had irregularity at the junction of the anterior and the middle third of their vocal folds (Table 1). The results of GRBAS scale and the parents' reports on the vocal symptoms based on gender are summarized in Tables 2 and 3, respectively. The main vocal symptoms reported by the parents and the corresponding confidence thresholds, stressing hoarseness and fatigue upon speaking, are listed in Table 4. Factors responsible in worsening the vocal qualities reported by parents, such as excessive environmental noise, vocal abuse, and having the flu, are summarized in Table 5. The data show significant differences between gender of subjects concerning the presence of lesions ($P = 0.00000$), which indicates that the risk of lesions in boys is higher than in girls (Table 1). There are significant differences between gender and type of lesions ($P = 0.02952$) (Table 1), and gender and vocal disorders ($P = 0.03980$). Vocal disorders were present in 20.6% of the girls and in 32.6% of the boys. In this study, an s/z ratio test was performed for all subjects who had a lesion in the vocal cords. These results show significant differences between s/z ratio and type of lesion ($P = 0.0002$) (Figure 3).

DISCUSSION

The dispersion of the dysphonia in the pediatric population has steadily been increasing over the last few decades, and more attention is now being given to voice disorders. However, there is only minimal data in the literature about the prevalence of these

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