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HEARING AID EFFECTIVENESS ON PATIENTS WITH CHRONIC TINNITUS AND ASSOCIATED HEARING LOSS : SYSTEMATICS REVIEW

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Abstract

Tinnitus, the perception of sound in the absence of an obvious external source, is even more frequent, affecting around ten percent of adults in the United States. Tinnitus is defined as the sense of sound in the absence of an obvious external source. Tinnitus is typically accompanied by hearing loss, but this is not always the case. It is conceivable for it to occur either by itself or in conjunction with a loss of hearing of any type. Tinnitus and hearing loss are both caused by a wide variety of conditions, the most frequent of which is age-related hearing loss. Other, less common causes include malignancies of the brain and skull base. Hearing loss can be broken down into three basic categories: sensorineural, conductive, or mixed (where both conductive and sensorineural components are present). The perception of sound in the absence of external acoustic stimulation for an extended length of time (more than three months) is the hallmark of chronic tinnitus. Tinnitus is quite common, with an estimated incidence of 10–15% in the adult population; however, prevalence estimates can vary widely from study to study. Tinnitus is characterized by a buzzing or ringing sound in the ear. A minority of people may experience severe psychological distress as a direct result of the situation, despite the fact that the majority of people are able to adapt to the perception and report very mild emotional distress as a result of it. Tinnitus Questionnaire (abbreviated as TQ), Tinnitus Handicap Inventory (abbreviated as THI), and Tinnitus Functional Index (abbreviated as TFI) are the three self-report questionnaires that are used the most frequently for quantifying tinnitus-related suffering. The total scores of these measures properly capture both the suffering associated with tinnitus and the change that is attributable to treatments. In patients who have tinnitus and chronic hearing loss, the use of hearing aids is successful in suppressing the symptoms; however, the usage of the device must be carried out for at least six months in order for the treatment to take effect.

Keyword: *Chronic tinnitus; Frequency; Hearing aid; Hearing loss*

INTRODUCTION

Around five percent of the world's population has hearing loss severe enough to interfere with their daily lives, and many more people have some degree of hearing impairment. Hearing loss can have a substantial negative impact on quality of life, and it frequently plays a role in the development of mental illnesses such as depression and cognitive decline. Hearing loss is more common in older persons, with approximately one in three adults older than 65 years suffering from debilitating hearing loss. This condition affects men slightly more frequently than it does women.[1–3]

Tinnitus, which is the perception of sound in the absence of an obvious external source, is even more prevalent, affecting around ten percent of adults in the United States. Tinnitus is frequently associated with hearing loss, though this is not always the case. It is possible for it to happen on its own or in conjunction with hearing loss of any kind. The causes of hearing loss and tinnitus are varied and range from relatively common age-related hearing loss to rare tumors of the brain and skull base. Hearing loss can broadly be classified as sensorineural, conductive, or mixed (where both sensorineural and conductive components are present).[4–6]

In sensorineural hearing loss, the pathology lies within the inner ear and central hearing mechanisms in the brain and brainstem, whereas in conductive hearing loss there is impairment in the elements that conduct sound into the inner such as the ear canal, tympanic membrane, or ossicular chain.[1,7] Hearing loss severity is classified according to an average of loudness thresholds across the frequency spectrum compared with a person of normal hearing. This metric is called a pure-tone average and is a commonly reported measure of hearing severity.[6,8]

Hearing aids help severe hearing loss patients. Audiologists customize hearing aids to boost and filter specific frequencies. They often link wirelessly to phones and other devices.[9] Hearing aids help sensorineural and conductive hearing loss patients. Speech discrimination scores are ideal for hearing aid candidates. Even with strong hearing aids, people with poor speech discrimination report poor speech understanding and clarity. Chronic ear disease patients may not tolerate ear devices.[10,11] The purpose of this study is to demonstrate the hearing aid effectiveness on patients with chronic tinnitus and associated hearing loss.

METHODS

By adhering to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines, the author ensured that the study was conducted appropriately and that the results were trustworthy. The research was conducted in accordance with these guidelines, guaranteeing its quality. This is done to ensure that the study's conclusions are accurate, and it is done to guarantee this. The purpose of this literature review is to demonstrate the efficacy of hearing aids for patients with chronic tinnitus and associated hearing loss by evaluating or analyzing previous research on the subject.

The paper's main goal is to emphasize the importance of considering the issues raised. The study participants have to meet one or more of the following criteria: 1) The study must be written in English and focus on hearing aid effectiveness in individuals with persistent tinnitus and hearing loss to be published. Acceptance of the manuscript requires this. 2) This evaluation includes publications published after 2018 but before the core focus of this systematic inquiry. Editorials, submissions without a DOI, review articles that have previously been published, and entries that are substantially identical to journal publications are not allowed.

We used “hearing aid”; “chronic tinnitus”; and “hearing loss” as keywords. The search for studies to be included in the systematic review was carried out from May, 17th 2023 using the PubMed and SagePub databases by inputting the words: *("hearing aids"[MeSH Terms] OR ("hearing"[All Fields] AND "aids"[All Fields]) OR "hearing aids"[All Fields] OR ("hearing"[All Fields] AND "aid"[All Fields]) OR "hearing aid"[All Fields]) AND ("chronic"[All Fields] OR "chronical"[All Fields] OR "chronically"[All Fields] OR "chronicities"[All Fields] OR "chronicity"[All Fields] OR "chronicization"[All Fields] OR "chronics"[All Fields]) AND ("tinnitus"[MeSH Terms] OR "tinnitus"[All Fields]) AND ("hearing loss"[MeSH Terms] OR ("hearing"[All Fields] AND "loss"[All Fields]) OR "hearing loss"[All Fields])* used in searching the literature.

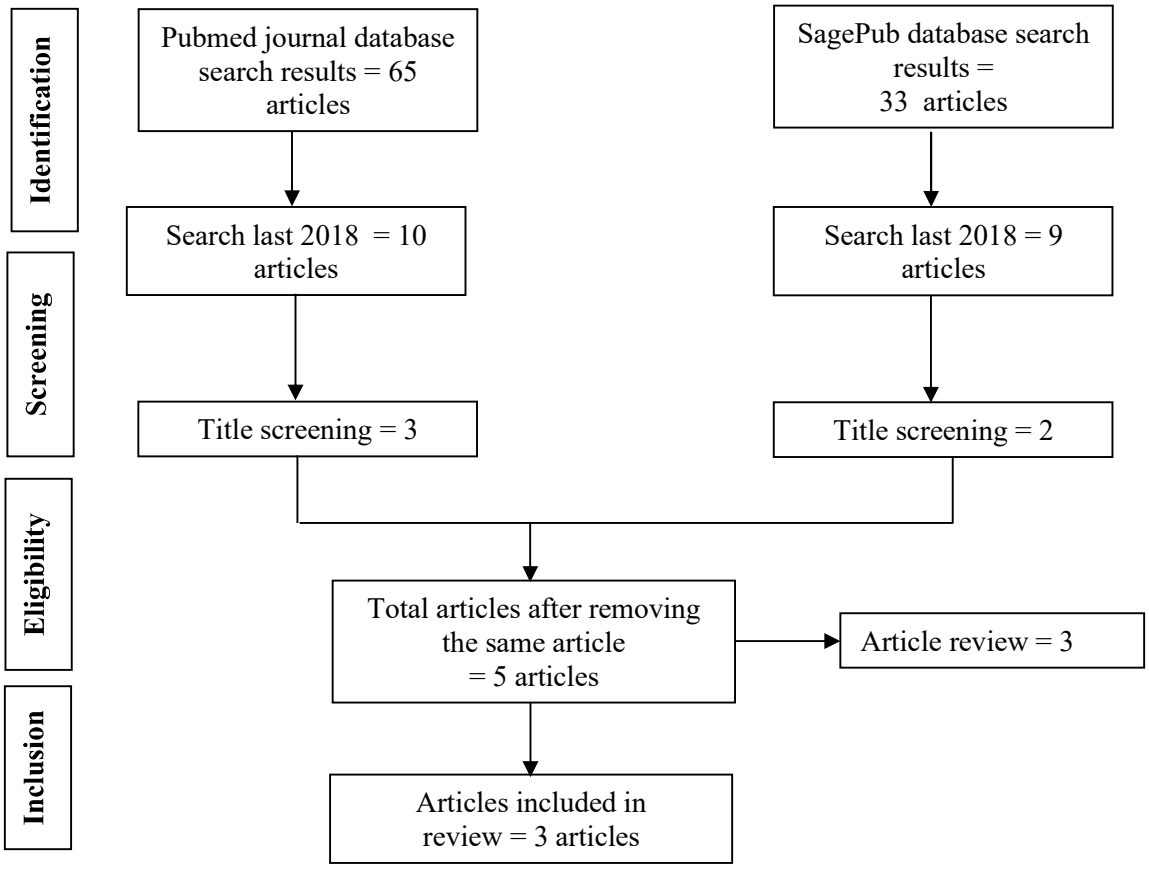

Figure 1. Article search flowchart

The writers used the abstract and title of each study to determine whether or not it qualified for inclusion. After then, the authors chose previous studies to use for this article. Analysis of a large number of publications following the same pattern led to the discovery of this result. All English contributions are required to be previously unpublished. Only those studies were considered for inclusion in the systematic review that fulfilled all of the criteria.

The search only delivers results that are helpful to the user. We don't consider research that doesn't meet our standards. Following that, the research will be analyzed. The names of people, the authors of the study, the publication date, the location, the study activities, and the parameters were found in this study. Each author conducted their own investigation into the research that was outlined in the publication's title and abstract before making a decision regarding which publications to examine in greater detail.

The next step will be to examine all of the articles that are qualified for inclusion in the review because they fulfill the requirements outlined in the review's inclusion criteria. Following that, we will select the papers that will be discussed in the review depending on what we have discovered. Based on this criterion, certain manuscripts are selected to undergo an evaluation. in order to simplify the process of selecting papers for further evaluation as much as is humanly practicable.

RESULT

Simonetti, et al (2022)[12] contucted a study with 19 patients. Following the usage of hearing aid (HA) for a period of six months, a decrease in the reported severity of tinnitus as well as scores on hearing handicap ratings was found, both statistically and clinically. A comparison was made between Minimum Masking Level measurements (MML), pitch matching, and loudness matching of the initial evaluation and the final evaluation. After using HA for a period of six months, MML's thresholds decreased dramatically.

Table 1. The litelature include in this study

Author	Origin	Method	Sample Size	Result
Simonetti, 2022[12]	Brazil	Prospective cohort study	Nineteen patients with chronic tinnitus and untreated sensorineural hearing loss	According to the findings of this research, HA fitting is an effective therapeutic method for the reduction of persistent tinnitus in patients who also have an associated hearing loss subtype.
Simonetti, 2022[13]	Brazil	Randomized, controlled trial	33 patients with and without tinnitus	In the analysis, the metabolic profile of the hearing loss control group did not demonstrate any significant changes. We were able to identify areas that were implicated in decreases in tinnitus

				handicap as a result of the intervention by isolating the impact of tinnitus independent of hearing loss. This allowed us to do so. The regions of the brain that were investigated in this study may be a component of a network that is unique to chronic tinnitus.
Boecking, 2022[14]	Germany	Randomized, controlled trial	One-hundred-seventy-seven gender-stratified patients	Mildly bothered patients with persistent tinnitus and mild-to-moderate hearing loss experience a significant and long-lasting improvement in tinnitus-related suffering after receiving the researched hearing therapy. Research should be done to learn more about the positive psychological knock-on effects.

Other study by Simonetti, et al (2022)[13] showed tinnitus scores decreased six months after HA implantation. Within the tinnitus group, the analysis revealed increased glycolytic metabolism in the left orbitofrontal cortex, right temporal lobe, and right hippocampus, and decreased glycolytic metabolism in the left cerebellum and inferior parietal lobe. Analysis of the hearing loss control group revealed no significant metabolic alterations. By isolating the contribution of tinnitus independent of hearing impairment, we were able to identify areas implicated in reductions in tinnitus disability as a consequence of the intervention. Brain regions implicated in the present investigation may be part of a network specific to chronic tinnitus.

Boecking, et al (2022)[14] showed the intensity of the distress symptoms was rather low. In contrast to the DIG, the IIG was associated with considerable reductions in the distress caused by tinnitus. Both groups saw a small amelioration of several psychological epiphenomena, the most notable of which was anxiety. Within-group studies indicated that the tinnitus-related effects on stress were stable, and uncontrolled improvements in perceived stress and mood-related symptoms were observed at follow-up. Conclusions: Mildly bothered patients with persistent tinnitus and mild-to-moderate hearing loss experience a significant and long-lasting improvement in tinnitus-related suffering after receiving the researched hearing therapy.

DISCUSSION

Chronic tinnitus is the perception of sound without external acoustic stimulation for an extended period of time (>3 months). Tinnitus is prevalent, with an estimated prevalence of 10–15% in the adult population; however, prevalence estimates vary greatly across studies. Despite the fact that the majority of people acclimate to the perception and report minimal emotional distress, a minority of people experience significant psychological distress as a result. The Tinnitus Questionnaire (TQ), Tinnitus Handicap Inventory (THI), and Tinnitus Functional Index (TFI) are the most frequently used self-report questionnaires for measuring this type of tinnitus-related distress. These measures' total scores adequately capture both tinnitus-related distress and intervention-related change.[15]

Tinnitus is associated with hearing loss, which is one of the risk factors for the condition. Approximately 90% of people who suffer from tinnitus also report having some degree of hearing loss. It is hypothesized that if auditory input is restored, central nervous system gain and neural hyperactivity may be reduced, which in turn may promote and build up secondary brain plasticity, and provide a permanent advantage on reducing tinnitus awareness.[16] It's possible that methodological considerations are to blame for the scant evidence of HA's efficacy in treating tinnitus that's been found in systematic reviews.[17]

Using a randomized, controlled, cross-over design, the immediate intervention group demonstrated substantially greater reductions in tinnitus-related distress than the delayed intervention group. This is the first study to demonstrate that the 14-day Terzo hearing therapy may enhance self-reported psychological tinnitus symptomatology in patients with chronic tinnitus and mild-to-moderate high-frequency hearing loss. Importantly, the effect sizes of the observed effects differed depending on the questionnaire used, highlighting the importance of aligning the content and objectives of interventions with the measurement instruments used.[14,15]

Other study analyzed changes in cerebrovascular response associated with the intervention and investigated the influence that using hearing aids (HA) has on tinnitus sufferers as well as hearing-matched controls. It has been suggested that the use of HA is the most effective therapy option for people who suffer from tinnitus and associated hearing loss. There is currently no objective scientific evidence to support the use of HA for the treatment of tinnitus, despite the fact that using HA can help tinnitus sufferers.[13]

Hearing aids have been demonstrated to have a considerable positive influence on both a person's quality of life and their ability to communicate, making them an essential component of the treatment plan for patients who suffer from hearing loss. Hearing aids are not without their drawbacks. They are just capable of amplifying sound and do not aid natural hearing in any way. In many cases, the patient's insurance will not cover the cost of the extremely high cost of the device.[20,21]

Hearing aids that are smaller have the potential to be more comfortable and distinctive; yet, the decreased dexterity that is common with elderly patients can make these devices less comfortable. Once the device has been fitted, the management of the hearing aid does not end. It takes a lot of effort and experience to learn how to use hearing aids, as well as to adjust to the physical discomfort and cognitive changes that come along with them.[20,21]

Patients often need encouragement because many find hearing aids uncomfortable, unattractive, and embarrassing. Hearing aids are indicated at a certain threshold of hearing loss. Cochlear implants may be offered to patients with severe bilateral hearing loss that does not improve with hearing aids. There are specific criteria for patients to be considered as candidates, and often include a predetermined level of impairment in word identification.[20,21]

CONCLUSION

The use of hearing aids in patients with tinnitus and chronic hearing loss is effective in suppressing the symptoms, although the use of the device must be carried out for at least six months.

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