Original article

Utilization of hearing aids for the underprivileged at Sisaket Hospital under Thai Red Cross Hearing Aids Project

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Background: As the second-most prevalent disability in Thailand, mitigating the effects of hearing loss can have wide-ranging benefits. Despite the availability of hearing aids, its usage remains low.

Objective: This research aimed to study factors related to utilization of hearing aids: age, gender, level of education, degree of hearing loss, understanding of usage and maintenance, and attitudes towards its use.

Methods: A cross-sectional study was conducted in 30 hearing loss patients of the Thai Red Cross (TRC) Hearing Aids Project for the Underprivileged, Sisaket Hospital, Sisaket Province, Thailand (here in after referred to as "TRC Hearing Aids Project") by face-to-face interviews from November 2017 to March 2019.

Results: Many of the subjects (62.0%) are elderly with a mean age of 63.4 years (SD = 18.2). The group is equally represented by men (51.7%) and women (48.3%). The group's level of education is fairly low, with 86.2% having finished only elementary school. Most of them (41.4%) have had hearing loss for 6 - 10 years; the degree of hearing loss is moderately severe; 96.6% have bilateral hearing loss and; 86.2% of the subjects use hearing aids. The hearing aid utilization rate is 3 hours per day. About half (48.3%) have a moderate level of understanding usage and maintenance. Factors that are related to utilization of hearing aids were age, self-image, earache, acoustic feedback, and overall satisfaction.

Conclusion: Patients of the TRC Hearing Aids Project have hearing aids utilization rates less-than-ideal. Most of them are elderly and need time to get accustomed to using them.

Keywords: Hearing loss, hearing aid, use, attitude, elderly.

Hearing is an important part of human life. Hearing loss can cause problems in language development in children and, as is especially the case in the elderly, cause difficulties in daily life. According to the World Health Organization, 466 million people (or 5.0% of the world's population) have hearing or communication disabilities: 432 million adults and 34 children. Approximately, one-third of the people above the age of 65 suffer from some form of hearing or communication disability, and more predominantly in South Asia, Asia-Pacific and Africa regions.[1] As of September 2017, the Ministry of Social Development and Human Security has registered 332,294 people with hearing and communication disabilities, making it the second-most predominant disability.[2] At present, aural rehabilitation by the utilization of hearing aids for people with hearing disabilities remains one of the most frequently used alternatives. However, the relatively high cost of hearing aids as a ratio to the average income of Thai households, the different stages of diagnosis i.e. selection, fitting, and speech training all have to be personalized, makes the entire process lengthy. Moreover, it has been found that despite having received hearing aids, many still opt not to use them. The reasons for the relatively low utilization rate can be attributed mostly to the fact that most users are elderly. Numerous studies have found that the frequency of usage in the elderly population in actuality decreases with age. Korkmaz MH, *et al.*[3] and Salonen J, *et al.*[4] found that as hearing aid users get older, their satisfaction with the hearing aids drop, which in turn lowers the amount of time spent using hearing aids. Additionally, Guerra-Zuniga M, *et al.*[5] found that the main reason that elderly users stop using hearing aids is age-related decline in fine motor skills, making holding and adjusting hearing aids a difficult task and require assistance in using (the

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small-sized) hearing aids. Moreover, McCormack A. and Fortnum H.[6] found that most hearing aids users are elderly, need assistance, and are not able to equip the hearing aids on their own, causing them to use the hearing aids with less frequency or stop using them altogether. Pantumongkol W, *et al.*[7] found that those with hearing disabilities and benefit from the Universal Health Coverage Project in Thailand are mostly women, and that gender does not affect the utilization of hearing aids in these cases as well; however, the study noted that male users stop using hearing aids 15 months later than their female counterparts, and that men have proportionately higher utilization rates of hearing aids than their female counterparts as the time period with hearing impairment increases. The research further opines that male users use hearing aids for communication with other people, while women prefer to remain in the house more. This contradicts the findings by Staehelin K, *et al.*[8] that found that female users tend to use hearing aids more consistently than men, whereas Guerra-Zuniga M, *et al.*[5] and Knudsen LV, *et al.*[9] found that gender did not affect the utilization and satisfaction towards hearing aids. Other reasons include negative self-image as its usage is perceived as an indication of one's hearing impairment.[6 - 7, 10], earache during usage[10], and low sound quality (presence of background noise and acoustic feedback).

This research aimed to study the utilization frequency of hearing aids and the factors that relate to its utilization for patients of the Thai Red Cross (TRC) Hearing Aids Project. The factors studied within this research are: age, gender, level of education, degree of hearing loss, understanding of proper usage and maintenance, and attitudes towards the application of hearing aids in terms of self-image, comfortability, the sound quality of the hearing aid, and level of satisfaction in using the hearing aids.

Materials and methods

This cross-sectional study was conducted in 30 hearing loss patients of the TRC Hearing Aids Project from November 2017 to March 2019.

Inclusion criteria

Subjects must have at least a unilateral hearing loss of more than 25 decibels. They should be in the TRC Hearing Aids Project and be in good consciousness and able to communicate and be willing to answer interview questions.

Exclusion criteria

Subjects with at least one of the following were excluded from the research when he or she: does not consent to participate in the study; displays signs of suspicion, confusion, or neurotic behavior, or shows signs of physical violence that becomes an obstacle in interviewing.

This study has been approved by the Institutional Review Board, the Faculty of Medicine, Chulalongkorn University (IRB no. 510/61).

Data collection

This study was conducted via interviews with patients who have been receiving treatment from the TRC Hearing Aids Project for at least six months. All subjects were fitted with a Behind-The-Ear (BTE) hearing aid with batteries for the entirety of the project and were trained on proper usage and maintenance of the hearing aids. They also received a brochure-style manual to keep at home for future reference. Interviews were the main research tool employed for this research. Once the questionnaire was localized to the region and target group, it was submitted to a panel of 3 experts to evaluate the research tools, content validity testing, and comprehensiveness to research objectives, after which the Item Objective Congruence (IOC) was evaluated - a value of 0.8. The interview comprises four parts: 1) General Information: the subject's usage and rate of usage of the hearing aid that using a closed form interview with multiple choices and space for short answers, a 6-item check list for the subject to respond for general data collection on gender, age, marital status, education, occupation, income, monthly hearing aid maintenance costs, usage of hearing aids (yes/no), and usage (hours/day); 2) Data related to the severity of hearing loss was collected via a closed form interview with multiple choices, a 3-item check list interview regarding the period since first having hearing abnormality, whether the hearing loss unilateral or bilateral, and the degree of hearing loss; 3) Data related to the subject's understanding of proper usage and maintenance of hearing aid was collected via a 15-question closed form interview with 3 possible answers (yes/no/unsure), comprising 9 positive-worded questions and 6 negative-worded questions; and, 4) Data related to self-image, comfortability, quality of sound (background noise and acoustic feedback), and overall usage satisfaction were collected via a rating scale questions (very little, little, much, very much).

Statistical analysis

This study was carried out using SPSS version 22.0. Demographic data analysis was conducted using descriptive statistics, namely: frequency, percentage, mean, standard deviation, and descriptive results. Analysis of age-related factors was carried out by using the one-way analysis of variance (ANOVA). The correlation coefficient between different factors, i.e., gender, degree of hearing loss, and usage of hearing aids with inferential statistics were calculated using the Fisher Exact Test. Finally, the unpaired Student *t* - test was used to compare factors on attitudes between the group that used and the group that opt not to use hearing aids. *P* - values of < 0.05 were considered statistical significance.

Results

Demographic data

Of the 30 patients that participated in this study, one subject misplaced his hearing aid. A large proportion of the subjects (62.0%) are elderly, mean age of 63.4 years (SD = 18.2); males and females equally represented at 51.7% and 48.3%, respectively. The level of education overall is relatively low, with 86.2% having finished only elementary school (Table 1).

By analysing the age and frequency of usage (hours/day) from the group of subjects that use their hearing aids on a consistent basis using a Scarlet Plot, it was found that the more elderly the person is, the fewer hours they are using hearing aids (Figure 1).

Severity of hearing loss

In Table 2, it can be seen that a large proportion of the subjects (44.8%) have had hearing abnormalities for a period of 6 - 10 years, and 96.6% suffer from bilateral hearing loss (BHL), and 41.4% of the entire group have moderately severe hearing loss.

Knowledge on usage and maintenance of hearing aids

This section of data can be separated into three levels, using the mean ($\overline{X}$) and standard deviation (SD), where the calculated mean is $\overline{X} = 11.0$ and the standard deviation is SD = 2.2. The three levels of categorization are: High ($\geq \overline{X} + \frac{1}{2}$ SD); Moderate ($= \overline{X} \pm \frac{1}{2}$ SD); and Low ($\leq \overline{X} - \frac{1}{2}$ SD).

A large proportion of the subjects (48.3%) have a moderate level of understanding of proper usage and maintenance of the hearing aids, while 27.6% of the group have a high level of understanding, as can be seen in Table 3 below. During interviews, the topic most commonly answered wrongly is the topic of adjusting the volume of the hearing aids.

Table 1. Demographic data of subjects.

Demographic data	Amount (persons)	Percentage of group
Age		
Below 20 years	1	3.5
20 - 40 years	2	6.9
41 - 60 years	8	27.6
61 - 80 years	13	44.8
Above 80 years	5	17.2
$\overline{X}$ = 63.4, SD = 18.2, Max = 85.0, Min = 19.0		
Gender		
Male	15	51.7
Female	14	48.3
Level of education		
Elementary school (grades 1 - 6)	25	86.2
Middle school (grades 7 - 9)	1	3.5
High school (grades 10 - 12) or vocational training	3	10.3

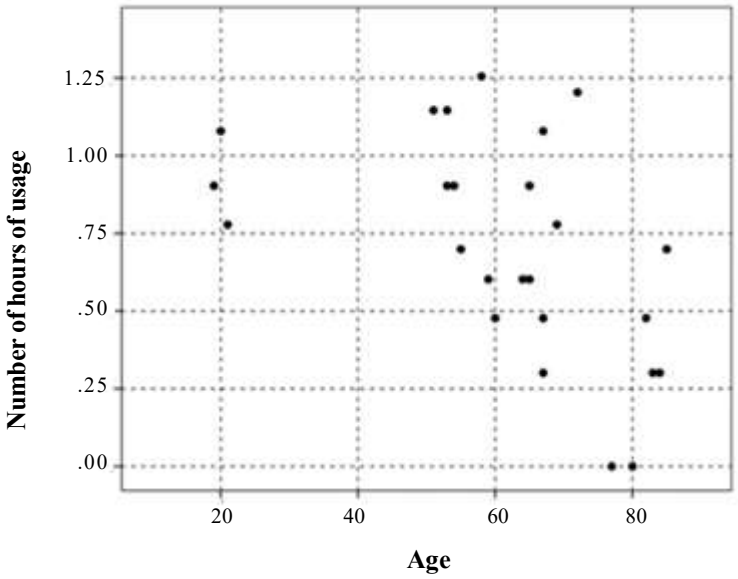

Figure 1. Ages of the subjects in relation to their usage of hearing aids (in hours).

Table 2. Frequency and period of having experienced hearing impairment, type of hearing loss, and degree of hearing loss.

Hearing loss data	Amount	Percentage
Period of which the patient has had hearing abnormality or hearing loss		
1 - 2 years	1	3.5
3 - 5 years	6	20.7
6 - 10 years	13	44.8
More than 10 years	9	31.0
Type of hearing loss		
Unilateral Hearing Loss (UHL)	1	3.5
Bilateral Hearing Loss (BHL)	28	96.6
Degree of hearing loss		
Mild	1	3.5
Moderate	8	27.6
Moderately severe	12	41.4
Severe	8	27.6

Table 3. Level of understanding of proper usage and maintenance of hearing aids.

Level of understanding of proper usage and maintenance of hearing aids	Amount (persons)		Percentage
	Use	Non-use	
High (a score of 12.15 to 14 points)	8	0	27.6
Moderate (a score of 9.91 to 12.14 points)	11	3	48.3
Low (a score of 5 to 9.90 points)	6	1	24.1

Usage and frequency of utilization of hearing aids

Data manipulation of most subjects (86.2%) use hearing aids; 17.2% of the group use hearing aids for three hours per day; in the group that uses hearing aids, 3.5% use hearing aids up to 18 hours per day (highest frequency) and 6.9% use hearing aids for only 1 hour per day (lowest frequency) (Table 4).

Analysis of factors related to hearing aids usage

Age

After grouping the age ranges into three groups i.e. 19 - 50 years, 51 - 71 years, and 72 - 85 years, the mean hours of hearing aids usage among the different age groups have a statistically significant difference (P = 0.04). The follow-up multiple comparisons (post-hoc) using Least Significant Difference (LSD) further showed that the group of 72 - 85 years have a significantly lower mean value of usage of hearing aids (in hours) than users in the 19 - 50 years age group (P = 0.04) as well as the 51 - 71 years age group (P = 0.02).

Gender

Of the 15 male subjects, 14 use hearing aids and 1 does not; of the 14 female subjects, 11 use hearing aids and 3 do not. Data manipulation with the Fisher Exact Test revealed no correlation between gender and the usage of hearing aids.

Degree of hearing loss

Data manipulation of the above using the Fisher Exact Test revealed no correlation between the degree of hearing loss and usage of hearing aids (Table 5).

Attitude

Table 6 shows that overall satisfaction has a statistically significant difference ($P < 0.05$). Attitudes towards the three factors, namely self-image, earache, and acoustic feedback, also have a statistically significant difference ($P < 0.05$). The group that uses hearing aids have a higher level of satisfaction towards using hearing aids compared to the group that opt not to use hearing aids.

Table 4. Number and frequency of subject and percentage of hearing aids utilization per day (hours).

Usage of hearing aids	**Amount (person)**	**Percentage**
Use	25	86.2
Non-use	4	13.8
Frequency hearing aids usage per day (hours)	**Amount (person)**	**Percentage**
0	4	13.8
1	2	6.9
2	3	10.3
3	3	10.3
4	3	10.3
5	2	6.9
6	2	6.9
8	4	13.8
12	2	6.9
14	2	6.9
16	1	3.5
18	1	3.5

Table 5. Correlation analysis between degree of hearing loss and utilization of hearing aids.

Degree of hearing loss	**Usage of hearing aids**		**Total**	***P*-value**
	Use	**Non - use**		
Mild to moderate	7	2	9	0.78
Moderately severe to severe	18	2	20	
Total	25	4	29	

Table 6. Analysis comparing the different attitudes to hearing aids usage in both groups (groups that use and that opt not to use their hearing aids).

Attitude	Hearing aids usage				*P* - value
	Use		Non - use		
	$\bar{X}$	SD	$\bar{X}$	SD	
Self-image	3.4	0.6	3.0	0.0	<0.001
Earache	3.4	0.6	3.0	0.0	<0.001
Fitting	3.2	0.4	2.8	0.5	0.061
Comfortability	3.2	0.6	2.8	0.5	0.224
Background noise	3.2	0.7	3.0	0.0	0.083
Acoustic feedback	3.3	0.6	3.0	0.0	0.032
Satisfaction	3.4	0.6	2.5	1.0	0.018

Discussion

Most of the subjects are elderly and it has been found that more elderly groups have a statistically significantly lower frequency of hearing aids usage than other groups similar to previous studies.[3 - 6] This study showed that there is no difference between gender and level of education when it comes to people who have hearing loss and that there is no correlation to the utilization of hearing aids. Other studies on the relation between gender and level of education as factors to the utilization of hearing aids are inconclusive.[3, 5, 7 - 9]

The study on the utilization of hearing aids shows that patients of the TRC Hearing Aids Project have a utilization rate lower than ideal.

Most subjects have a moderately severe level of hearing loss [11], and use hearing aids, no correlation was found between the level of hearing loss and utilization of hearing aids. This is inconsistent with previous study that severe hearing loss is the main factor for patient to utilize hearing aids on a consistent basis.[3, 9, 12]

A large proportion of subjects have a moderate understanding of proper usage and maintenance of their hearing aids. Studies found that elderly users do not use hearing aids because they do not know how to use them.[5 - 6, 10] A group of four that do not use hearing aids, whose ages between 72 - 83 years old and therefore relatively higher than the mean age, it was found through the interview that 3 had a moderate understanding and 1 had a low understanding of proper usage and maintenance of their hearing aids. The question most commonly answered wrongly was the one regarding volume adjustment and cleaning the hearing aids. Additionally, most of them held the perception that they do not need to use the hearing aids everyday.

The results of the analysis of attitudes towards hearing aids indicated that the group that utilizes hearing aids have a significantly higher overall level of satisfaction compared to the group that does not. considering each factor individually, it was found that the group that use hearing aids have a better self-image when using hearing aids - consistent with the other studies.[5, 13] Results from the analysis on the relatively low presence of earache and acoustic feedback when using hearing aids are consistent with the previous studies that found that the comfortability and how well the hearing aids fit in with the users' ears have a positive effect on the decision to use hearing aids. [6, 10, 13]

This study can be used to further improve the TRC's implementation of the Hearing Aids Project. To this end, the author's recommendations are as follows: 1) Staff should proactively offer suggestions and allot more time with patients in hearing aid selection and fitting, use high quality materials to prevent earache during usage, train users the proper usage to prevent acoustic feedback; 2) A training session on proper usage and maintenance of hearing aids for those with hearing loss, especially elderly patients, their family and caregivers, should be conducted to boost confidence in using hearing aids, maximize benefits of using hearing aids by modernizing training mediums to be suitable and easily accessible to for people that have received hearing aids, in addition to having experts provide advice on a regular basis; 3) Monitoring and evaluation of usage of users' experience with hearing aids should be conducted continuously and systematically; and, 4) promote cooperation between communities, hospitals and relevant agencies to be the liaison between people with hearing loss and the companies that sell hearing

aids, support users for periodic maintenance schedules or when the hearing aids are damaged, including providing a convenient channel for purchasing replacement batteries for users' hearing aids. Since the number of patients that participated in this research was small. Therefore, this research should be extended to other provinces and include other patients that receive hearing aids from the National Health Security Office (NHSO), as the research results will be valuable for the provision of NHSO's hearing aids to people with hearing disabilities.

Conclusion

This study revealed that most of the patients of the TRC Hearing Aids Project do use the hearing aids, but have a lower-than-ideal frequency of utilization. The factors that are related to utilization of hearing aids are: age, where more elderly patients use hearing aids less frequently; attitudes towards self-image when using hearing aids, where the patients that use hearing aids have a generally positive self-image; comfortability, where the patients that use hearing aids experience less earache, and; quality of sound, where users do not experience acoustic feedback and also have an overall level of satisfaction higher than patients that opt not to use the hearing aids. The data from this research indicate that the factors that are related to utilization of hearing aids are sensitive issues; it is therefore imperative for service providers to mind the minute details and problems that arise from utilization of hearing aids so that those with hearing loss can receive the maximum benefit from hearing aids.

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Conflict of interest

The author, hereby, declare no conflict of interest.

References

1. World Health Organization. Deafness and hearing loss [Internet]. 2018 [cited 2020 Jun 12]. Available from: www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss.
2. Department of Empowerment of Persons with Disabilities. September 2017 monthly report on persons with disabilities in Thailand: Ministry of Social Development and Human Security [Internet]. 2017 [cited 2017 Sept 15]. Available from: http://dep.go.th.
3. Korkmaz MH, Bayır Ö, Er S, Işık E, Saylam G, Tatar E, et al. Satisfaction and compliance of adult patients using hearing aid and evaluation of factors affecting them. Eur Arch Otorhinolaryngol 2016;273:3723-32.
4. Salonen J, Johansson R, Karjalainen S, Vahlberg T, Jero JP, Isoaho R. Hearing aid compliance in the elderly. B-ent 2013;9:23-8.
5. Guerra-Zúñiga M, Cardemil-Morales F, Albertz-Arévalo N, Rahal-Espejo M. Explanations for the non-use of hearing aids in a group of older adults: A qualitative study. Acta Otorrinolaringol Esp 2014;65: 8-14.
6. McCormack A, Fortnum H. Why do people fitted with hearing aids not wear them? Int J Audiol 2013; 52:360-8.
7. Pantumongkol W, Doungthipsirikul S, Photihang O. Factors associated with the use of hearing aids in people with hearing loss under the universal health coverage scheme. J Health Systems Res 2018;12: 164-72.
8. Staehelin K, Bertoli S, Probst R, Schindler C, Dratva J, Stutz EZ. Gender and hearing aids: patterns of use and determinants of nonregular use. Ear Hear 2011; 32:e26-37.
9. Knudsen LV, Oberg M, Nielsen C, Naylor G, Kramer SE. Factors influencing help seeking, hearing aid uptake, hearing aid use and satisfaction with hearing aids: a review of the literature. Trends Amplif 2010;14: 127-54.
10. Kongtangchit P. Hearing aid fitting procedure in the Pathumthani Hospital. Thammasat Med J 2013;13: 465-76.
11. Clark JG. Uses and abuses of hearing loss classification. Asha 1981;23:493-500.
12. Moon IJ, Baek SY, Cho YS. Hearing aid use and associated factors in South Korea. Medicine 2015;94: e1580.
13. Archana G, Krishna Y, Shiny R. Reasons for nonacceptance of hearing aid in older adults. Indian J Otol 2016;22:19.