Turkish Journal of Geriatrics
2014; 17 (4) 389-396

Özgül AKIN ŞENKAL[1]
Ayşen KÖSE[2]
Songül AKSOY[3]

RESEARCH

ASSESSMENT OF GERIATRIC PATIENTS' SATISFACTION ON HEARING AIDS AND THEIR INFLUENCE ON QUALITY OF LIFE

ABSTRACT

Introduction: The use of hearing aids is one of the few efficient solutions for hearing loss in the elderly; modern hearing aids are effective in minimizing the negative consequences of hearing loss in daily functioning.

Materials and Method: This study used the Short Form-36 Quality of Life survey to determine the effects of hearing aid use on the short-term general well-being of persons aged 65 and older with sensorineural or mixed type hearing loss. Satisfaction with hearing aid use was evaluated using the Abbreviated Profile of Hearing Aid Benefit survey.

Results: Hearing aids not only increased communicative ability, but also boosted self-confidence. A unilateral hearing aid was found to be 75% useful in quiet places where communication was easy. An overall assessment of the Short Form -36 Quality of Life (SF-36) survey of the unilateral hearing aid users did not reveal any significant effect of the duration of hearing aid use on quality of life (p>0.05).

Conclusion: In order to increase the level of satisfaction with hearing aids, the use of binaural aids should be supported. Depending on the degree of hearing loss, geriatric individuals may need to get professional help when using hearing assistance devices (for environmental factors). The International Classification of Functioning framework can provide a holistic perspective on the evaluation of hearing aid use of the elderly. Therefore, it is recommended that valid surveys be adapted for use with geriatric individuals.

Key Words: Geriatrics; Hearing Aids; Correction of Hearing Impairment; Personal Satisfaction.

ARAŞTIRMA

GERİATRİK HASTALARIN İŞİTME CİHAZI MEMNUNİYETİNİN VE CİHAZLARIN YAŞAM KALİTESİNE ETKİSİNİN İNCELENMESİ

ÖZ

Giriş: Yaşlılıkta işitme cihazları tedavi için bir seçenektir ve modern işitme cihazları da yaşlı bireylerin günlük fonksiyonlarında işitme kaybının negatif etkilerini azaltmakta etkilidir.

Gereç ve Yöntem: Bu çalışmada sensörinöral veya mikst tipte işitme kaybı olan 65 yaş ve üzeri işitme cihazı kullanan kişilerde Kısa Form- 36 Yaşam Kalitesi ölçeği ile işitme cihazı kullanımının kısa dönemde genel sağlık üzerine yaptığı etkiler belirlenmiştir ve Abbreviated Profile of Hearing Aid Benefit- Türkçe anketi ile işitme cihazı memnuniyeti değerlendirilmiştir.

Bulgular: İşitme cihazı kullanımı iletişim yeteneğini arttırırken, özgüveni sağlamlaştırmaktadır. unilateral işitme cihazı kullanımı % 75 sessiz ve iletişimin kolay sağlanabildiği ortamlarda fayda sağlamıştır. Arka plan gürültünün varlığında unilateral işitme cihazı kullanımı %63 konuşmanın anlaşılırlığında fayda sağlarken, işitme cihazının kullanılmadığı durumlarda oran %51 olmaktadır ve bu fark istatistiksel olarak anlamlı değildir (p=0.31). Kısa Form- 36 Yaşam Kalitesi Anketi'nin unilateral işitme cihazı kullanıcılarında genel değerlendirilmesinde, işitme cihazı kullanım süresinin yaşam kalitesi üzerine istatistiksel olarak etkisi bulunmamıştır (p<0.05).

Sonuç: İşitme cihazından memnuniyetin arttırılması için yine de binaural işitme cihazı uygulamalarının desteklenmesi gerekmektedir. İşitme kaybının derecesine bağlı olarak yardımcı dinleme cihazları (çevresel etmenler) için profesyonel yardım almaları gerekliliği vardır. Yaşlı bireylerdeki işitme cihazı uygulamalarında International Classification of Functioning çerçevesi ile holistik bir bakış açısı sağlanabilmektedir. Bu nedenle geçerli anket uygulamalarının geliştirilerek geriatrik bireyler için uyarlanması önerilmektedir.

Anahtar Sözcükler: Yaşlılık; İşitme Cihazı; Odyolojik Rehabilitasyon; Kişisel Memnuniyet.

İletişim *(Correspondance)*

Özgül AKIN ŞENKAL
Başkent Üniversitesi Tıp Fakültesi Kulak Burun Boğaz Anabilim Dalı ADANA

Tlf: 0322 235 80 80
e-posta: oakinsenkal@yahoo.com

Geliş Tarihi: 08/08/2014
(Received)

Kabul Tarihi: 01/10/2014
(Accepted)

[1] Başkent Üniversitesi Tıp Fakültesi Kulak Burun Boğaz Anabilim Dalı ADANA
[2] Ankara Üniversitesi Sağlık Hizmetleri Meslek Yüksekokulu ANKARA
[3] Hacettepe Üniversitesi Sağlık Bilimleri Fakültesi ANKARA

INTRODUCTION

Communication is an essential tool of daily life for all age groups. The most common cause of communicative disorders in children and adults alike are hearing loss. Hearing loss not only decreases the ability to understand and differentiate speech, but also restricts the person's communication, depending on the person's age of diagnosis, and type, degree and configuration of hearing loss. Communication skills start deteriorating due to hearing loss, particularly when it is associated with ageing. This deterioration leads to a decline in quality of life. However, using a hearing aid enhances both auditory perception and quality of life (1,2).

Symmetrical sensorineural hearing loss particularly affects the audition of sounds at higher frequencies due to biological ageing, and is referred to as presbycusis. Some researchers take presbycusis to mean hearing loss caused by degenerative changes brought about by ageing.

The onset and rate of progression of hearing loss varies; it is not only impairment as it relates to hearing that is important, but also perception and coding centres and how these relate to one another (3). Schuknecht (4) defines four types of presbycusis in relation to selective atrophy of different morphological structures in the cochlea; Sensory presbycusis, neural presbycusis, strial presbycusis, and cochlear conductive presbycusis.

Presbycusis starts to affect the hearing of sounds at lower frequencies as time progresses. In addition to the effects of ageing on the auditory system and age-related degenerative structures, external factors such as noise, cardiovascular disease and stress can also lead to hearing loss.

Recent studies designed to evaluate the effects of hearing-aid use employ not only audiological assessments, but also surveys. This new trend can be attributed to the need to increasing the quality of individual-oriented services.

The performance of hearing aids in patients with sensorineural hearing loss is a significant determiner of quality of life. Selecting the ideal hearing aid for these patients is a major step in auditory rehabilitation. The ideal hearing aid should help the patient regain frequencies below their hearing level. When the performance expected from hearing aids is evaluated or patients using a hearing aid are monitored, subjective evaluations, audiological examinations and survey methods are commonly used (5-7).

Bilateral hearing aids are commonly prescribed for patients with presbycusis, but it is often preferred to use a single hearing aid for patients for economic or aesthetic reasons. In addition, public health institutions that provide hearing aids may only issue unilateral hearing aid. Cosmetic appeal is still a concern for many with hearing impairments, and these patients often prefer one hearing aid as it is perceived as more discreet than two.

Since the elderly populations in developing countries are growing, ageing represents a high-priority issue for the World Health Organization. This provides grounds for investigating problems caused by hearing loss in older people by examining a number of factors within the framework of the International Classification of Functioning, Disability and Health (ICF) (8). Evaluation of hearing rehabilitation and the resultant changes in quality of life promotes cooperation between audiology and geriatric departments. This study aimed to determine the quality of life and satisfaction with one hearing aid (unilateral) of individuals age 65 and older who had used their device for eight hours or more per day over a period of at least 24 months. Results were interpreted using the ICF framework. This is the first study in a homogeneous group who use unilateral hearing aid and satisfaction in ICF framework.

The overall aim of the ICF is to provide a common, standard language and framework for describing health and health-related conditions (Figure 1). The ICF belongs to the international family of classifications developed by the World Health Organization (WHO) for use in as many areas of health as possible. This common, standard language enables worldwide communication related to health and medical care between various disciplines and scientific fields. The ICF is also a standard tool used to share knowledge and experience, and to ensure successful assessment and treatment, of voice disorders in school age children who pose particular challenges for the evaluation and therapy processes.

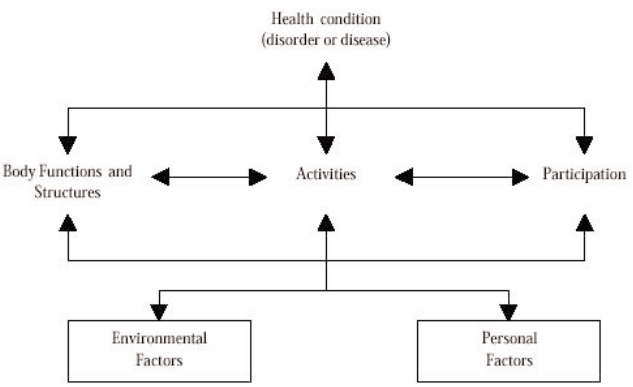

Figure 1— Conceptual framework of ICF.

Table 1— Demographic Data

Gender	n	Age (year)	Pure Tone Average (dB)	Daily Use of Hearing Aids (hours)	Total Period of Hearing Aid Use (months)	Length of Hearing Loss (months)
Female	29	71.8±12.2	56.23±8.3	10.5±2.2	31.3±6.07	33.8±12.08
Male	35	73.74±10.2	56.9±8.9	9.45±1.8	27.8±5.5	36.08±13.8
Total	64	73.11±7.3	56.71±8.7	9.8±1.98	29.42±6.11	35.07±11.8

Materials and Method

The study was carried out with individuals aged 65 and older who had been prescribed a hearing aid for hearing loss. Informed consent of all individuals was obtained before participation in the study. The study began with 100 geriatric individuals: 64 who had mild degree mixed or sensorineural hearing loss and who used a unilateral digital hearing aid comprising Wide Dynamic Range Compression (WDRC) technology for at least eight hours a day over a period of at least 24 months were included in the final evaluation (Table 1). This usage criterion allowed for a hearing aid adaptation period. Individuals using a unilateral hearing aid were chosen because currently, geriatric individuals can commonly afford to use only one device. Patients were informed about the objectives of the study, which was carried out in accordance with the Helsinki Declaration and was approved by the Ethical Committee of Ankara University with the decree dated 09/05/2013 and numbered 148/764.

The average daily duration of hearing aid use by individuals was 9.8±3.04 hours. The mean age of participants was 73.11±7.3 and the mean pure-tone hearing threshold (PTA) was 56.71±10.01 dB. Of the 64 participants, 29 were females and 35 were males (Table 1).

The following subjective tests were used to evaluate participants' quality of life and to determine their degree of satisfaction with the hearing aid:

a. SF-36 Quality of Life Scoring Scale (9). SF-36 is a self-assessment scale developed by Ware (1992). Its validity and reliability have been studied by Koçyiğit et al. (2006). The scale consists of a total of 36 questions in eight subscales: physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. The SF-36 evaluates both the negative and positive aspects of one's general health. Scores on the subscales range between 0 and 100, with higher scores indicating a better condition (10).

b. Abbreviated Profile of Hearing Aid Benefit (APHAB), Turkish Version

The APHAB is an inventory that collects information about how hearing disability affects daily life. It evaluates the problems that an individual encounters in a variety of listening environments during the course of the day (11-13).

The data obtained using the Turkish APHAB was examined in relation to ICF categories. The relationship between the APHAB results and the results obtained from the SF-36 quality of life survey was investigated.

Demographic data were evaluated using descriptive statistics and expressed as means and standard deviations. T-tests were used for parametric variables, and the Wilcoxon Paired Samples Test was used for non-parametric comparisons. Correlations were calculated using Spearman's rho. The level of statistical significance was set at $p<0.05$. Data were analysed using MedCalc 9.2.0.1 software.

Results

Satisfaction with a unilateral hearing aid was assessed on the four different subsections of the APHAB Form A. A unilateral hearing aid was found to be 75% useful in quiet places where communication was easy. This rate dropped to 32% when the hearing aid was not used, and the difference between the two percentages was statistically significant ($p<0.05$). When there was background noise, the unilateral hearing aid was 63% useful in helping speech comprehension, while this rate dropped to 51% without the hearing aid; however, the difference was not statistically significant ($p=0.31$). In the presence of reverberation, speech comprehension was 61% with the hearing aid and 43% without, again displaying a non-significant difference ($p=0.33$). In addition, use of the unilateral hearing aid allowed participants to ignore discomforting sounds at a rate of 42%, whereas without the hearing aid, they could only be ignored at a rate of 20%; this difference was statistically significant ($p<0.05$) (Figure 2).

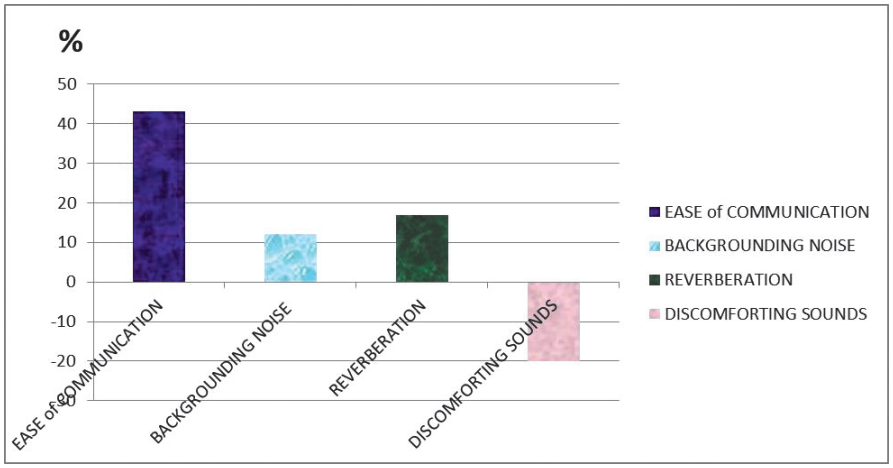

Figure 2— APHAB assessment results.

When APHAB survey questions were evaluated within the ICF framework, we found that the questions in all subsections of the survey were related to the ICF categories of "Activities and Participation" and "Body Functions" (Table 2).

Results of the SF-36 survey indicate that hearing aid use has a positive influence on quality of life. When the mean values of the SF-36 survey results of geriatric hearing aid users were considered, the values of social functioning, bodily pain and mental health, physical functioning, vitality, role limitations due to emotional problems and role limitations due to physical problems in unilateral hearing aid users were obtained (Figure 3).

An overall assessment of the SF-36 survey of the unilateral hearing aid users did not reveal any significant effect of the duration of hearing aid use on quality of life ($p>0.05$).

Discussion

The worldwide ratio of hearing aid use for individuals over 65 years of age was 48.7% in the 1980s and 13% for individuals between 40 and 65 years of age in 1998. In 1997 in the U.S., about 8% of individuals aged 65 or over used a hearing aid (13, 14). Although hearing loss increases with age, the rate of hearing aid use in Turkey has remained relatively low.

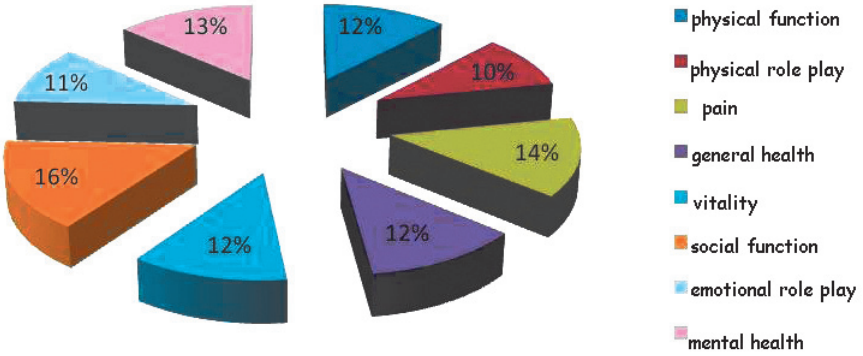

Figure 3— SF-36 Assessment results.

Table 2— APHAB Survey Questions According to ICF Tags and Frequency of Complaints.

APHAB Survey Questions	Categories and Tag of ICF	Frequency of Complaints (%)	
		Without Hearing Aid	Unilateral Hearing Aid
Ease of Communication Scale			
4. I have difficulty hearing a conversation when I'm with one of my family at home.	d310 communicate through verbal communication, b2304 speech discrimination	79.0	33.0
10. When I am in a small office, interviewing or answering questions, I have difficulty following the conversation.	d310 communicate through verbal communication, b2304 speech discrimination	67.0	31.0
12. When I am having a quiet conversation with a friend, I have difficulty understanding.	d310 communicate through verbal communication, b2304 speech discrimination	70.0	29.0
14. When a speaker is addressing a small group and everyone is listening quietly, I have to strain to understand.	d310 communicate through verbal communication, b2304 speech discrimination	79.0	29.0
15. When I'm having a quiet conversation with my doctor in an examination room, it is hard to follow the conversation.	d310 communicate through verbal communication, b2304 speech discrimination	75.0	27.0
23. I have to ask people to repeat themselves in one-on-one conversations in a quiet room.	d310 communicate through verbal communication, b2304 speech discrimination	78.0	32.0
Background Noise Scale			
1. When I am in a crowded grocery store and talking with the cashier, I can follow the conversation.	d310 communicate through verbal communication, b2304 speech discrimination	20.0	49.0
6. When I am listening to the news on the car radio and family members are talking, I have trouble hearing the news.	d115 listening, b230hearing functions, d310 communicate through verbal communication, d9208 recreation and leisure, other specified	80.0	51.0
7. When I'm at the dinner table with several people and am trying to have a conversation with one person, understanding speech is difficult.	d310 communicate through verbal communication, d9205 socializing, b2304 speech discrimination	81.0	43.0
16. I can understand conversations even when several people are talking.	d310 communicate through verbal communication, d350 conversation, b2304 speech discrimination	68.0	49.0
19. I can communicate with others when we are in a crowd.	d310 communicate through verbal communication, d350 conversation, b2304speech discrimination	79.0	44.0
24. I have trouble understanding others when an air conditioner or fan is on.	b230 hearing functions, d310 communicate through verbal communication, b2304 speech discrimination	49.0	69.0
Reverberation Scale		Not valid	Not valid
2. I miss a lot of information when I'm listening to a lecture.	d115 listening, b2304 speech discrimination		
5. I have trouble understanding the dialogue in a movie or at the theatre.	d9208 Recreation and leisure, other specified, b2304 speech discrimination, d115 listening	80.0	51.0

Continued

Table 2— APHAB Survey Questions According to ICF Tags and Frequency of Complaints.—*Continued*

APHAB Survey Questions	Categories and Tag of ICF	Frequency of Complaints (%)	
		Without Hearing Aid	Unilateral Hearing Aid
9. When I am talking with someone across a large empty room, I understand the words.	d3503 conversation, one to one, b2304 speech discrimination	58.0	33.0
11. When I am in a theatre watching a movie or play and the people around me are whispering and rustling paper wrappers, I can still make out the dialogue.	b2304 speech discrimination, d920 recreation and leisure	35.0	49.0
18. It's hard for me to understand what is being said at lectures or mosque.	b2304 speech discrimination, d115 listening	81.0	39.0
21. I can follow the words of a sect leader when listening inside a mosque.	b2304 speech discrimination, d115 listening	27.0	63.0
Aversiveness Scale			
3. I miss a lot of information when I'm listening to a lecture.	b2703 Sensitivity to a noxious stimulus	20.0	40.0
8. Traffic noises are too loud.	b2703 Sensitivity to a noxious stimulus	20.0	49.0
13. The sounds of running water, such as a toilet or shower, are uncomfortably loud.	b2703 Sensitivity to a noxious stimulus	20.0	30.0
17. The sounds of construction work are uncomfortably loud.	b2703 Sensitivity to a noxious stimulus	20.0	45.0
20. The sound of a fire engine siren close by is so loud that I need to cover my ears.	b2703 Sensitivity to a noxious stimulus	20.0	47.0
22. The sound of screeching tires is uncomfortably loud.	b2703 Sensitivity to a noxious stimulus	20.0	39.0
Mean score evaluations (%)	ACTIVITIES AND PARTICIPATION (d), BODY FUNCTIONS(b)	61.0	43.0

A study by Kahveci et al. (2011) found that 517 patients had been prescribed a hearing aid, but 58 (22%) did not use it (15). In a study that examined the effects of budgetary restrictions on the use of a hearing aid for presbycusis, Eşki and Yılmaz (2011) found that budgetary restrictions affected the choice of hearing aid (16). The same study also explored the effect of using a unilateral hearing aid for presbycusis on quality of life and patient satisfaction with the device. It was reported that hearing aid use had positive communicative and psychosocial effects in daily life and bolstered the elderly population's quality of life (17). Similarly, Acar et al. (2011) reported a significant improvement in the psychosocial and cognitive functions of geriatric individuals after three months of hearing aid use (1).

A hearing aid contributes positively to the communicative abilities of individuals from the moment they start using it. The present study also revealed that use of a unilateral hearing aid provided ease of communication in quiet places. The ability to understand speech in the presence of background noise, however, was found to be problematic, even with a unilateral hearing aid. It was also seen that the benefits of the hearing aid in helping patients understand speech in environments where there is reverberation were limited, while the effects of discomforting sounds could increase when a hearing aid was used.

When the Turkish version of Form A of the APHAB was considered in relation to the ICF Framework, we found that "Activities and Participation" and "Body Functions" were correlated with hearing aid satisfaction. However, the evaluation of hearing loss associated with presbycusis should not be based on only these two categories. Quality of life scales should also be used to include "Personal and Environmental Factors" in the evaluation. With these concerns in mind, SF-36 survey results in this study showed that unilateral hearing aid use did not have a considerable effect on quality of life. However, we know from the literature that hearing dysfunc-

tion negatively impacts individuals' quality of life, cognitive functions, emotional structure and habits. It has also been reported that personality changes might occur and social relations might be strained secondary to loss of hearing (15). In the present study, we found that there was a quantitative (statistically not significant) increase only in the social functions of individuals who used a unilateral hearing aid. Likewise, Stark and Hickson (2004) found a correlation between hearing loss and quality of life in their study, which showed that use of a hearing aid can curtail the negative effects of hearing loss on daily life (Activities and Participation) (18). Conversely, Hickson and Scarinci (2007) describe in their review that the complaints of geriatric individuals in the area of "Activities and Participation" had increased. Thus, they argue that hearing aids and hearing assistance products should be examined in the "Body Functions" (specific mental activities such as having to listen into their partners' social conversations as well as their own) part of the survey. However, with respect to rehabilitation of hearing loss, it is not enough to examine the "Body Functions and Structures" section only. The "Activities and Participation" section should also be addressed to assess the challenges facing the elderly in their daily life (8).

Brooks (1996) noted that geriatric individuals had a longer period of adaptation to hearing aids than younger users of the device (5). Therefore, geriatric individuals who are preparing to use a hearing aid should be provided with extensive adaptation and hearing rehabilitation services to bolster their use; this will not only facilitate communication, but also improve their quality of life. Additionally, to increase the level of satisfaction with the hearing aid, the use of binaural hearing aids should be supported. Depending on the degree of hearing loss, geriatric individuals may need to get professional help with hearing assistance devices (for environmental factors). The ICF framework can provide a holistic perspective in the evaluation of hearing aid use with the elderly. Therefore, it is recommended that valid surveys be adapted for use with geriatric individuals.

Hearing aid satisfaction and its effects on general health assessed with APHAB and SF-36 questionnaires in this study. There are similar studies in the literature, but the interpretation of these studies has not been integrated with the ICF. ICF compose a common and standard language in order to evaluate and understand situations about health.

This study was carried out using the 64 hearing-impaired individuals over 65 years with unilateral hearing aid. The sample group may be unable to represent all hearing impaired individuals in Turkey. However, individuals over 65 years of experience with hearing aids reveal. This study does not compare satisfaction of unilateral and bilateral hearing aids which can be considered as limitations of this study.

In bilateral hearing loss unilateral devices are commonly observed in clinical use. In this case there are economic and or aesthetic reasons. There are some restrictions of unilateral hearing aid use in background noise in terms of speech intelligibility. In order to eliminate this problem, bilateral hearing aids are preferred. Therefore, advantages of bilateral hearing aid have to explain to individuals with hearing impairment.

The use of hearing aids is important to ensure social communication. Therefore, using a hearing aid has a positive effect on quality of life. The benefits of the use of the device can be independent of time. Short or long-term use of hearing aids rather than the device being used is sufficient to improve the quality of life.

In future, a study with bilateral and unilateral use of hearing aids as a comparative study is expected.

Acknowledgements

The authors are obliged to the geriatric patients for their cooperation during this study, and the valuable information they have provided.

References

1. Acar B, Yurekli MF, Babademez MA, et al. Effects of hearing aids on cognitive functions and depressive signs in elderly people. Archives of Gerontology and Geriatrics 2011;52(3):250-2. (PMID:20472312).
2. Martini A, Mazzoli M, Rosignoli M, et al. Hearing in the elderly: A population study. Audiology 2001;40(6):285-93. (PMID:11781040).
3. Lim DP, Stephens DG. Clinical investigation of hearing loss in the elderly. Clin Otolaryngol 1991;16(3):288-93. (PMID:18791075).
4. JB Nadol Jr. Disorders of Aging, In: Merchant SN, Nadol Jr JB (Eds). Schuknecht's Pathology of the Ear. 3th edition, People's Medical Publishing House, USA 2010, pp 431-44.
5. Brooks DN. The time course of adaptation to hearing aid use. Br J Audiol 1996;30(1):55-62. (PMID:8839367).
6. Gates GA, Rees TS. Hear ye? Hear ye! Successful auditory aging. West J Med 1997;167(4):247-52. (PMID:9348755).
7. Baraldi Gdos S, de Almeida LC, Borges AC. Hearing loss in aging. Rev Bras Otorinolaringol (Engl Ed) 2007;73(1):58-64. (PMID:17505600).
8. Hickson L, Scarinci N. Older adults with acquired hearing impairment: Applying the ICF in rehabilitation. Seminars in speech and language 2007;28(4):283-90. (PMID:17935013).

9. Ware JE Jr, Sherbourne CD. The MOS 36-Item Short Form Health Survey (SF-36): I. Conceptual framework and item selection. Medical Care 1992;30(6):473-83. (PMID:1593914).
10. Kocyigit H, Aydemir O, Fisek G, Olmez N, Memis A. A. Validity and reliability of Turkish version of Short form 36: A study of patients with romatoid disorder. Journal of Drug and Therapy 1999;12:102-6. (in Turkish).
11. Abbreviated profile of hearing aid benefit (APHAB). Hearing Aid Research Lab (HARL) 2014. [Internet] Available from: http://www.harlmemphis.org/index.php/clinical-applications/aphab/. Accessed: 17.03.2014.
12. Cox RM, Alexander GC. The abbreviated profile of hearing aid benefit. Ear and Hearing 1995;16(2):176-86. (PMID:7789669).
13. Skafte MJ. The 1999 Hearing instrument market-the dispensers' perspective. The Hearing Review 2000 June 01. [Internet] Available from: http://www.hearingreview.com/2000/06/the-1999-hearing-instrument-market-the-dispensers-perspective/. Accessed: 04. 03. 2014.
14. Strom EK. An industry in transformation: Technology and consolidation lead hearing care into the USA. The Hearing Review 2001 March 02. [Internet] Available from: http://www.hearingreview.com/2001/03/an-industry-in-transformation-technology-and-consolidation-lead-hearing-care-into-the/.Accessed: 04.03.2014.
15. Kahveci OK, Miman MC, Okur E, et al. Hearing aid use and patient satisfaction. Journal of ear nose and throath 2011;21(3):117-21. (PMID:21595614). (in Turkish).
16. Eski E. Yımaz I. Effects of budget constraints on hearing rehabilitation in patients with presbycusis. Turkish Journal of Geriatrics 2011;14(4):359-61. (in Turkish).
17. Chang WH, Tseng HC, Ting- Kuang C, et al. Measurement of hearing aid outcome in the elderly: Comparison between young and old elderly. Otolaryngology-Head and Neck Surgery 2008;138(6):730-4. (PMID:18503844).
18. Stark P, Hickson L. Outcomes of hearing aid fitting for older people with hearing impairment and their significant others. International Journal of Audiology 2004;43:390-8. (PMID:15515638).