Age-related Hearing Loss and Its Correlation with Depression
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ABSTRACT
Age-related hearing loss (ARHL), commonly referred to as presbycusis, ranks as the third most prevalent health issue among older individuals, following heart disease and arthritis. This is a progressive, symmetrical, age-related sensorineural hearing impairment that primarily affects higher frequencies. This review was aimed to describe age related hearing loss and depression in elderly people. Individuals who suffer from tinnitus and experience difficulty discerning speech in noisy environments are at a higher risk of developing paradoxical hypersensitivity to loud sounds. Consequently, individuals with age-related hearing loss (ARHL) experience increased challenges in perceiving consonant sounds inside words. These sounds play a crucial role in conveying the main message of a word, aiding in syllable separation, and indicating word boundaries. Healthcare providers must prioritize the screening and detection of HL (hearing loss) and depression. Initially, primary care providers may be most adept at identifying both hearing loss (HL) and depression.

The prevalence of age-related hearing loss (ARHL) increases significantly from the second to the seventh decade of life. In adults aged 20–29, the incidence is 3%, while it nearly doubles to 45% in adults aged 60–69. Furthermore, it exceeds 80% in individuals over the age of 80. Most of the information regarding the epidemiology of age-related hearing loss (ARHL) has been derived from extensive studies involving a large group of individuals, where audiometric testing was conducted as a component of the assessment procedure. Men have a higher likelihood of developing hearing loss compared to women of the same age; however, African-Americans have a reduced risk compared to white or Hispanic Americans. The exact reasons for these ethnic variances in hearing sensitivity remain uncertain. However, it is theorized that they could be associated with variations in

1. Introduction
Hearing impairment is a common occurrence among elderly individuals, affecting around one-third of those aged 65 and above. Hearing loss (HL) is the third most prevalent chronic health problem among older adults, and its frequency increases as individuals age. Age-related hearing loss (ARHL), commonly referred to as presbycusis, ranks as the third most prevalent health issue among older individuals, following heart disease and arthritis. This is a progressive, symmetrical, age-related sensorineural hearing impairment that primarily affects higher frequencies. The primary cause of ARHL is typically age-related pathological alterations, specifically the degeneration of hair cells located at the basilar membrane, leading to a decline in high-frequency auditory perception.¹³

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lifetime noise exposure or other environmental hazards, as well as disparities in melanin levels.\textsuperscript{4,5}

ARHL typically manifests in individuals in the later stages of middle age, primarily affecting their ability to hear high-frequency sounds associated with conversation. Over time, the condition progresses to impact the perception of lower-frequency tones. The range of human hearing frequencies spans from 20 Hz to 20,000 Hz, but speech frequencies typically fall within the range of 400 Hz to 5000 Hz. Hearing loss is most pronounced at frequencies equal to or exceeding 2000 Hz. Consequently, individuals with age-related hearing loss (ARHL) experience increased challenges in perceiving consonant sounds inside words. These sounds are crucial for conveying the main significance of a word, dividing syllables, and indicating word boundaries. The decline in semantic content leads to a decrease in speech intelligibility. This is due to the absence of clear word boundaries, resulting in the perception of jumbled speech. Additionally, the absence of syllables further complicates the differentiation of words that sound similar.\textsuperscript{6,7}

ARHL is linked to significant psychological and physiological morbidity, such as social isolation, frailty, depression, and cognitive decline, despite not being life-threatening. Multiple authors have suggested that hearing loss (HL) might contribute to depression, perhaps due to heightened social isolation and changes in brain structure associated with HL. Research has demonstrated a correlation between hearing loss (HL) and depression in individuals of various age groups. Prior study found a correlation between age-related hearing loss (ARHL) and increased feelings of depression in older individuals who are otherwise in good health, both in terms of a single point in time and over a period of time. Individuals suffering from age-related hearing loss (ARHL) had 1.63 times higher chances of experiencing an increasing pattern of depression symptoms and 1.85 times higher chances of having consistently high levels of depressive symptoms during a 10-year period, compared to individuals without hearing loss. Bigelow et al. found a link between self-reported health literacy (HL) and mental distress, the use of antidepressant and anxiety medications, and the use of mental health care services in a sample of US people that is a good representation of the whole country.\textsuperscript{3,6}

While the effect on the severity of symptoms and major depression disorder (MDD) is not very clear, hearing loss (HL) does increase the likelihood of acquiring clinically significant depression symptoms in older adults, both at a given point in time and over time. Healthcare professionals who understand hearing loss (HL) and its psychosocial effects better can help find HL and depression more quickly, which will allow for more effective intervention. Currently, there is only a limited amount of evidence supporting intervention for this particular population. This is an imperative subject that necessitates additional investigation and experimentation to provide guidance for implementation. Because HL is a big threat to the mental and social health and well-being of older people, we need to look into and use specific interventions for this group to improve their quality of life and ease the stress on their mental health.\textsuperscript{8}

**Physiological and clinical manifestations of hearing impairment associated with aging**

Age-related hearing loss (ARHL), also known as presbycusis, is marked by a higher sound threshold and a loss of the ability to understand speech, especially in noisy or complicated environments. Hearing loss is not attributed to a single cause but rather arises from a combination of risk factors that influence when it begins, how severe it becomes, and how it progresses. Numerous medical, psychological, and pharmaceutical factors can make age-related hearing loss (ARHL) worse and cause it to manifest more gradually. To diagnose presbycusis, it is necessary to eliminate any simultaneous medical and pharmaceutical influences and then conduct a thorough examination of the patient’s history, physical condition, and audiological tests. Onset of hearing loss can occur at any age; however, it is often identified during the sixth decade of life and progresses gradually and evenly throughout the following decades.\textsuperscript{1,8}

Individuals who suffer from tinnitus and experience difficulty discerning speech in noisy environments are at a higher risk of developing
paradoxical hypersensitivity to loud sounds. Consequently, individuals with age-related hearing loss (ARHL) experience increased challenges in perceiving consonant sounds inside words. These sounds play a crucial role in conveying the main message of a word, aiding in syllable separation, and indicating word boundaries. The language knowledge lost due to presbycusis is responsible for many of its symptoms. The decline in meaning leads to a decrease in speech intelligibility. The absence of clear word boundaries results in speech appearing jumbled. Additionally, the absence of syllables makes it more challenging to differentiate between words that sound similar.

Changes that happen over time in the inner ear lead to hearing loss. These changes include the loss of inner and outer hair cells, spiral ganglion cells breaking down, and the stria vascularis getting smaller. Additionally, there is a disruption in the way that the neurons process auditory information. The exact cause of these alterations, as well as the specific proportion of peripheral to central contributions, remains uncertain.

In a frequency range of 125 Hz to 8 kHz, pure-tone audiometry checks the overall health of the auditory pathway. It is a useful tool for determining the degree and scope of hearing impairment. Speech perception is reduced in a way that is not proportional to the extent of hearing loss, and the accuracy of temporal coding is compromised due to dysfunction in the central auditory system. In order to measure central auditory processing problems, it is necessary to conduct more advanced behavioral and/or electrophysiological studies. These tests involve presenting separate pieces of information to each ear and assessing the listener’s ability to grasp them simultaneously.

Treatment of age-related hearing loss and depression

Moreover, an increasing amount of research indicates that hearing loss elevates the likelihood of experiencing depression. There is a consistent and reciprocal association between hearing loss (HL) and depression in older individuals. A longitudinal study, however, yields a diverse range of outcomes. Early surveys indicate a positive correlation between hearing difficulties in senior individuals and higher scores on depression symptom ratings. Several studies found depressive symptoms were associated with mild hearing loss but not moderate or severe hearing loss. Individuals with mild, moderate, or more severe hearing loss demonstrated a higher susceptibility to both moderate and severe psychological discomfort in comparison to those without hearing loss.\(^{11-13}\)

Patients’ ability to control stress affects how they deal with the daily challenges of auditory problems. Patients may exhibit their discontent either overtly or internally. Patients may express dissatisfaction with others regarding their grandchildren’s inarticulate or rapid and subdued speech. Internally, patients may become disengaged from interactions occurring directly in their line of sight. This state of isolation might have an impact on the process of treating age-related hearing loss (ARHL). Some people may choose not to acknowledge their hearing impairment because of the negative perception surrounding it. Late-life depression sometimes manifests as physical symptoms and a lack of energy, known as “depression without sadness,” making it challenging to spot using conventional screening methods.

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graphically displays the puretone thresholds in relation to frequency. Medical data indicates that hearing aids effectively enhance health-related quality of life by mitigating the psychological, emotional, and social consequences of hearing loss, particularly in older individuals with mild to moderate hearing impairment. Studies have demonstrated that the utilization of hearing aids and auditory rehabilitation can effectively alleviate symptoms of depression. A recent study discovered that a 6-month regimen of auditory training, coupled with 3 months of hearing aid usage, significantly alleviated depressive symptoms to a considerable extent. Elderly individuals who utilize a conventional hearing aid, a customizable hearing aid with options for different listening environments, or an assistive listening device experience an enhanced health-related quality of life.5,6

In the US, bone-anchored hearing aid (BAHA) systems and other osseointegrated hearing implants can be used on people who have single-sided deafness (SSD) or conductive/mixed hearing loss (CMHL) and don’t get any benefit from standard amplification. The initial application of BAHA systems was to patients who had undergone dental implant procedures. These participants reported the perception of sound through an osseointegrated dental implant. The developments in BAHA technology and treatment have significantly minimized complications.13,14

While the majority of elderly individuals with hearing impairments can benefit from amplification, approximately 10% of older patients with hearing loss have such a severe condition that amplification proves to be ineffective. While cochlear implants have demonstrated efficacy in enhancing health-related quality of life, there was no observed decrease in symptoms of anxiety or depression at the 12-month mark following the surgical procedure.15

It is expected that communication problems in people who have hearing loss will have a big effect on how conventional psychological “talk therapies” are delivered and how well they work. Therefore, older individuals with hearing loss may particularly benefit from focusing on the physical symptoms of depression. Given the association between somatic symptoms and a heightened propensity for suicidal thoughts in individuals already at a high risk of suicide, this holds particular significance.10-14

2. Conclusion

Audiological rehabilitation, which incorporates the utilization of hearing aids, can effectively improve mental well-being.

3. References


