Hearing Aid Satisfaction in the Elderly with Hearing Impairment: A Comparison of Three Different Technologies

Rezvan Dashti, Seyed Jalal Sameni, Arash Bayat, Hamed Tabesh, Farzad Faraji Khiavi

Objective: The aim of this study was to evaluate the degree of satisfaction for hearing impaired elderly who use different hearing aid technologies.

Methods: Forty patients with hearing loss fitted with different technologies of hearing aids (analogue, digital and digitrim) were included. Scale “Satisfaction with Amplification in Daily Life” (SADL) was applied used to assess the benefits yielded by the hearing aids.

Results: In evaluation of satisfaction of hearing aid on elderly groups, the positive effect has highest mean score among SADL subscale in both of age group that shows elderly groups are very satisfied in this subscale and negative features has least mean effect has highest mean score among SADL subscale in both of age group . Significant difference was observed between the satisfactions of hearing aids based on elderly grouping (p-value=0.02). Patients who used different hearing aid technologies showed no significant differences in terms of satisfaction rate. Conclusion: The present study demonstrated a high degree of satisfaction among elderly which were using hearing aids. It seems that satisfaction level in any dimension is not changing significantly by using former or modern hearing aids technologies, except that the former types of hearing aids cost less. So we can recommend these hearing aid types for hearing-impaired aged groups.

INTRODUCTION

One of demographic facts that affect the present and future population of the world is aging and older people. It is rising in most parts of the world and its growth rate is higher than the rate of population (Malayeri and Jafari, 2004). According to WHO estimates, nearly 1/2 billion people in the world are over 60 years old. It changes the demographic shape of population to aging (Sprinzl and Riechelmann, 2010). Presbycusis is one of the most common chronic diseases in older people (Humes et al., 2009, Sindhusake et al., 2001) that less attention has been (Humes et al., 2009). Approximately 278 million people suffer from moderate to profound hearing loss in worldwide (Sindhusake et al., 2001, Weinstein, 2013). So this patient is placed in the top fifteen in serious condition. In general, hearing loss has been reported as the second leading cause disabling life after depression (Sindhusake et al., 2001). It is reported that 25% of those 65-75 years, and 70-80% of people older than 75 suffer from SensoryNeural hearing loss, which is known to presbycusis (Sprinzl and Riechelmann, 2010).

Several studies have shown that hearing loss has many negative effects on social, physical and mental life (Iriz et al., 2012) and it has a serious effect on quality of life (Israsena et al., 2013). Since communication is a vital skill for every person and plays a key role in communication and family, when communication breaks down, it is difficult personal relationships (HYWU et al., 2004). Negative consequences of hearing loss is not limited to a disturbance in the relationship (Newman and
but also includes participation restrictions in social activities, dependence on family support, isolation, depression and cognitive decline (Iriz,2012, Israsena et al.2013, Newman and Sandridge.2004, Silva et al.2009, Ozler,2013). Hearing loss can negatively affect all aspects of people’s life especially personal and professional interactions that can cause anxiety (Grewal and Irwin, 2012) and decrease their quality of life (Chisolm et al.2007) Aural rehabilitation process enables individuals to regain their social life (Newman and Sandridge,2004). In fact, the use of hearing aids or medical intervention to improve hearing loss has a positive effect on their quality of life (Newman and Sandridge,2004, Johnson et al.2009).

Untreated hearing loss has irreversible effects (Magni et al, 2005) and can lead to increased stress on the individual and family (Shapiro and Shekelle, 2004). The purpose of prescribing the hearing aids is amplifying sound signals in a way that makes sound audible for hearing impaired person (Grewal and Irwin, 2012). For amplifying, hearing aid has 4 basic parts including microphone, amplifier, receiver and battery. There are various hearing aids considering the hearing loss type and patients’ loss’ degrees (hearing loss is classified in 3 major types: (1) Sensorineural hearing loss- loss of hearing in internal ear and above in brain performance (2) Conductive Hearing Loss- loss of hearing in middle and external ear (3) Mixed Hearing loss: include both of above hearing loss types) (Grewal and Irwin, 2012). The use of hearing aids isn’t common in people who are candidates. In the United States, so that less than 25 percent of people who can benefit from hearing aids are the actual user and this situation is worse in developing countries. Some kinds of hearing loss can be fixed by early intervention, but research shows older adults are interested to wait 10 years before seeking hearing aid (Milstein and Weinstein,2003) In the past this has been partly due to the analog technology hearing aids that Prevents satisfaction in using hearing aid (Jalilvand Karimi et al. 2007). Since, it has significant limitations, such as linear amplification of all frequencies regardless of individual auditory thresholds, today's; digital hearing aids are the priorities for patient selection (Shapiro and Shekelle, 2004).

Current technology of digital hearing aids improves speech clarity and Research suggests that Hearing aids are effective in reducing the negative effects of hearing loss on daily activity in elderly (Iriz,2012). Because digital processing in digital hearing aids allows the sound to be adjusted automatically and set thousand regulation in per second which leading to noise reduction, improved audio system in noisy environments and users can use a variety of programs for different listening environments (Grewal and Irwin,2012) and It is generally agreed that digital hearing aids are more benefits for hearing impaired people that there isn’t in analogue hearing aids (Khalfia et al.2004). Digitrim hearing aids allow to implement several operation that aren’t possible in analogue hearing aids although don’t adjusted according to patient’s needs like digital hearing aid (Sprinzl and Riechelmann,2010). Because of advances in digital technology and directionality feature and improving in accessibility and use of wireless technology developed speech discrimination in noise or increased signal to noise ratio (Milstein and Weinstein, 2003). Considering all the features mentioned about the variety of hearing aids and the price of digital hearing aids, especially in developing countries, so using hearing aids is reduced (Humes et al., 2002).

Evaluation results of using hearing aids is one of the areas which has been maintained for more than a decade (Kochkin, 2005). Many attempts has been done to measure hearing aids’ outcomes since 1990 (Humes et al., 2002). Some specialists used self -reported questionnaires for determining users’ satisfaction and hearing aid outcomes, despite the fact that users’ answers in these questionnaires were influenced by their personal attitudes (Desjardin and Doherty, 2009). However, Satisfaction term is used for describing general opinions that are important for users. SADL questionnaire developed by Cox and Alexander (1999). It measures multiple dimensions of satisfaction (Uriarte et al. 2005), Halpern and Husford Dunn recommended SADL and called it a gold standard for evaluating satisfaction (Halpern and Husford Dunn, 2000). No research in Iran studied users’ satisfaction level based on hearing aids types. The present study evaluates satisfaction level among older people with digital and analog hearing aids.

MATERIALS AND METHODS

Participants:

Participants consisted of 40 hearing-aid users (30 males,10 females) on December 2013 up to march 2014 from hearing aid clinic in one of cities in south of Iran. All of the participants were fitted monaurally. They were classified into two different age groups according to WHO criteria (Mirkhani,2006): 65-74 and 75-90 years old. The aim of this grouping was comparative evaluation of satisfaction level with variety of hearing aid in each group.

The inclusion criteria for participation in the study were:
- Acquired post-lingual hearing loss
- Age over 65 years
- At least 6 months experience in the use of hearing aids

Procedure:

First each participant was counseled on the management and maintenance of the hearing aid and
having realistic expectations about hearing aid outcomes.

Second Measuring satisfaction of hearing aid was conducted by completing validated Persian version of SADL questionnaire. Validity of the original version of the questionnaire was conducted by designers (Cox and Alexander, 2001) and the reliability of the questionnaire was approved by the Iranian authors (p=0.432) (Ahadi et al., 2007).

The SADL questionnaire was administered via oral presentation, in individual interviews conducted by the researcher in a silent room and with the participant using the hearing aid. An interview room considered for this research. The researchers asked the questions and marked the respondents' answers due to high rate of illiteracy among them.

The questionnaire consisted of 15 questions, divided into four categories: positive effects, services and costs, negative features and personal image. The questionnaire presented closed questions, with seven response options: Not at all, a little, somewhat, medium, considerably, greatly, and tremendously. The answers are equivalent to a seven-point scale, where the score with the smallest value is 1, corresponds to the answer “Not at all”; the highest value is 7 and corresponds to the response “Tremendously”, indicating, respectively, the lowest and highest satisfaction. Reverse scoring considered in 4 questions, where the score 7 corresponds to the answer “Not at all” and the score of 1 corresponds to “Tremendously”.

This study was approved by the Research Ethics Committee of the Ahvaz Jundishapur University of Medical sciences under protocol number ajums.rec.1393.5.

Statistical analysis:

Data analysis was performed using SPSS 19 statistical software. The significance level was set at 0.05. Whereas distributed of data were un-normal, descriptive statistics and central indices like mean and standard deviation were used. Non-parametric Mann-Whitney and Kokaran tests used to show whether any differentiations existed among studied population or not.

Results:

A majority of the patients were men (75%), and the ages ranged from 65 to 90 years (mean: 74.62 years). 90% of patients were illiterate, and literate ones could not finish high school. The marital status of patients were 36 (90%) married, 3 (7.5%) widowed and 1 (2.5%) single.

The degree of hearing loss prior to fitting was moderate for 9 (22.5%), moderate to severe for 20 (50%) and severe for 11 (27.5%). Thirty-eight participants (95%) were fitted with behind-the-ear (BTE) and two (5%) with in-the-ear (ITE) hearing aids. 10 (25%), 24 (60%) and 6 (15%) participants were fitted with analogue, digital and digitrim hearing aids, respectively.

Table 1 shows the distribution of the percentage of variety of Hearing Loss in elderly groups. Just as is observed the most rampancy of hearing impairment in group 1 is moderate loss and in group 2 is moderate to severe loss.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Degree of Hearing loss</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Severe</td>
</tr>
<tr>
<td>65-74 years (n=20)</td>
<td>2</td>
</tr>
<tr>
<td>75-90 years (n=20)</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2: Satisfaction of hearing aids based on older age groups.

<table>
<thead>
<tr>
<th>SADL subscale</th>
<th>Age group (years)</th>
<th></th>
<th></th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65-74</td>
<td>75-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost and Services</td>
<td>5.16±1.26</td>
<td>4.50±0.90</td>
<td></td>
<td>0.09</td>
</tr>
<tr>
<td>Personal Image</td>
<td>4.50±0.68</td>
<td>4.41±0.84</td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>Negative Features</td>
<td>3.51±0.67</td>
<td>3.60±0.94</td>
<td></td>
<td>0.62</td>
</tr>
<tr>
<td>Positive Effect</td>
<td>6.18±0.71</td>
<td>5.53±0.92</td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Global score</td>
<td>5.11±0.50</td>
<td>4.41±0.47</td>
<td></td>
<td>0.02</td>
</tr>
</tbody>
</table>

According to table 2, a significant difference was seen in mean positive effect subscale and global score of satisfaction with hearing aid among different age groups. The positive effect and negative features had highest and lowermost mean scores among SADL subscales in both of age groups.

In cost and services subscale, the highest mean score was related to age group 1 (65-74) and showed these users were satisfied with their hearing aids. Age group 2 was very satisfied in positive effects. In personal image, the mean scores demonstrated a relative satisfaction of users in both of elderly groups. Negative feature sub scale had lowest score among subscales of SADL which was indicating of dissatisfaction among users.

Based on table 3, in cost and services, the mean scores in 3 types of hearing aids showed a relative satisfaction. The highest score in this subscale was related to analogue hearing aid and also in another subscale personal image, the mean scores show relative satisfaction too.

In negative features, the mean score of SADL ranged from 3.00 to 3.69 among different hearing aid users that showed a relative dissatisfaction among users. There was obtained a great mean score in
positive effect which showed users very satisfied with their hearing aid.

The mean scores of SADL subscale ranged from 3.00 to 6.16 among different hearing aid users. (Table 3). There was a greater satisfaction for subscales Positive Effect and Services and Costs and less satisfaction for Negative Factors. However, no significant satisfaction level difference was seen in terms of type of hearing aid technology.

The results showed no significant difference between the level of satisfaction of hearing aids (p-value= 0.9) and education of persons in each group. In overall the degree of satisfaction of users are very high and there are a few differences in subscales.

Table 3: Satisfaction with hearing aids in elderly people and their types of hearing aids.

<table>
<thead>
<tr>
<th>SADL subscale</th>
<th>Hearing Aid Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Digital</td>
</tr>
<tr>
<td>Cost and Services</td>
<td>4.50±0.54</td>
</tr>
<tr>
<td>Personal Image</td>
<td>4.23±0.80</td>
</tr>
<tr>
<td>Negative Features</td>
<td>3.69±0.80</td>
</tr>
<tr>
<td>Positive Effect</td>
<td>5.89±0.91</td>
</tr>
<tr>
<td>Global score</td>
<td>4.95±0.54</td>
</tr>
</tbody>
</table>

Discussion:

Hearing loss is the most common complaint in the world and it can limit a person’s quality of life(Cox and Alexander,2001, Tsiakropoulos et al,2007). Since the world population is aging, the prevalence of hearing loss is growing. So it is clear that there is an increasing need for rehabilitation and we will have to think to ensure capital resources. In a research reported that annual spending per person in Denmark auditory is equivalent of 61/9 Euros(Salonen et al,2013). Consequently, it is important to determine whether patients will benefit from a hearing aid benefits.

The result of current study shows the comparative satisfaction with hearing aid in hearing impaired elderly based on technology of their hearing aid. And also shows the high degree satisfaction with hearing aid based on ageing group.

There have been several studies on the use of hearing aids and satisfaction in older people. Hums and colleagues reported that only about 20 percent of older adults with hearing loss use hearing aids and only half of them are satisfied in the United State(Humes LE et al,2009, Israsena et al,2013, Khalafia et al,2004, Kochkin,2005, Arlinger et al,2003, Humes,2003).

In a study based on the satisfaction of hearing aids, Kndsen et al expressed that age and gender did not affect the use and satisfaction of hearing aids (Salonen et al, 2013) and they also expressed that educational level does not affect. These results weren’t consistent with the present results. In this study, there was correlation between the cost of materials and services and gender and significant difference was observed between the positive characteristics and classification of elderly. Compared with Kochkin (Kochkin,2005) results, these results are less satisfying in ages grouping that the main reason is that central auditory processing deficit increases with age and elderly and elderly have difficulty with hearing in noisy environments and strengthening the hearing aid is less effective in patients who have central auditory processing(Chang et al,2008).

In 1980s Brooke reported that daily use of hearing aids is lower among older seniors than younger seniors (Chang et al, 2008) that this is not consistent with the present results. So, this is probable because of better well-being mental and their daily activities are not limited to the aging. It also aids shrinkage also may make patients more motivated to use hearing aids.

The first generation was analog hearing aids. Then it took breakthroughs in digital technology and the speed of the speech signal processing to improve the performance of modern hearing aids (Kerckhoff et al, 2008). However, despite these improvements, users complain of auditory problem of speech in noisy environments and the performance of the phone and sometimes lack of availability and high cost of digital hearing aids are the other major people complaint (Israsena et al, 2013) which have led to lower satisfaction of hearing aid negative features that this results matches with results of similar studies. Weinstein reported that older people have to deal with problems understanding speech in noisy environments that the persistent problems of understanding in noise may cause discouragement and anxiety (Milstein and Weinstein, 2003). Vuchrialho et al reported that technical advances in hearing aid technology has increased the satisfaction of hearing aids and they expressed the same assessment procedures compared with a study conducted 20 years ago, the percentage of users of hearing aids rose from 40.9 to 56.6 percent (Salonen et al, 2013) that these results weren’t consistent with the results of the present research. These results were consistent with the study of Arlyngur et al (Arlynger et al,2003) and their research also found no significant difference in the satisfaction of hearing aids and technology of hearing aid. Although great advances have been made in the design and type of hearing aid today and it looks hearing aids have improved greatly in terms of quality but factors such as labeling with the use of hearing aids, hearing aids consumer dissatisfaction due to meet his expectations might lead to less emphasis on the use of hearing aids.
A pre- assumption considers that using digital hearing aids are accompanied with more satisfaction, but no evidenced data showed that digital hearing aids with characteristics such as automatic feedback reduction, digital program, various program for different auditory environments led to more satisfaction among users. These hearing aids costs is probably one of the causes, especially considering that the insurance firms do not cover listening assistive devices in Iran. Whereas Iran amongst of developing ageing countries with high prevalence of hearing loss; digital hearing aids because of their cost can prevent doing rehabilitation process adequately. Also with according to insignificant difference in satisfaction of elderly with hearing aid based on kind of technology, comparing this result with result of distribution of age shows this can arising from user’s age. Users are older adults that less active in work stage and social participation and they use hearing aid for communicate with environment and use this in a little time

The level of hearing aid that subjects used in various studies is different. In current study patients fitted with 3 models of hearing aid (analogue, digital and digitrim), but Cox & Alexander reported the majority of subjects were using analogue hearing aids and few persons fitted with digitrim hearing aid (Cox & Alexander, 2001), also Kochkin (2000) reported the programmable hearing aid is accompanied by higher level of satisfaction in comparison of not programmable ones, probably this can explain why in the present study showed higher level of satisfaction, Uriarte et al’ study was supported our results. (Uriarte et al 2005).

The primary aim of categorizing elderly users of hearing aid is enabling them with timely intervention and more for persons who have less satisfied. More intervention can perform in counselling and more education. Using of hearing aids for remedy of hearing loss is most effective solution in rehabilitation of hearing impaired persons; because of audiologists deal with hearing impaired person and their communication disorders they should aware from the importance of hearing in communicating that is more important in rehabilitation plan.

The present study demonstrated the high degree of satisfaction among elderly using hearing aid. It seems that satisfaction level in any dimension is not changing significantly by using former or modern hearing aids technologies, except that the former types of hearing aids cost less. So we can recommend these hearing aid types for hearing-impaired aged groups in developing countries.

**Conclusions:**

Overall average satisfaction scores among elderly who were using hearing aids showed no significant difference between different technologies which shows technology does not increase satisfaction lonely; and satisfaction was assessed relatively high for all different groups. Since all of the subjects of this study were used to hearing a single phone, we suggest that the use of handheld instruments should be investigated in future studies. World’s population is ageing and the prevalence of hearing loss is increasing, so the need for rehabilitation services is growing. Given an ascending percent of elderly people who need hearing aids, improving the counselling services and considering educational needs of patients for a better use of their hearing aids seems necessary for more satisfactory hearing. Considering the high costs of hearing aids and rehabilitation services as well as in view of unemployment or insufficient retirement pensions among majority of older adults, insurance firms and social insurance organizations coverage for this services’ costs can help elderly a great deal.

**Conflict of Interests:**

The authors declare that there is no conflict of interests regarding the publication of this article.

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