

Evaluation of age-related hearing loss and hearing aid use related problems in geriatric population*

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ABSTRACT

Introduction: Aging many changes occur in individuals, the most important of which is hearing loss. Hearing loss prebycusis, which develops with aging, affects the individual in many ways such as auditory, emotional and social, as well as affecting his/her social environment and family.

Materials and Methods: In this study, 15 individuals aged between 65 and 75 years (mean±SD=68.46±2.72) who had been using hearing aids for at least one year and 15 individuals who did not use hearing aids in daily life despite hearing loss were evaluated. The auditory, sensory and social status of the patients and their relatives were scored and their quality of life was evaluated by applying separate questionnaires to the patients with and without hearing aids and their relatives.

Results: In our study, the mean score was 64.13±4.86 when the questionnaire form of the Hearing Handicap Inventory for Elderly scale was evaluated in the group not using hearing aids. In the group using hearing aids, the mean score was 55.33±9.96 before and 41.06±11.82 after the use of the hearing aid. When the mean scores were compared between groups and within groups, it was found that the differences were statistically significant (p<0.05).

Conclusion: In our study, it was concluded from that the use of hearing aids eliminated significant obstacles in the daily lives of geriatric individuals, and their relatives felt better socially and emotionally. For healthy aging, geriatric individuals and their relatives, healthcare professionals and hearing aid sales and fitting centers should act jointly and be in constant cooperation

Keyword: presbycusis, aged, hearing aids, quality of life, healthy aging, health services for the aged

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ÖZ

Geriatrik bireylerde yaşa bağlı işitme kaybına ve işitme cihazı kullanımına bağlı olarak gelişen sorunların değerlendirilmesi*

Giriş: Yaşlanma ile bireylerde birçok değişiklik meydana gelmektedir ve bunlardan en önemlisi işitme kaybıdır. Yaşlanma ile gelişen işitme kaybı presbiakuzi, bireyi işitsel, duygusal ve sosyal gibi birçok yönden etkilediği gibi sosyal çevresini ve ailesini de etkilemektedir.

Gereç ve Yöntemler: Bu çalışmada, yaşları 65-75 arasında değişen (Ort±SD=68.46±2.7) ve en az bir yıldır işitme cihazı kullanan 15 birey ile işitme kaybına rağmen günlük yaşamında işitme cihazı kullanmayan 15 birey değerlendirildi. Hastaların ve yakınlarının işitsel, duygusal ve sosyal durumları puanlandı ve yaşam kaliteleri işitme cihazı kullanan ve kullanmayan hastalara ve yakınlarına ayrı anketler uygulanarak değerlendirildi.

Bulgular: Çalışmamızda işitme cihazı kullanmayan grupta Yaşlılar İçin İşitme Engeli Ölçeği anket formu değerlendirildiğinde ortalama puan 64.13±4.86 olarak bulundu. İşitme cihazı kullanan grupta ise işitme cihazı öncesi ortalama puan 55.33±9.96, işitme cihazı sonrası ortalama puan 41.06±11.82 idi. Puan ortalamaları gruplar arasında ve grup içinde karşılaştırıldığında, farkların istatistiksel olarak anlamlı olduğu bulundu (p<0.05).

Sonuç: Çalışmamızda, işitme cihazı kullanımının geriatrik bireylerin günlük yaşamlarındaki önemli engelleri ortadan kaldırdığı ve yakınlarının sosyal ve duygusal olarak kendilerini daha iyi hissettikleri sonucuna varılmıştır. Sağlıklı yaşlanma için geriatrik bireyler ve yakınları, sağlık çalışanları ve işitme cihazı satış ve uygulama merkezleri ortak hareket etmeli ve sürekli iş birliği içinde olmalıdır.

Anahtar Kelime: presbiakuzi, yaşlı, işitme cihazı, yaşam kalitesi, sağlıklı yaşlanma, yaşlılara yönelik sağlık hizmetleri.

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INTRODUCTION

Aging is a physiologic process involving all organs and systems in which susceptibility to many diseases increases (Boss & Seegmiller, 1981). The World Health Organization (WHO) defines aging as the decrease in the ability to adapt to environmental factors. According to the chronological classification, 65–74 years is the early old age period, 75–85 years is the middle old age period, and 85 years and older is the advanced old age period (World Health Organization, WHO, 2015). In social perspective, aging is a set of behaviors expected from a certain age group in society, the physical effects of aging are defined as the physical changes that occur with the progression of chronological age (Ağar, 2020). However, it is of great importance to distinguish the changes related to normal aging from pathological aging.

In ageing societies, the final stage of people's lives is changing profoundly. This is characterized by the emergence of a variety of complex health conditions commonly referred to as geriatric syndromes. These are usually the result of multiple underlying factors (Boss & Seegmiller, 1981; World Health Organization, WHO, 2022). Common complaints that occur in the geriatric population apart from physiological aging include hearing loss, cataracts, and refractive errors, back and neck pain, and specific medical problems such as osteoarthritis, chronic obstructive pulmonary disease, diabetes, depression, and dementia (World Health Organization, WHO, 2022). As people age, they are more likely to experience several complaints at the same time (Boss & Seegmiller, 1981). More than half of patients aged 65 years and older have three or more complaints (World Health Organization, WHO, 2022).

Hearing is one of our five sensory organs and has an important role in the individual's recognition of the environment, communication and self-protection (National Institutes of Health (US), Biological Sciences Curriculum Study, 2007). Individuals with a hearing threshold of 20 dB or better in both ears are defined as individuals with normal hearing, while individuals above this threshold are defined as individuals with hearing loss. Hearing loss can be mild, moderate or severe. Hearing loss can sometimes affect one or both ears, which can make it difficult for individuals to understand speech. 'Hearing disorders' refers to people with hearing loss ranging from mild to severe. People with hearing disorders can often benefit from hearing aids, assistive listening units and cochlear implants to communicate through spoken language (Mamo et al., 2018; National Institutes of Health (US), Biological Sciences Curriculum Study, 2007; World Health Organization, WHO, 2022).

Hearing loss is a serious problem affecting more than 1.23 billion people in the world today and is expected to increase rapidly over time (Taljaard, Olaithe, Brennan-Jones, Eikelboom, & Bucks, 2016). With the increase in the elderly population in a changing world, the proportion of elderly individuals in

developing countries is expected to increase from 8% to 19% by 2050 (World Health Organization, WHO, 2022). In Turkey, this rate is expected to increase to 23% (8). On the other hand, the World Health Organization (WHO) has announced that by 2050, 2.5 billion people, i.e. one in four people in the world, will experience hearing loss at different levels, and at least 700 million of these people will need hearing rehabilitation (World Health Organization, 2021).

Age-related hearing loss, or Presbycusis, is a progressive hearing loss that develops with aging and is one of the most common conditions affecting older adults (Shende, Nguyen, Lydon, Husain, & Mudar, 2021). Presbycusis typically presents with high-frequency hearing loss, which causes greater problems hearing consonants in words. Consonants convey much of the meaning in a word, and this loss of grammar is the basis for complaints about presbycusis (Patel & McKinnon, 2018). In fact, difficulty in recognizing speech in noise is one of the hallmark symptoms of presbycusis (Patel & McKinnon, 2018; Shende et al., 2021). Numerous studies (Çakır et al., 2013; Lotfi, Mehrkian, Moossavi, & Faghieh-Zadeh, 2009; Patel & McKinnon, 2018; Shende et al., 2021) show that even individuals with milder degrees of hearing loss face significant speech recognition difficulties in noisy environments. Hearing aids and cochlear implants significantly improve the quality of life of older adults with hearing loss, especially those with depression and dementia (Patel & McKinnon, 2018). Presbycusis negatively affects the quality of life by leading to restriction of social activities, loneliness, isolation, communication disorders and inability to enjoy family life (Lotfi et al., 2009). Although a significant link has also been observed between presbycusis and the risk of developing dementia, it has been observed that the risk of developing dementia in individuals with hearing loss is 5 times higher than in normal individuals (Strutt et al., 2022). The use of hearing aids is the most commonly used method in the treatment and rehabilitation of age-related hearing loss. The use of hearing aids improves the hearing and psychosocial status of people with presbycusis. Mulrow et al., in a study of 192 people aged 65 years and older who used hearing aids for 12 months, reported that hearing aid use provided benefits in social and emotional status, communication and depression (Çakır et al., 2013). Acar et al (Acar, Yurekli, Babademez, Karabulut, & Karasen, 2011), reported that depressive symptoms regressed and cognitive functions improved with the continuity of hearing aid use; hearing rehabilitation provided by hearing aids had positive effects on quality of life. Metselaar et al., who argued that the use of hearing aids did not affect quality of life, observed a significant decrease in quality of life scores after a history of hearing aids used for 1 year, which was interpreted as a significant decrease in quality of life scores due to aging during follow-up (Çakır et al., 2013; Metselaar et al., 2009). To get the most efficiency from hearing aids, the device should be used in both ears (binaural) and individuals should use the device for as long as possible during the day. Assessing whether individuals are provided with appropriate hearing aids is difficult if the audiologist is not sufficiently

experienced or if common assessment methods are not used, and this assessment becomes even more difficult in patients with poor economic status (Arslan & Genovese, 1996).

There are three motivational processes that are important for people with hearing loss to access and use hearing aids: acceptance, utilization and satisfaction. For patient satisfaction, the patient must primarily accept the need to use a hearing aid. However, acceptance and utilization of the device does not guarantee one hundred percent satisfaction. Although the effectiveness of the hearing aid is determined with the help of specific audiologic tests, the satisfaction with the device depends on the individual's own decisions (Hosford-Dunn & Halpern, 2001). The primary goal in hearing aid use is to maximize the benefit during adaptation, and therefore it is extremely important to choose the most appropriate device for the individual (Cox & Alexander, 2002). Studying the level of participation of individuals with hearing loss in social life and how these problems affect their social environment and especially their families will help in the process of use and acceptance of hearing aids by these individuals. While hearing loss is expected to negatively affect the relatives and family who have a biological bond with the person, it is also expected that the existing relationship between these individuals will be damaged. If there is an individual with hearing loss in the family, the balance within the family is disrupted and stressful environments are created (Feher-Prout, 1996). The new WHO baseline report for the decade of healthy ageing 2021–2030 sets the stage for a change in the approach to monitoring the health of older people. The WHO's 2015 world report on ageing and health defines healthy ageing as the process of developing and maintaining functional ability that leads to well-being in old age.

The aim of our study is to examine the change in the quality of life of the geriatric population according to the hearing aid usage of elderly individuals with hearing loss for healthy aging and to propose solutions to the problems experienced by their relatives.

MATERIALS AND METHODS

Participants

After ethics committee approval and written informed consent form was obtained from the volunteer individuals, the study was conducted on a total of 30 geriatric individuals and their relatives, consisting of 15 individuals who had been using hearing aids regularly for at least 1 year and 15 individuals who do not use hearing aids. The age range of geriatric individuals in the study was 65-75 years (Age mean±SD=68.46±2.72). Among the individuals who voluntarily agreed to participate in the study, individuals diagnosed with moderate sensorineural hearing loss (41-55dB) after otoscopic examination and audiologic evaluation were included in the study.

Study Protocol

Geriatric individuals included in the study were first subjected to a detailed physical examination followed by routine audiologic evaluations. Geriatric individuals were divided into two groups as hearing aid users and non-users. Geriatric individuals who used hearing aids were evaluated in two stages: before and after hearing aid use. The “Hearing Handicap Inventory for Elderly” questionnaire form was applied to all geriatric population in our study and 10 questions (it is given in the form of a table as supplement data) were asked to evaluate the problems they experienced with their relatives. In geriatric individuals using hearing aids, the “International Outcome Inventory – Hearing Aids (IOI-HA-TR)” questionnaire form was used for post-use evaluations.

Audiological Evaluations

Examinations of middle ear functions

Immittansmetric measurements were performed with Resonance R36M Middle Ear Analyzer (Resonance, Gazzaniga, Italy) using TDH-39 (Telephonics, USA) headphones at 226 Hz prop tone at 75 dB SPL. A tympanogram with a peak curve “type A” between +100 daPa and -50 daPa pressure range was considered normal.

Pure Tone Audiometry-Hearing Level

Audiometric evaluations were performed according to ANSI standards in standard soundproof cabinets following audiometric evaluation procedures. All pure tone airway audiometric evaluations were performed on an Interacoustics AC-40 clinical audiometer (Interacoustics, Denmark) with a range of 0.25-8 kHz using Telephonic TDH-39 (Telephonics, USA) headphones, and bone conduction evaluations were performed with a Radioear B-71 (Radioear, USA) bone conduction vibrator with a range of 0.5-4 kHz. After pure tone audiometric evaluation, speech discrimination scores in geriatric individuals with speech stimuli were evaluated as percentage (%) (Thornton & Raffin, 1978). Participants with a normal tympanogram giving “type A” and bilateral hearing in the range of 41-55 dB HL were considered to have moderate hearing loss (Suutarla et al., 2007).

Hearing Handicap Inventory for Elderly (HHI-E)

Hearing handicap inventory for elderly is an assessment tool designed to measure the emotional and social reactions of the elderly to hearing loss in geriatric individuals. It consists of two subscales, 13 questions evaluating the emotional and 12 questions evaluating the social situations of hearing loss in geriatric individuals, and a total of 25 questions. The answer to each question is 0 (no) – 2 (sometimes) – 4 (yes). The total score obtained as a result of the evaluation varies between 0–100. In the evaluations, scores up to 16% are considered as no disability, scores between 17% and 42% as mild-moderate disability, and scores of 44% and more as significant disability (Ventry & Weinstein, 1982; Weinstein & Ventry, 1983).

This scale has been adapted to the Turkish language, validity and reliability studies have been conducted and it has high reliability in accordance with the original (Aksoy, Aslan, Köse, & Alpar, 2019).

International Outcome Inventory – Hearing Aids (IOI-HA-TR)

The scale, which was created to determine the satisfaction of hearing aid use on the person, consists of a total of 7 questions. Each question is evaluated over 5 points and 1 is the worst score and 5 is the best score. A maximum of 35 points is given to 7 questions. The higher the score determined as a result of the scale, the higher the patient's hearing aid satisfaction was accepted (Kırkım, Şerbetçioğlu, & Mutlu, 2008).

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (IBM Statistical Package for Social Sciences (SPSS) version 22.0) program. Values with a “p-value” below 0.05 were considered statistically significant. Mean and standard deviation were used for numerical data and frequency values were used for categorical variables. Kolmogorow-Smirnov test was used to evaluate the conformity to normal distribution. Mann-Whitney U test was used to examine the difference between groups and Wilcoxon t test was used for intra-group comparisons.

RESULTS

Audiological Evaluations

In the audiologic evaluations performed on the geriatric individuals who participated in the study, no statistically significant difference was obtained between hearing aid users and non-users when evaluated in terms of hearing thresholds and speech discrimination scores between 0.25 kHz and 8 kHz in pure tone audiograms ($p > 0.05$; Table 1). Demographic information of a total of 30 geriatric individuals, consisting of 15 individuals who regularly used hearing aids for one year and 15 individuals who didn't use hearing aids, is given in Table 2.

Evaluations of Hearing Handicap Inventory for Elderly

In the group without hearing aid use, the mean score was 64.13 ± 4.86 when the HHI-E questionnaire form was evaluated. In the group using hearing aids, the mean score of the post-use questionnaire form was 41.06 ± 11.82 . When the mean scores of the questionnaire form were compared between the groups, it was observed that the difference was statistically significant ($p = 0.0001$). When the HHI-E questionnaire form data were evaluated in the group using hearing aids, the mean score of the questionnaire before hearing aid use was 55.33 ± 9.96 and 41.06 ± 11.82 after use. When the pre- and post-use questionnaire forms were evaluated in the geriatric group using hearing aids, a significant decrease was observed in the HHI-E, but a statistically significant decrease was observed ($p = 0.004$, Table 3).

According to the statistical analysis of the two subscales of the hearing disability scale, emotional and social status (Table 4), a significant decrease in social and emotional status was observed in the hearing aid user group ($p = 0.008$). When we compared these two subscales before and after the use of hearing aids in our hearing aid user group, no significant difference was observed in emotional states after use ($p = 0.82$), while a significant decrease was observed in social states ($p = 0.008$).

Table 1. Pure tone average (dBHL) and word discrimination scores (%) of hearing thresholds of geriatric individuals

Groups	N	PTA Mean±SD	WDS (%)
Users -HA	15	48,3±4,1dBHL	62,4±10,4%
Nonusers -HA	15	45,2±5,7dBHL	64,2±12,3%

HA: Hearing aids PTA: Pure tone average WDS: Word Discrimination Score
dBHL: Decibel Hearing Level

Table 2. Demographic information of the geriatric population

Groups	N	Female (%)	Male (%)	Age Mean±SD
Users -HA	15	6 (40%)	9 (60%)	68,6±3,15
Nonusers -HA	15	7 (46,7%)	8 (53,3%)	68,33±2,31

HA: Hearing aids

Table 3. Hearing Handicap Inventory for Elderly

Groups	N	Min-Max	Mean±SD
Users- HA (Before)	15	44-74	55,33±9,96
Users-HA (After)	15	24-66	41,06±11,82
Nonusers-HA	15	52-70	64,13±4,86

HA: Hearing aids

Table 4. Hearing Handicap Inventory for Elderly- Social and Emotional Situations

Groups	N	Social Min-Max	Social Mean±SD	Emotional Min-Max	Emotional Mean±SD
Users-HA (Before)	15	6-44	27,86±13,23	8-32	19,73±6,13
Users-HA (After)	15	10-36	21,20±7,73	2-32	20,40±10,61
Nonusers-HA	15	26-48	35,60±6,51	24-38	30,40±4,85

HA: Hearing aids

International Outcome Inventory – Hearing Aids (IOI-HA)

In the analyses performed with the IOI-HA-TR, the mean score was 29.46 ± 3.87 in geriatric individuals using hearing aids.

The percentage distribution of the findings obtained from the analysis of the problems experienced by all individuals included in the study with their relatives is presented in the form of a table as supplement data.

DISCUSSION

The number of geriatric individuals is increasing rapidly in the world and in Turkey, and the number of studies evaluating their needs, health problems and quality of life is increasing day by day (Dhamo & Koçollari, 2014; Noroozian, 2012). In our study, in which we addressed an important problem faced by geriatric individuals, the Hearing Handicap Inventory for Elderly (HHI-E) and the International Outcome Inventory – Hearing Aids (IOI-HA-TR) were used to evaluate the effects of hearing loss and hearing aid use in the geriatric population, and a questionnaire

consisting of 10 questions was used to evaluate the problems experienced by these individuals with their relatives. Although different temporal periods are used in the literature in the process of evaluating the effects of hearing aid use in geriatric individuals after hearing aid use, as the experience of hearing aid use stabilizes at the end of the first 3 months after hearing aid use and accordingly quality of life scores do not change in the following periods (Korkmaz et al., 2016; Saunders & Jutai, 2004; X. Wang et al., 2022) a 12-month period was used in our study in accordance with the literature.

Aging is a process of physiological, psychological and social changes. Studies have shown that cognitive skills and memory weaken with the aging process (Gagnon et al., 1994; Reid & MacLulich, 2006). Hearing loss is one of the most important health problems related to aging (Ciorba, Bianchini, Pelucchi, & Pastore, 2012). Hearing loss is a preventable/rehabilitatable health problem affecting the geriatric population worldwide, with the problems that it causes (Bielefeld, Tanaka, & Henderson, 2010). Presbycusis is a hearing loss that occurs with aging and is observed with a high incidence especially in the geriatric population. Studies have shown that presbycusis starts in the 40s and the most prominent age of onset is 60 years and older (J. Wang & Puel, 2020). Considering the age group in which the effects of hearing loss are observed the most is the geriatric population, the individuals included in the study were 65 years of age and older (Age mean \pm SD = 68.46 \pm 2.72).

Hearing aids are the most common treatment method for prebiacusis today, and according to TurkStat data, only 20.84% of individuals with hearing loss in Turkey use hearing aids (Tufan ve Arun, 2006). There are many factors affecting hearing aid use. These are listed as follows in studies (Jorgensen & Novak, 2020; Vestergaard Knudsen, Öberg, Nielsen, Naylor, & Kramer, 2010) patient's expectation from the device, psychological and social factors, hearing aid cost, general health problems, physical characteristics of the hearing aid and aesthetic problems, correct selection and programming of the hearing aid, inadequate information about hearing aid use and care. The device satisfaction of the hearing aid users included in our study was evaluated with the IOI-HA-TR and the mean questionnaire score was 29.46 \pm 3.87. The scores obtained from the IOI-HA-TR form approaching 35 points indicate that the satisfaction with the hearing aid is high.

We used the HHI-E questionnaire form, which has been used in many studies (Aran & Aksoy; Deepthi & Kasthuri, 2012) to evaluate the effects of hearing loss (SSO \pm SS = 46.75 \pm 4.9 dB) in the geriatric population included in our study. We analyzed the geriatric population using hearing aids in two stages: before

and after hearing aid use. When we compared the mean scores before (55.33 \pm 9.96) and after (41.06 \pm 11.82) the use of hearing aids, it was observed that the use of hearing aids reduced the negativities caused by hearing loss, that is, the perceived hearing loss decreased and the difference was statistically significant ($p=0.001$). When we evaluated the two subscales of the HHI-E, emotional and social states, a significant difference was obtained in the scores obtained in both emotional and social states in the hearing aid user and non-user groups. When we compared these two subscales before and after hearing aid use in our hearing aid user group, no significant difference was observed in emotional states after use, while a significant decrease was observed in social states. In studies, it has been observed that hearing aid use reduces the inadequacies perceived by geriatric individuals in terms of quality of life in social and emotional areas (Maeda, Sugaya, Nagayasu, Nakagawa, & Nishizaki, 2016; Newman & Weinstein, 1988). In our study, although a decrease was observed in the scores of both emotional and social domains in the groups with and without hearing aid use, a difference was observed only in social domains after hearing aid use. This difference showed that the use of hearing aids in geriatric individuals can positively change the emotional states of the person in an emotional sense and accordingly support social development.

Many studies indicate that communication and interaction with family member's decreases and social isolation increases in geriatric population (Akbaş, Taşdemir Yiğitoğlu, & Çunkuş, 2020; de Vries, 2013). It is known that communication problems between family members and geriatric population leads to many negative effects. Hearing loss in the geriatric population increases these communication problems and reduces family ties. The questions we asked to the entire geriatric population and their families/relatives in our study were used to prevent communication and social isolation problems experienced/to be experienced between individuals and to develop suggestions for the solution of these problems. The responses we received in our study indicate that the level of awareness of the geriatric population about hearing aid use should be increased and annual hearing evaluations should be followed up without interruption in individuals using hearing aids.

As a result, our findings showed that the use of hearing aids in the geriatric population eliminates significant obstacles in their daily lives. Likewise, our study results revealed that the relatives of patients using hearing aids felt better socially and emotionally. In terms of the healthy aging process, which WHO defines as the development and maintenance of functional ability that ensures well-being in old ages, it is essential that geriatric individuals and their relatives, healthcare professionals and hearing aid sales and fitting centers should act jointly and in constant cooperation.

Ethics Committee Approval: This study was approved by Trakya University with the decision number 2022/129-10/06.

Peer-review: Externally peer-reviewed.

Informed Consent: Written informed consent was obtained from the participants.

Author Contributions: Concept – M.T; Design – Ş.Y; Supervision – E.B; Resources– Ö.D; Data Collection and/or Processing – Y.M.E, Ş.A, E.E; Analysis and/or Interpretation – E.A; Literature Search – N.G.B; Writing Manuscript – M.A, G.H.A.

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