

FACTORS ASSOCIATED WITH VOICE DISORDERS: A SYSTEMATIC REVIEW

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Abstract

Introduction: During the ageing process, the larynx and structures involved in phonation undergo natural changes that account for the distinctive characteristics of geriatric voices. A voice disorder has occurred when, at any time, a person's voice fails and causes communication difficulties. This can have an adverse effect on communicative efficacy and quality of life, compromising mechanisms of socialisation, the maintenance of autonomy, and the feeling of well-being. However, there appears to be a lack of clarity regarding the factors associated with voice disorders in this population, particularly from an epidemiological standpoint.

Objective: This study aims to identify factors associated with voice disorders in elderly through a comprehensive systematic review.

Methods: A systematic review of literature published between 2004 and July 2023 was performed across several databases including MEDLINE/PubMed, Cochrane Library, and Google Scholar. Duplicate publications, review articles, and incomplete articles were excluded.

Results: We included four appropriate studies in this systematic review, involving 65.112 patients in total. The population of the study was elderly, aged 60 years and older. The factors associated with voice disorders include, but are not limited to, age, gender, comorbid conditions such as colds, sore throats, gastroesophageal reflux, arthritis, thyroid problems, bronchitis, sleep disorders, asthma, chronic obstructive pulmonary disease, vocal fold disease, depression or anxiety, and geographic locations.

Conclusion: Physical and psychosocial factors were associated with voice disorders in the elderly. However, the methodological differences between the studies included in this review, particularly in terms of sample selection and the instruments used, indicate a great deal of variability and undermine the results' reliability.

Keywords: Voice disorder, Elderly, Associated factors

INTRODUCTION

The ageing process is affected by factors that are present at birth and develop over the course of a person's lifetime. During this process, natural changes in the larynx and structures involved in phonation can explain the specific characteristics found in the voices of elderly people, such as hoarseness, breathiness, aphonia, vocal fatigue, effort required to improve vocal projection, a reduction in vocal extension, a trembling voice, difficulty controlling vocal intensity, pain in the region of the shoulder girdle, and a sensation of burning, odour, or a foreign body.

A voice disorder occurs when the voice fails or is considered by the individual to be different from usual, interfering with communication. It is not remarkable to observe a rise in the number of elderly patients seeking consultations for dysphonia as the population of individuals aged 65 and older increases. The incidence of vocal complaints in the geriatric population is approximately 12%–35%, according to reports.¹⁻³ The prevalence of vocal disorders ranged from 4.8% to 29.1% in the general population aged 60 or older.⁴

Dysphonia negatively affects the quality of life for all elderly patients. Frequently, it also significantly hinders the ability to communicate effectively. In fact, dysphonia and hearing impairment frequently coexist in the elderly; those with hearing impairment are more likely to have dysphonia than those without hearing impairment.^{1,2} Therefore, elderly patients with dysphonia may experience social isolation, anxiety, and melancholy, indicating the need to treat both dysphonia and hearing loss when treating these patients.^{1,2,5}

It is critical that older voice care is based on preventive behaviours and subsequent increases in vocal efficiency. To accomplish this, it is necessary to understand the factors associated with VDs among the elderly. It has been described that the physical, psychological, and life history of individuals, as well as bad behaviours and constitutional, racial, genetic, alimentary, social, and environmental factors, can affect the voices of elderly people.^{2,6-8} In spite of this, there appears to be a lack of clarity regarding the factors associated with voice disorders in this population, which can ensure the representativeness of a given population. In light of this deficiency, the purpose of this systematic literature review was to identify, from population-based studies, factors associated with voice disorders in the elderly.

Method

Search Strategy

A systematic review of literature published between 2004 and July 2023 was performed across several databases including MEDLINE/PubMed, Cochrane Library, and Google Scholar. The search strategy involved the following combinations of search descriptors based on the Medical Subjects Headings (MeSH): (voice disorder) AND (elderly) AND (associated factors) OR (risk factors).

Table 1. Literature search strategy

Database	Keywords	Results
PubMed	(voice disorder) AND (elderly) AND (associated factors) OR (risk factors)	461
Cochrane Library	(voice disorder) AND (elderly) AND (associated factors) OR (risk factors)	36
Google Scholar	(voice disorder) AND (elderly) AND (associated factors) OR (risk factors)	17,800

Eligibility Criteria

The following inclusion criteria were adopted: original articles published or accepted for publication in English, and a population aged 60 or older in developing countries and 65 or older in developed countries, per World Health Organisation criteria. The exclusion criteria of the studies are articles that are not indexed by Scopus, editorials, reviews, and articles that did not evaluate the focus of interest of this study. The research selection was carried out in three successive phases. The titles and abstracts of all search results were initially screened and evaluated for relevance. Second, complete access was gained to all potentially eligible studies. Finally, the systematic review included only those studies that met our inclusion criteria. The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guideline is used for the selection.

Data Extraction and Parameter Measured

The authors extracted the data from the articles. The following data regarding the factors associated with voice disorders in elderly are collected: Author, year of publication, study location, population, sample size, age of study subjects, instrument for diagnosing voice disorders, and factors associated with voice disorder in elderly.

Risk of Bias in Individual Studies

The quality of each study's methodology was determined by the manner in which patients were assigned to the study's arms, the confidentiality of allocation procedures, the use of blinding, and the amount of data lost due to attrition. The studies were then qualitatively classified in accordance with the 2019 Cochrane Handbook for Systematic Reviews of Interventions guidelines. Each study was designated to one of the three following categories based on the quality

assessment criteria: A: if all quality criteria were adequately met, the study was judged to have a low risk of bias; B: if one or more quality criteria was only partially met or unclear, the study was judged to have a moderate risk of bias; and C: if one or more criteria were not met, or not included, the study was judged to have a high risk of bias.

Results

The databases search identified a total of 18,297 articles (Table 1) and resulted in 17,336 articles after duplicates removed. Of these, 17,236 articles were excluded due to non-original study and titles and abstract not represented the focus of interest; and resulting in 100 articles for screening process. Articles not evaluating the focus of interest and articles in which full-text are not available are excluded, resulting in 15 articles for evaluation of eligibility criteria. Among them, 11 articles did not focus on the elderly population and did not give sufficient details about the associated factors of voice disorders in elderly. Hence, we found 4 appropriate studies included (Figure 1). The summary of the main findings of the selected studies is presented in Table 2.

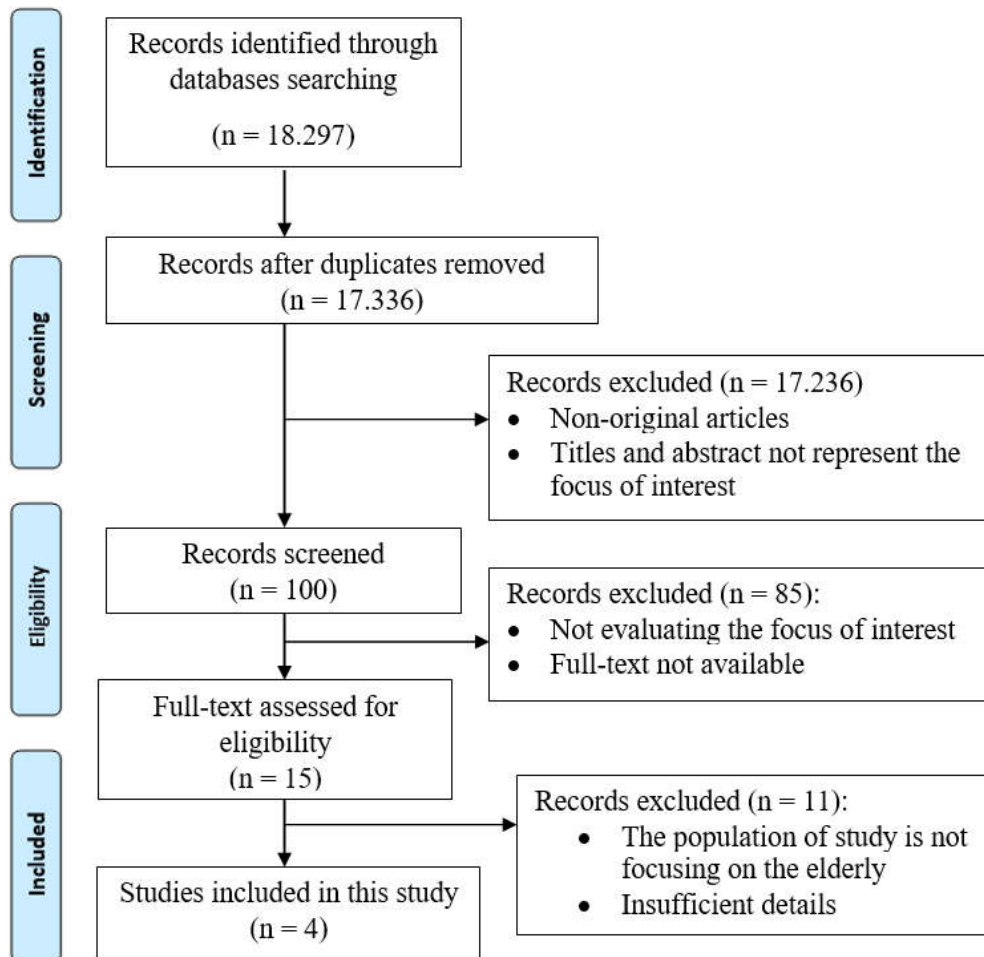


Figure 1. The search strategy based on PRISMA flow diagram

Table 2. Characteristics of studies evaluating factors associated with voice disorder in elderly

Author & year of publication	Study location	Population	Sample	Gender	Age	Instrument	Factors associated with vocal disorders
Roy et al. (2007) ²	Utah and Kentucky, USA	Elderly aged 65 years or older	117	Men: 39 (33.3%) women: 78 (66.7%)	65–94 years (76.1 ± 8.5)	Interview based on an adaption of a previous study's instrument (Roy, Merrill, Thibeault, Parsa, Grey, and Smith, 2004).	Colds Sore throat Gastroesophageal reflux Arthritis Thyroid problems Bronchitis Sleep disorders Feeling anxious or frustrated
Ryu et al. (2015) ⁶	Korea	Elderly aged 65 years or older	3759	Men: 1542 (41%) Women: 2217 (59%)	65 years and older (72.4 ± 5.5)	The Korea National Health and Nutrition Examination Survey (KNHANES)	Area of residence Body Mass Index (BMI) Self-rated health status Asthma Chronic obstructive pulmonary disease (COPD) Thyroid disease Cerebrovascular disease Vocal fold disease Depression
Roy et al. (2016) ⁷	US	Elderly aged >65	60,773	Men: 43% Women:	65–105 years (74.9)	International Classification of	Age, gender, comorbid conditions, geographic

Author & year of publication	Study location	Population	Sample	Gender	Age	Instrument	Factors associated with vocal disorders
		years		53%	± 6.6)	Diseases, Ninth Revision	location, and physician type
Góis et al. (2018) ⁹	Brazil	Elderly aged 60 years or older	463	Men: 181 (39.1%) Women: 282 (60.9%)	70 ±7.74 years	Rastreamento de Alterações Vocais em Idosos (RAVI) questionnaire	Gastroesophageal reflux Respiratory allergies Cold (three colds over a year) Sore throat (three colds over a year) Smoking (smoking for ≥1 y; current or past) Current use of professional voice Sought a physician or health professional care for voice disorders Self-reported difficulties in swallowing Self-reported hearing loss Temporomandibular disorder Hyposalivation Depressive symptoms

Discussion

The associated factors of voice disorders in the elderly can be classified as physical and psychosocial factors according to the findings of four studies included in this systematic review. The physical factors included age, gender, BMI, comorbid conditions such as colds, sore throat, gastroesophageal reflux, arthritis thyroid problems, bronchitis, asthma, chronic obstructive pulmonary disease (COPD), respiratory allergies, sleep disorders, cerebrovascular disease, vocal fold disease, self-reported difficulties in swallowing, self-reported hearing loss, temporomandibular disorder, and hyposalivation. The psychosocial factors included smoking, anxious or frustrated, depression, geographic location, physician type, current use of professional voice, sought a physician or health professional care for voice disorders.

Due to inflammatory conditions and edema present in the respiratory mucosa, which may impact the structures involved in the physiology of phonation, respiratory diseases are frequently associated with voice disorders.¹⁰⁻¹² The side effects of the medications used to treat these conditions, which can affect the salivary glands and respiratory mucus of the elderly, may also contribute to this association.^{12,13}

The presence of gastroesophageal reflux (GER) was also linked to voice disorders.¹⁴ It has been demonstrated that disorders of the digestive system, such as GER, impair the process of phonation by impeding the free movement of the diaphragm, favouring the aspiration of secretions, and altering vasomotor functioning by stimulating the vagus nerve. Aging-related physiological changes in the oesophagus, such as decreased saliva flow, decreased motility and oesophageal sphincter pressure, and hiatal hernias, may impact the prevalence and severity of GER. In addition, acid content may damage the larynx and cause inflammation, which diminishes a person's ability to communicate and may cause or exacerbate voice disorders.^{15,16}

Thyroid issues were described as contributing factors to voice disorders. Thyroid diseases may be associated with a raspy voice, shortness of breath when speaking, speaking exertion, and uncertainty regarding how the voice will begin to emit. This is due to the fact that dysregulation in the production of thyroid hormones can cause alterations in the lamina propria or excessive metabolic processes, resulting in vocal fold wear. It can be inferred that regardless of the type of thyroid disease, there may be vocal or respiratory phonatory apparatus-related physiological alterations.¹⁷

Areas of residence, BMI, and depression were also associated with voice disorders in the elderly. Elderly living in urban areas are more likely to be exposed to air pollution, which can irritate the pharyngeal and respiratory mucosa and induce a voice disorder.⁶ Weight, an additional factor that affects the voice, can influence vocal function by altering the abdominal respiratory support. When this decreases, the larynx may endure physiological and structural changes, including atrophy of the laryngeal muscles, thinning of the elastic and collagen fibres, and a reduction in the amount of hyaluronic acid in the vocal folds.¹⁸

The American study identified rheumatoid arthritis as a factor associated with VDs. This disease can cause lesions in the larynx, inflammation, edoema, swelling, and dryness of the vocal folds^{19,20}, with vocal nodules being a prevalent finding in patients with this condition.²¹

The general condition of health can be influenced by physiological changes in communication abilities that occur during the course of ageing²² and begin to interfere with the social lives of the elderly. Voice alterations caused by changes in the speech apparatus²³ can have a major impact on the psychological aspects of elderly people, interfering with their social functioning.²⁴

In a study conducted in the United States, vocal fold illness was linked to voice disorders. Voice issues in the elderly are caused by diseases related with ageing, such as benign vocal fold lesions, inflammatory disorders, laryngeal cancer, and laryngeal paralysis.²⁵

There is also an association between BMI and voice disorders. Obese elderly individuals may exhibit pathologies such as cardiovascular disease, metabolic syndrome, respiratory diseases such as sleep apnea, psychiatric diseases, neoplasias, dyslipidemias, and others, demonstrating an association with voice disorders, as these pathologies can cause physiological changes in the larynx or psychological changes in the individual.⁶

Another factor associated with voice disorders described in an article was sleep disturbance. Changes in normal sleep patterns may result from ageing, including a reduction in the number of stages of deep sleep and an increase in the number of stages of superficial sleep, fragmentation of nocturnal sleep, greater latency at the onset of sleep, and a reduction in the total duration of nocturnal sleep. These alterations may be the result of other disorders prevalent in this age group, such as depression, urinary difficulties, and neurological disorders, such as Parkinson's disease and strokes, which are extensively associated with voice disorders.²⁶

Increased anxiety and frustration are known to negatively impact the quality of life of elderly people from a psychosocial perspective. This association demonstrates that the voice is a characteristic that reflects the socio-emotional and clinical conditions of the individual, and that it is considered to be of the utmost importance in human and professional relationships. Consequently, elderly individuals with voice disorders are at a greater risk of social isolation, unproductivity, melancholy, anxiety, and a decline in general health.²⁷

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This study identified smoking as a risk factor for laryngeal diseases, including laryngeal carcinoma, and smoking was found to be associated with VDs. This risk is even more prevalent among older adults.^{29,30} There is evidence that the larynx is the organ most susceptible to histopathological changes after exposure to cigarette smoke, and that prolonged exposure to cigarette smoke alters vocal quality, causes irritation of the vocal tract, edoema of the vocal folds, coughing, a burning sensation, secretions, and infection.³¹

Moreover, self-reported hearing loss was related to VDs. The relationship between voice and hearing is symbiotic, particularly in terms of the auditory monitoring of speech. Therefore, older adults with difficulties in these communicative elements may have a diminished quality of life²³, resulting in symptoms of melancholy, distress, social isolation, and a negative self-evaluation of their general health.³² According to Góis et al., the prevalence of VDs in community-dwelling older individuals with self-reported hearing loss is roughly double that of those without hearing complaints. The results may imply that the likelihood of communicative restriction and psychosocial withdrawal is increased, thereby accelerating the decline of both functional capacity and quality of life, particularly in the group in which the disabilities coexist.⁹ In spite of the association between hearing loss and voice disorders, additional studies with instrumental auditory evaluation are required to confirm this result.²³ It is known that older adults with moderate to profound hearing loss have altered vocal production because they must exert more effort or increase their vocal intensity to hear themselves communicate.²³

The forms of identification and recruitment criteria utilised in the selected studies varied considerably. A methodological limitation was the varied instruments that were used to collect the data, which compromises the reliability of the results because elderly individuals can lose concentration more easily during questionnaire administration. It is suggested that short, rapid-application instruments be used so that elderly individuals can provide answers with a high degree of reliability and produce results that reflect the actuality of this population. The diversity of locations where the studies were conducted was another limitation of this review. Voice disorders are influenced by cultural values, way of life, socioeconomic-demographic variables, and local climate, among other factors. Consequently, it is crucial to broaden the purview of these studies.

Conclusion

Both physical and psychosocial symptoms are associated with voice disorders in the elderly according to the findings of this study. These findings may aid in the development of early screening procedures to identify individuals exposed to these risk factors, allowing for the development of interventions and health services aimed at enhancing the vocal quality and quality of life of ageing individuals. The methodological differences between the studies, especially in terms of sample selection and the instruments used, imply a great deal of variability and undermine the dependability of the results. From an epidemiological standpoint, it is essential to conduct prevalence studies in various cultures to investigate the factors associated with vocal disorders in the elderly.

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