RELATIONSHIP BETWEEN CHRONIC SUBJECTIVE TINNITUS, HEARING FUNCTION AND SLEEP QUALITY IN ADULTS

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Abstract. *Chronic subjective tinnitus is a persistent auditory symptom which is associated with sleep disturbances, cognitive difficulties and reduced quality of life. Its clinical severity does not always correspond to the degree of hearing loss. The relationship between tinnitus and hearing loss should be assessed using several methods. Pure-tone audiometry shows the patient's hearing level, while the THI shows how strongly tinnitus affects the patient. The PSQI is used to assess sleep quality. The aim of the study was to evaluate the association between chronic subjective tinnitus and hearing function and sleep quality in adult patients and to compare these parameters between patients with preserved hearing and patients with hearing impairment. In our study, we assessed these aspects in patients with chronic subjective tinnitus. This allowed us to determine whether sleep problems were mainly associated with hearing loss or could also occur in patients with normal or near-normal hearing, and to assess their relationship with tinnitus severity and its impact on quality of life. Our study included 60 patients aged 18–50 years with chronic subjective tinnitus. Tinnitus severity was assessed using the Tinnitus Handicap Inventory (THI), sleep quality using the Pittsburgh Sleep Quality Index (PSQI). Hearing was evaluated by pure-tone audiometry, and patients were divided into groups according to the presence or absence of hearing impairment. The mean age was 37.94 ± 7.81 years. Mean THI, PSQI scores were 61.35 ± 4.3, 8.58 ± 1.74 respectively. Patients with hearing impairment had higher THI and PSQI scores than patients with preserved hearing. However, sleep difficulties were also observed in patients without significant hearing impairment and were associated with greater tinnitus severity. These findings suggest that the development and severity of chronic tinnitus may be associated not only with hearing loss but also with central mechanisms of auditory information processing. The results support the need for a comprehensive assessment of patients with chronic tinnitus. Diagnostic evaluation should include not only hearing function but also psychoemotional status and sleep quality.*

Keywords: *chronic subjective tinnitus, tinnitus severity, hearing impairment, pure-tone audiometry, THI, PSQI, sleep quality.*

INTRODUCTION.

Tinnitus is commonly described as the perception of sound in the absence of an external acoustic source. The perceived sound may be described by patients as ringing, buzzing, hissing, humming, whistling or other tonal or complex auditory sensations.[2] When tinnitus persists for more than six months, it is generally considered chronic. Chronic tinnitus can affect patients in different ways, and its symptoms can vary from person to person.[3] Tinnitus is a common condition worldwide. According to the systematic review and meta-analysis by Jarach et al., its prevalence varies depending on age, population characteristics, and the methods used for assessment.[1] Because tinnitus is common and can affect quality of life, it remains an important clinical and public health problem. Tinnitus is often associated with problems of the auditory system, especially hearing loss.[4] Damage to the peripheral auditory system can change the signals reaching the brain and affect auditory processing. Some patients with hearing loss have only mild tinnitus, while others with normal or almost normal hearing may experience severe and persistent tinnitus.[5] Today, tinnitus is related not only to the auditory system, but also to cognitive, emotional and attentional processes.[6]

Constant perception of tinnitus may require additional attention and mental effort. Because of this, patients may have difficulties with concentration, feel mentally tired, and have problems with more complex cognitive tasks.[7][15] Sleep problems are also common in patients with chronic tinnitus. Some patients have difficulty falling asleep because tinnitus becomes more noticeable in a quiet environment. Others wake up several times during the night or do not feel rested after sleep. Poor sleep can increase daytime fatigue and make tinnitus more difficult to tolerate. Thus, tinnitus and poor sleep may influence each other.[8] One possible explanation is that constant tinnitus takes attention away from other sounds and tasks. The continuous perception of tinnitus may increase mental effort and make it harder to focus on other activities. This may be especially important for patients who find tinnitus difficult to ignore. Another important factor is how the patient reacts to tinnitus.[9] Even patients with similar hearing results may have very different levels of tinnitus-related distress. The THI helps to assess how tinnitus affects the patient's daily life, emotional state and overall well-being. This information cannot be obtained from audiometry alone.[10]. According to the largest systematic review and meta-analysis to date, chronic tinnitus affects approximately 14.4% of the adult population worldwide. In about 2–3% of the population, the symptoms are severe enough to significantly affect daily activities and work ability. This means that almost one in seven adults experiences tinnitus. In absolute numbers, this corresponds to more than 740 million people, with more than 120 million experiencing severe forms that can significantly limit daily activities and reduce quality of life [1]. According to World Health Organization projections, by 2050, around 2.5 billion people will have some degree of hearing loss, making the problem of tinnitus increasingly important for global healthcare systems [8] [11]. In recent decades, tinnitus has become an increasingly important health problem. This is related to the increasing life expectancy, the growing prevalence of age-related hearing loss, exposure to occupational and environmental noise, widespread use of personal audio devices, and high levels of chronic stress in modern society [1] [12] [13]. Current studies show that the main risk factors for tinnitus include age-related changes in the auditory system, sensorineural hearing loss, and long-term exposure to different types of noise [12] [14]. In addition, more attention has recently been given to psycho-emotional factors. Mood disorders, chronic stress, and sleep problems may not only increase the subjective perception of tinnitus but also contribute to its persistence. Tinnitus is more than just a perceived sound. In clinical practice, we often see patients who complain of poor sleep, anxiety, difficulty concentrating, and increased fatigue. At the same time, the severity of these complaints does not always correspond to the degree of hearing loss. Therefore, current approaches increasingly focus not only on audiological assessment but also on the evaluation of patients' psycho-emotional state [7] [4] [5].

MATERIALS AND METHODS.

The study included 60 adult patients aged 18–50 years with chronic subjective tinnitus lasting more than six months. All patients underwent clinical and audiological assessment as part of the study. Pure-tone audiometry was performed to assess hearing function in both ears. Based on the audiometry results, we divided the patients into two groups: patients with preserved hearing and patients with bilateral hearing impairment. Preserved hearing was defined as a pure-tone average (PTA) of ≤25 dB in both ears. Hearing impairment was defined as PTA >25 dB in both ears. After the audiometric assessment, all patients completed several standardized questionnaires. Tinnitus severity was assessed using the Tinnitus Handicap Inventory (THI). This questionnaire was used to evaluate how strongly tinnitus affected the patients and their daily life. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which allowed us to identify sleep problems associated with chronic tinnitus. The questionnaires were selected because tinnitus can affect patients in different ways. This allowed us to assess the relationship between hearing status, tinnitus severity and sleep quality.

RESULTS AND DISCUSSION.

Among the 60 patients, 30 had preserved hearing in both ears and 30 had bilateral hearing impairment. The mean THI score was 57.88 ± 4.35 in patients with preserved hearing and 64.82 ± 4.25 in patients with bilateral hearing impairment. The mean PSQI score was 7.81 ± 1.80 and 8.10 ± 1.69, respectively. Overall, patients with bilateral hearing impairment had higher THI and PSQI

scores compared with patients who had preserved hearing in both ears. At the same time, it was interesting to find that patients with a normal audiogram also had relatively high THI scores and sleep problems. This suggests that hearing loss alone cannot fully explain the severity of tinnitus. Therefore, central mechanisms may also be involved, including the way the brain processes auditory information, emotional reactions to tinnitus, and the role of the limbic system. Our results are in line with recent studies showing that chronic tinnitus is often associated with anxiety and sleep problems. In recent years, more attention has been given to the role of the central nervous system in maintaining tinnitus, especially in patients with normal hearing. These findings support the need for a comprehensive assessment of patients with chronic tinnitus. The evaluation should include not only hearing tests, but also assessment of the patient's emotional state and sleep quality.

CONCLUSION.

The main finding of our study is that chronic tinnitus was associated with changes in several clinical aspects, including tinnitus burden and sleep quality. These changes were observed in both groups, not only in patients with hearing impairment. Patients with hearing impairment had higher THI scores than patients with preserved hearing. However, patients with preserved hearing also had relatively high THI scores. This shows that the severity of tinnitus cannot be explained by hearing loss alone. The presence of tinnitus itself appears to be an important part of the clinical picture. Sleep problems were also observed in both groups. PSQI scores indicated reduced sleep quality, with more pronounced changes in patients with hearing impairment. However, sleep disturbance was also present in patients with preserved hearing. This may be related to the fact that tinnitus often becomes more noticeable in a quiet environment, especially at night, and can make it difficult to fall asleep or stay asleep. Overall, our results suggest that hearing loss may influence the severity of some symptoms, but it does not fully explain the clinical manifestations of chronic tinnitus. Even patients with preserved hearing showed tinnitus-related burden and sleep problems. This finding supports the idea that chronic tinnitus is not only an auditory symptom. Its clinical manifestation may also be related to attention, emotional response, sleep and cognitive processes. The results are consistent with the current understanding of tinnitus as a complex condition involving both auditory and non-auditory processes. This may explain why patients with similar hearing results can experience very different levels of tinnitus-related problems. Another important point is that the presence of a normal audiogram does not mean that the patient has a mild or clinically insignificant form of tinnitus. Some patients with preserved hearing in our study still had considerable tinnitus burden and problems with sleep. Therefore, the assessment of chronic tinnitus should not be limited to hearing tests. THI, PSQI can provide additional information about how tinnitus affects the patient's daily life and general functioning. A comprehensive assessment can help to identify problems that may not be detected by audiometry alone. Age may also be an important factor, especially in patients who have both hearing impairment and tinnitus. Age-related changes in hearing and other functions may contribute to the clinical presentation. However, tinnitus-related complaints were also observed in younger patients and in those with preserved hearing. Overall, our findings emphasize the importance of looking at tinnitus as a multidimensional condition. Hearing status is important, but the patient's experience of tinnitus, sleep quality should also be considered. The presence of abnormalities in these areas in both groups suggests that tinnitus itself may play an important role in the overall clinical picture.

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