

Need of Hearing Assistance Technology (HAT) for Adults with Hearing Impairment

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Abstract

Background: Hearing aids remain the preferred choice of rehabilitation for the persons with sensorineural hearing impairment which facilitates better speech perception in a quiet environment, but fails to provide better signal to noise ratio (SNR) and give limited benefit in many daily life situations. The use of hearing assistance technology (HAT) along with hearing aids facilitates the communication. The present study is aimed at comparing the need for Hearing Assistance Technology (HATs) in adults with pre and post-lingual hearing impairment. **Materials and methods:** This cohort study included sample of 105 persons in the age range of 20 to 40 years (mean age = 28.1yrs) with hearing impairment. Subjects were divided in 2 x 2 groups based on onset of hearing loss (prelingual and postlingual) and hearing aids usage (hearing aid users and hearing aid nonusers). The standardized questionnaire tool comprised of two sections viz. general demographic details, and twenty questions based on five domains of daily life viz. interactive communication, non interactive communication, public communications, alerting signals and others were used to find the difficulty felt and perceived need for use of HATs. **Results:** On the basis of qualitative analysis postlingual group (mean score=42.57) felt more difficulty and perceived need for HATs compared to prelingual group (mean score=36.41). Within subgroups of prelingual, hearing aid users felt more difficulty and perceived need for HATs where as in postlingual subgroups hearing aid non users felt more difficulty and perceived need for HATs. **Conclusion:** The post lingual group felt more difficulty, and perceived need for HATs as compared to prelingual group. Hence it can be inferred that postlingual were dependent upon auditory based communication modalities and age of onset of hearing loss has significant influence on the difficulty felt and perceived need for HATs. Further it also depends upon the usage of the hearing aids.

Key words: *Hearing Assistance Technology (HAT), Prelingual, Postlingual, Hearing Impairment, and Rehabilitation*

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INTRODUCTION

The sense of hearing offers the opportunity to hear, listen and understand the world of sounds. It is the key factor which fosters acquisition of speech and language skills in human beings. Adult onset of hearing loss is the second leading cause of the years lived with disability (YLD) accounting for 4.6% of total

global YLDs.¹ Hearing impairment can be prelingual (acquired before the acquisition of speech and language skills) or postlingual (acquired after acquisition of speech and language skills). Rehabilitation of persons with hearing impairment is always a challenge and needs proper examination in various areas like age of onset, degree of hearing loss, listening needs of the

person, type of hearing loss, and role of a person in life. Research and advancement in technologies have made rehabilitation options more high tech as per need of the persons with hearing impairment. The hearing aids are preferred option for the person with sensorineural hearing loss, but use of hearing assistance technology (HAT) along with it facilitates the communication.² "HAT refers to a broad array of devices designed to facilitate reception of auditory information via amplification, vibrotactile stimulation and/ or visual display."² They can function alone as independent communication devices or in conjunction with hearing aids. HATs improve signal to noise ratio up to + 15dB.³ HATs provide the listener with improved sound quality by minimizing effects of reverberation and background noise.⁴ Pruitt⁵ reported rejection of conventional amplification in favor of successful use of a FM system by an older individual. Kochkin and Rogin⁶ demonstrated the need of assistive devices to facilitate the receptive communication. They also emphasized on the importance of the alerting devices for increased safety to persons with hearing impairment. Hearing aids remain the preferred choice of rehabilitation which facilitates better speech perception in a quiet environment, but fails to provide better signal to noise ratio and give limited benefit in many daily life situations. In spite of having HATs available, only 20% of persons with hearing impairment make use of it in the United States.⁷ This figure are very less in Indian scenario. There are two proposed reasons for this: a) lack of awareness among persons with hearing impairment, and professionals regarding potential benefit of HATs b) HATs are not readily accessible/ affordable. Therefore this study is envisaged to understand need of HATs for person with hearing impairment in Indian context. This study was aimed at comparing the need for Hearing Assistance Technology (HATs) in adults with pre and postlingual hearing impairment and further in hearing aid users and hearing aid non users.

MATERIAL AND METHODS

The present study involved conducting a survey on a convenient sample of 105 persons in the age range of 20 to 40 yrs (mean age=28.1yrs) with bilateral Severe to Profound Hearing Impairment. Pure tone audiometry (PTA) was carried out before administration of the questionnaire to find out the severity of hearing impairment for selection of the participants. Modified Hughson- Westlake method (bracketing) was used for estimation of hearing

thresholds. PTA for all the participants was done by a qualified Audiologist inside a double room sound treated audiometric suite. Subjects were divided in 2 x 2 groups based on onset of hearing loss and use of hearing aids. Group 1: persons with prelingual hearing impairment (60 subjects; mean age=26.4; SD=5.6) and Group 2: persons with postlingual hearing impairment (45 subjects; mean age=29.8; SD=7.2). Subjects were further divided into hearing aid users and hearing aid non users. Group 1A: prelingual hearing aid users (30 subjects), Group 1B: prelingual hearing aid non users (30 subjects) and Group 2A: postlingual hearing aid users (30 subjects), Group 2B: postlingual hearing aid non users (15 subjects). In Group 2B (postlingual hearing aid non users) data was collected from 15 subjects only due to non availability of the subjects. Subjects with cognitive and neurologic impairment were excluded from the study. Table 1 summarizes distribution of sample according to age of onset of hearing impairment, hearing aid usage, gender and mean age with standard deviation. In the absence of standardized questionnaire/ tool on the difficulty felt and perceived need for Hearing Assistance Technology (HATs), one was designed to gather key information about the difficulty felt and perceived need for use of HATs by the person in five different domains of daily life. The questionnaire comprised of two sections viz. general demographic details, and twenty questions based on five environmental conditions which include interactive communication, non interactive communication, public communications, alerting signals and others. The questionnaire was validated by the experts in audiology, speech language pathology, clinical psychology and statistics and was found reliable ($\alpha = 0.78$). The questionnaire was also given to the persons with hearing impairment for validation as well to check the understanding before finalization. The questionnaire was translated into Hindi and Marathi languages using standardized back to back translation protocol. All the participants were given the questionnaire to read carefully and answer. The researcher was always available to clarify any doubt regarding the same. In some cases the questionnaire was also filled through verbal interview. Help of the sign language interpreter was taken whenever needed. The scores of the questionnaire were calculated separately on the two aspects viz. difficulty faced and perceived need for HAT using 3-point rating scale. For difficulty assessment higher score indicated more difficulty whereas lower score indicated less

difficulty. In case of perceived need for HAT higher score indicated less perceived need whereas lesser score indicated more perceived need. The data collected was analyzed using t- test (2- tailed). Informed consent was obtained from all the participants.

RESULTS

On Qualitative analyses of difficulty felt and need perceived for HATs across the five domains of daily activity, Group 2 (mean score=42.57) felt more difficulty compared to Group 1 (mean score=36.41) similarly the need perceived for HATs was more among Group 2 (mean score=47.58) compared to Group 1 (mean score=43.29). On Quantitative analyses of prelingual and postlingual groups of persons with hearing impairment the obtained p-value (0.000) for t- test (2- tailed) was significant at 0.05 level of significance indicating significant difference between two groups in terms of both difficulty felt and need perceived for HATs. Table 2 illustrates the mean, SD, Std errors of mean on total score for difficulty felt and perceived need for the HATs Groups 1 and Group 2.

Table 1: Age wise distribution of sample in various groups

Group	Subgroups	Gender	Total N	Mean Age	SD
Prelingual Hearing Impaired (Group 1.)	Hearing aid user (Group 1A)	M= 21 F = 9	30	25.5	6.26
	Hearing aid non user (Group 1B)	M= 20 F = 10	30	27.30	4.96
Postlingual Hearing Impaired (Group 2.)	Hearing aid user (Group 2A)	M= 20 F =10	30	29.4	7.89
	Hearing aid non users (Group 2B)	M= 10 F = 5	15	30.13	6.54

Table 2: Score of difficulty felt and perceived need for HATs among Prelingual and Postlingual hearing loss groups.

Total Difficulty Score	Age onset	N	Mean	SD	SE (mean)
Total HATs	Pre-lingual	60	36.41	6.90	.89
	Post-lingual	45	42.57	5.10	.76

need score	Post-lingual	45	43.29	2.50	.37
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Within subgroups of Prelingual, hearing aid users (mean score = 39.50) felt more difficulty compared to hearing aid non users (mean score=33.33) while comparing for perceived need for HATs hearing aid users (mean score=45.60) felt more need than the hearing aid nonusers (mean score=49.57). While comparing subgroup of prelingual, the obtained p- value (0.000) and (0.000) respectively for t- test (2- tailed) was significant at 0.05 level of significance indicating significant difference between Group 1A and Group 1B in terms of both difficulty felt and need perceived for HATs. Table 3 illustrates the mean, SD, Std errors of mean on total score for difficulty felt and perceived need for the HATs among 1 A and Group 1B. Within subgroups of Postlingual, hearing aid nonusers (mean score = 43.13) felt more difficulty compared to hearing aid users (mean score=42.30) while comparing for perceived need for HATs

Table 3: Scores of difficulty felt and need perceived for HATS by prelingual hearing aid users and hearing aid non users.

Total difficulty score	Usage of HA	N	Mean	SD	SE (mean)
Total HATs need score	HA user	30	39.50	6.08	1.11
	HA non user	30	33.33	6.35	1.16

hearing aid non users (mean score=43.00) felt more need than the hearing aid users (mean score=43.43). Whereas in subgroups of postlingual group the obtained p- values (0.611) and (0.590) respectively for t- test (2- tailed) were not statistically significant at 0.05 level of significance indicating no significant difference between Group 2A and Group 2B in terms of both difficulty felt and need perceived for HATs. Table 4 illustrates the mean, SD, Std errors of mean on total score for difficulty felt and perceived need for the HATs among Groups 2 A and Group 2B. On quantitative analyses of all domains of daily listening situations viz. interactive communication, non interactive communication, public communication, alerting signals and others it was found that difficulty felt

and need felt for HATs by the persons with postlingual hearing impairment Group is greater

Total difficulty Score	Usage of HA	N	Mean	SD	SE (mean)
	HA user	30	42.30	4.72	.861
	HA non user	30	43.13	5.95	1.536
Total HATs need score	HA user	30	43.43	2.28	.417
	HA non user	15	43.00	2.95	.762

compared to the prelingual hearing impairment

Table 4: Score for difficulty felt and perceived need for HATs by persons with postlingual hearing aid users and hearing aid non users

Group Figure 1 Illustrates number of participants who felt need for HATs in different domains of daily life situation. It can be inferred from Figure 1 that hearing aid users felt highest need for HATs in non interactive communication and lowest need in situation like others which include communication with persons not knowing sign language. For the

domain like non interactive communication, communication, and alerting signals both the group i.e. hearing aid users and non users felt nearly similar need.

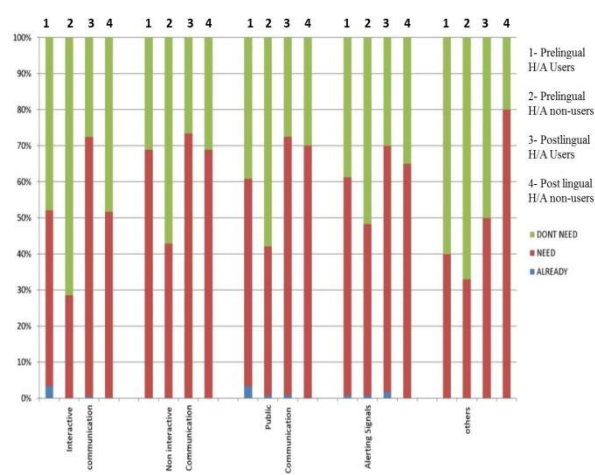


Figure. 1: Need perceived for HATs by four groups in different functional domains

DISCUSSION

From the above finding it is clear that persons with postlingual hearing impairment (either hearing aid

users or hearing aid non users) felt greater difficulty and perceived more need for HATs than those with the prelingual hearing impairment. It can be inferred that persons with prelingual hearing impairment make adaptation to the environment hence felt less difficulty and perceived less need for HATs as compared to persons with postlingual hearing impairment. The finding was similar to Hallberg and Carlsen⁸ study which concluded that active coping strategy tends to focus attention on disability and increase perceived handicap. The present study was supported by the findings that activity limitation and participation restriction is more on postlingual hearing impaired based on ICF model⁹The other aspect of the obtained finding has shown that among hearing aid users and nonusers in prelingual group, hearing aid users felt more difficulty and perceived more need for HATs as compared to the hearing aid non users. This finding could have raised because of the fact that prelingual hearing aid non user mostly rely on manual mode of communication with their peers and have least experience of audition. Whereas for the hearing aid users dependency on the hearing instrument was more to remain connected with the environment. Hence hearing aid users expect more benefit from the instrument or need more auditory or HATs to fulfil their listening needs.¹⁰In the postlingual group, hearing aid non users felt more difficulty and perceived more need for HATs. Hence it can be inferred that both the subgroups of postlingual were dependent upon auditory based communication modalities thus the need perceived was more or less same. Whereas in prelingual group, hearing aid user’s expectation from the auditory modality is more than the hearing aid non users so difficulty felt and need perceived for HATs is more. From figure 1 it is clear that among the prelingual hearing impaired group the hearing aid users felt more need of HATs across the domains. The hearing aid users felt highest need for HATs in non interactive communication and the lowest need in the situation like others which include communication with the persons not knowing sign language. For the domain like non interactive communication, public communication, and alerting signals both the group i.e. hearing aid users and non users felt nearly similar need. The prelingual hearing aid users felt least need in the domain of interactive communication. The postlingual hearing aid non users felt greatest need for HAT in the domain of others which include the communication with person who do not know manual mode of communication. The persons with

postlingual hearing impairment felt more insecurity as compared to the persons with prelingual hearing impairment which also support the need of Assistance technology to improve communication. The present study shows that the difficulty faced by the different segments of the hearing impairment is different and it also vary from situation to situation. Similar finding are observed in need perceived for the HATs.

CONCLUSION

Findings of the present study suggest that the difficulty felt and need perceived for use of HAT of persons with postlingual hearing impairment was greater than that of person with prelingual hearing impairment. Hence it is clear that age of onset of hearing loss has significant influence on the difficulty felt in different domains of daily life activity as well as for the need perceived to use the HAT. It also depends upon the usage of the hearing aid by the persons. Thus, from above study it can be concluded that though persons with hearing impairment perceive the need to use HAT but they are not using frequently. It is possible because of certain factors like: a) less availability in the market b) less awareness among the professional, hence less prescription c) less awareness among persons with hearing impairment regarding their availability and potential benefits and d) affordability. Persons with Hearing impairment felt the perceived need for HAT to improve the communication skills as well as quality of life. It indicates that it is necessary for the professionals to guide persons with hearing impairment regarding availability of HAT, their benefits to optimise communication and its role in rehabilitation.

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