

Title: A Preliminary Investigation of Voice and Swallowing Function in the Elderly Population**Author 1:** Sivaranjani G**Affiliation:** Clinical Supervisor Grade I, Department of Audiology and Speech-Language Pathology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu - 603 203, India**Author 2:** Santria K A**Affiliation:** Clinical Supervisor Grade I, Department of Audiology and Speech Language Pathology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu - 603 203, India**Author 3:** Vandhana P**Affiliation:** Clinical Supervisor Grade I, Department of Audiology and Speech Language Pathology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu - 603 203, India**Author 4:** Kala Samayan**Affiliation:** Professor and HOD Incharge, Department of Audiology and Speech Language Pathology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu - 603 203, India**Corresponding author:** Sivaranjani G**Affiliation:** Clinical Supervisor Grade 1**A Preliminary Investigation of Voice and Swallowing Function in the Elderly Population****Sivaranjani Gnanasekaran¹, Santria KA², Vandhana P³, Kala Samayan⁴**^{1,2,3}Clinical Supervisor Grade I, Department of Audiology and Speech-Language Pathology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu - 603 203, India

⁴Professor and HOD Incharge, Department of Audiology and Speech-Language Pathology, SRM Medical College Hospital and Research Centre, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu - 603 203, India

Abstract:

Voice and swallowing disorders can occur in the elderly due to anatomical and physiological changes or greater exposure to pathological conditions in aging, affecting communication and swallowing. These factors compromise the quality of life of the elderly people. The main aim of this study is to indicate the importance of finding the prevalence of voice and swallowing problems in the elderly due to aging. Voice Handicap Index 10 (VHI-10) and Eating Assessment Tool 10 (EAT-10) questionnaires were used to profile the voice and swallowing-related concerns. VHI-10 is an instrument to quantify patients' perception of their voice handicap, whereas EAT-10 is the instrument to document the initial dysphagia severity. These questionnaires were administered to 50 geriatric participants who were gender equally distributed. The results suggest that about 9% of the participants have problems with both voice and swallowing.

Keywords: Voice, Swallowing, Presbyphagia, Presbyphonia

INTRODUCTION:

Voice production is a highly intricate process that involves various physiological, biomechanical, and aerodynamic mechanisms, resulting in acoustic output. Swallowing is a process of bolus transition from the oral cavity to the stomach. Voice and swallowing are interconnected due to their shared anatomical structures. Throughout a person's lifespan, the oral cavity and vocal structures undergo numerous modifications that impact various swallowing parameters including duration of swallowing, swallowing trigger, and voice parameters such as frequency, intensity, and quality. These structural changes commence at birth and continue as part of the aging process.

Incidence & Prevalence:

According to the Population Census 2011, there are nearly 104 million elderly persons (aged 60 years or above) in India; 53 million females and 51 million males. A report released by the United Nations Population Fund and HelpAge India suggests that the number of elderly persons is expected to grow to 173 million by 2026. As there is an increase in the population size, there is also a steady increase in the prevalence of vocal-related disorders in this population. In a region-specific study, the prevalence of vocal-related disorders in the elderly ranged from 4.8% to 29.1% in (Kenio Costa de Lima, 2015). It affects around 30% of community-dwelling elderly, almost 50% of geriatric patients, and above 50% of nursing home residents (Doan, T. N. et al., 2022). However, the scarcity of literature about population-based studies in India, makes it challenging to identify and treat this population.

In one such rare study, Chatterji et al., (2008) predicted that 34% of the geriatric population will experience dysphagia due to modifications in social, economic, and medical

reforms. In fact, it has been estimated that as many as 20% of individuals over the age of 50 years, and most individuals by the age of 80 years, experience some degree of swallowing difficulty. Individuals over the age of 65 years accounted for 12.9% of population in 2009 and are expected to account for 19% of the population by 2030 (Rebecca Leonard, 2003). These large and growing numbers motivate us to understand about how aging affects swallowing.

Development of Anatomical structures related to voice:

The development of the oral cavity begins at 14 days from first branchial arch and larynx initiates at 25 days of gestation from the tracheobronchial groove. As individuals age, specific anatomical changes occur in the larynx, leading to alterations in the acoustic characteristics of the voice. For instance, prepubertal boys have lower and more closely spaced vocal tract resonances compared to girls, while men generally have a lower fundamental frequency than women. Men have longer vocal tracts, which enable them to produce lower formants (F_i) and narrower formant spacing (DF) compared to women. Additionally, men have longer and thicker vocal folds, resulting in a lower mean fundamental frequency (F_0), which is perceived as a lower pitch.

Development of Anatomical structures related to swallowing:

The development of anatomical structures related to swallowing is a complex process that involves multiple stages from fetal development through infancy and childhood. Suckling and Swallowing reflexes are present from birth and mature over the first year of life. They involve the integration of sensory feedback and motor responses, contributing to the development of safe and efficient feeding. The tongue begins to develop early in fetal life. It is crucial for moving food boluses to the back of the mouth and initiating the swallowing reflex (Sakai, Hisama 2020). The palate develops to separate the oral and nasal cavities, aiding in proper oral functions including sucking and swallowing. The intrinsic and extrinsic muscles that mature to facilitate efficient oral bolus transport and pharyngeal peristalsis (Langmore & Gould 2009). Pharyngeal development includes the maturation of pharyngeal muscles responsible for peristalsis and protective reflexes (Skandalakis, Zoras 2004). The epiglottis forms as a flap of cartilage to cover the larynx during swallowing, preventing food and liquids from entering the airway which ensures the coordination of breathing and swallowing.

Aging in Voice:

As individuals reach their sixties and beyond, structural changes occur in various physiological systems leading to changes in voice and swallowing. These changes can impact the accuracy, speed, range, endurance, coordination, stability, and strength of muscular movements. Age-related changes in the larynx encompass the hardening of laryngeal cartilages, atrophy and degeneration of intrinsic laryngeal muscles, deterioration of the cricoarytenoid joint, degeneration of laryngeal mucosa glands, degenerative changes in the lamina propria, degenerative changes in the conus elastics, and a decrease in laryngeal blood flow. These modifications can lead to presbyphonia, a voice condition characterized by changes in pitch, pitch range, loudness, and voice quality among older individuals (Roy et al., 2007).

Ageing in Swallowing:

Even healthy aging contributes to changes in eating, only some of which are related to swallowing per se. The aging process leads to alterations in olfaction and gustatory sensation that can affect appetite, dietary selection, and amount of oral intake. Sarcopenia (decreased muscle mass and quality with advancing age) has been shown to affect the muscles used for swallowing, given that they are of the skeletal type (Molfenter et al., 2019; Buehring et al., 2013). Due to these effects, the force generation capacity of the oral tongue has been shown to decrease with advancing age, leading to reduced pressure generation during the oral phase and poor bolus clearance (Salai et al., 2017; Hara et al., 2018; Nicosia et al., 2000). Changes in the muscles of mastication result in slower and inefficient chewing, increasing the risk of asphyxiation (Morita et al., 2018). Aging also results in lower salivary flow rates (Affoo et al., 2015) which, in combination with medication effects, can lead to the onset of xerostomia. Many medications older adults consume also contribute to decreased appetite, incoordination, and esophagitis, further exacerbating the problem. Thus, in an older adult with concerns related to eating, it is important to distinguish whether dysphagia is a significant contributor or if other factors predominate. Aging can significantly impact anatomical structures related to swallowing, leading to changes in function and potentially increasing the risk of swallowing difficulties (dysphagia).

Need of the Study:

The increasing number of elderly in our country indicates that in the future it will be imperative for Speech Language Pathologists to handle this large group of population. Hence this preliminary study is conducted to find the prevalence of voice and swallowing problems in the elderly in Chennai city.

Research on swallowing and voice disorders has prime importance in preparation for preventing and rehabilitating these conditions to improve overall well-being and reduce long-term disability in a significant proportion of the elderly population. The growing numbers generate a need for a deeper understanding of the effects of aging on swallowing and vocal function, in order to outline proper assessment and management. The availability of such data can help in predicting the prevalence, progress and severity of the disorders in this population. The current study is a preliminary attempt to obtain the prevalence in the specific region among geriatric members of the society.

AIM OF THE STUDY:

The preliminary study aims to find the prevalence of voice and swallowing problems in the elderly and creation of awareness among professionals for management to overcome those problems and find suitable treatment.

METHODOLOGY:

Subjects: A cross-sectional study of independent-living residents of Chennai was the subject of this study. 50 participants (25 males & 25 females) with the age range of 60-80 years are selected for this study. Based on gender all the participants were equally distributed. The informed consent form was obtained from all the participants before commencing the study.

Inclusion criteria: Individuals between the ages of 60 to 80 years of age. Individuals with Functional mobility and cognitive dependency. Individuals with

Exclusion Criteria: Individuals with history of respiratory problems, Gastrointestinal Disorder, Kidney diseases, Heart diseases, history of tobacco / paan chewing and alcoholism and other major illnesses are excluded from the study.

Test material used: The subjects are administered with a 5-point rating voice questionnaire Voice Handicap Index 10 (VHI-10) and swallowing questionnaire Eating Assessment Tool 10 (EAT-10). VHI-10 is a questionnaire with statements individuals used to describe their voices and the effects of their voices on their lives (Rosen, C. A., et al. 2004). EAT-10 is a self-administered instrument that may be utilized to document the initial dysphagia severity and monitor the treatment response in persons with a wide array of swallowing disorders (Belafsky et al., 2008).

Procedure: Following the exclusion criteria, 50 individuals proceeded for further study with a mean age of 66 years. Every participant was explained about the outcome and usefulness of the study. Informed consent was obtained from all the participants. Basic history was collected on voice usage, medical history, and regular food habits of the participants. Both VHI-10 and EAT-10 questionnaires were rated by every participant.

RESULTS:

The data are quantitatively analyzed using SPSS software. As the four participants failed to fill out the proforma and few have given double scoring. Thus, five data were excluded from the study. Analysis revealed that among the 45 participants, 9 % of them reported they had problems with both voice and swallowing. Only a few of the participants met the criteria for VHI-10 (scores >11) and EAT-10 (scores >3). Most of the individuals had concerns about voice and swallowing problems but did not fall under the criteria.

VHI-10 revealed that 13% of the participants had changes in their voice. A total of 18 of the participants reported - I feel as though I have to strain to produce voice. 13 participants reported that people ask “What's wrong with your voice?” and People have difficulty understanding me in a noisy room. 12 participants reported – My voice makes it difficult for people to hear me and the clarity of my voice is unpredictable. A mean of 3.83 and a maximum score of 28 was obtained from this study.

Based on the EAT-10 tool 33% of the participants had problems in swallowing. All 25 participants reported the question I cough when I eat. 22 participants reported that swallowing pills takes extra effort. 13 participants reported that When I swallow food sticks in my throat and Swallowing liquids and solids takes extra effort. A mean score of 3.6 was obtained for the EAT-10 questionnaire.



Figure 1 & 2: Percentage of Voice and Swallowing problems in the elderly

DISCUSSION & CONCLUSION:

The aging individuals are usually concerned about the loudness of their voices, teachers are concerned about the endurance of their voices, and singers are concerned about their voice quality. Aging changes can impact the accuracy, speed, range, endurance, coordination, stability, and strength of muscular movements. VHI-10 revealed about 13% of the participants had concerns related to swallowing. Most of the participants have reported that they have difficulty in predicting their voice clarity.

Dysphagia in simple is a difficulty in swallowing. It is a symptom and not a disease. Patients with the symptoms of dysphagia can have a vast array of clinical diagnoses, ranging from mild acid reflux to terminal oesophageal cancer. Because dysphagia is a symptom, the clinician must be able to document the severity of a patient's self-perception of the disability caused by the swallowing problem (Peter C. Belafsky et. al 2008). The results from this study suggest that 33% of participants had difficulty in swallowing.

The results of this study will assist in differentiating between normal aging and disordered communication or swallowing function. Speech Language Pathologists provide vital services to those individuals who have communication, cognitive, and swallowing impairments following illness, trauma or disease. They also have a significant role in preventing communication and swallowing disorders by promoting a healthy lifestyle and educating consumers about how to prevent the disorders that may lead to impairment.

SLP provides vital services to those individuals who have communication, cognitive, and swallowing impairments following illness, trauma, or disease. They also have a significant role in preventing communication and swallowing disorders by promoting a healthy lifestyle and educating consumers about how to prevent the disorders that may lead to impairment. The present study is one such effort to understand the occurrence and severity of vocal and swallowing-related disorders in the elderly. Knowing the existence of these problems will pave the way for creating awareness among professionals involved in treating the geriatric population. The team approach, early identification, and appropriate intervention will produce optimal results to drastically improve the quality of life for the elderly.

Future Directions: As this was a preliminary study, a larger population and objective analysis had to be done to find the exact prevalence of presbyphagia and presbyphonia in the elderly.

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