



Original Article

Impact of Hearing Aid Use on Listening Skill of Hearing-Impaired Students

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ABSTRACT

Hearing loss affects listening and communication. Listening represents the basis for verbal communication. Literature reveals a research gap as regards listening effort in case of HA users especially students. **Objective:** To determine the impact of hearing aid on listening skills of school going hearing impaired students. **Methods:** This comparative study was conducted from 1st February, 2023 to 30th June, 2023 at Shifa International Hospital Ltd using purposive sampling. Sample of N=66 participant students of both genders, aged 5 years and above with moderate to profound hearing loss for more than three years and using hearing aids. 20 words were presented to the participant first without hearing aids and then with hearing aids and their response was recorded. Data analysis was performed by SPSS version-23.0 and Wilcoxon signed rank test was used to determine any associations and $p < 0.05$ was considered significant. **Results:** Results revealed that for unaided condition Median (IQR) score of 54, and IQR of 35 and mean rank 32. In aided condition Median (IQR) score was 80, IQR was 2 and mean rank was 0. The $p = 0.000$ suggests a significant difference between the two categories. **Conclusions:** Study concluded that there was substantial improvement in the listening skills of participants with hearing aids on as compared to without hearing aid with children having moderately severe category of hearing loss benefitting the most from hearing aids.

INTRODUCTION

Human ear is responsible for listening and hearing. Hearing is process of the ear in which sound is transmitted to the brain i.e., it is a passive process while listening being an active dynamic process in which transmitted acoustic event is captured by the individual [1]. A person is labelled as having hearing loss (HL) when his hearing threshold is 20dB or worse and according to World Health Organization (WHO), the threshold of hearing is classified as having mild HL (20-40 dB), Moderate (41-60), Severe (61-80dB) and Profound (> 81 dB), with 34 million children suffering from hearing loss which is disabling [2, 3]. Hearing loss affects listening and communication. Listening represents the

basis for verbal communication [4]. With different categories of HL representing diverse population of HI students, early identification and assessment of hearing loss can be helpful in early intervention [5]. Listening is an essential for communication being reception state which allows one to understand all that a person hears and provide complete participation in the process of communication. Listening being an integral component of literacy development augments two-way communication and plays a critical role in teaching and learning process [6]. Hearing impairment results in impairment of language, communication, and learning requiring thoughtful

involvement in research for the betterment of this population [7]. Hearing aids are devices which amplify sound after receiving and pass on amplified sound to the recipient thus helps the hearing impaired to hear better [8]. According to Cubick et al., hearing aids distort spatial perception and reduce speech intelligibility in individuals with normal hearing [9]. Patient experience a pleasurable emotional satisfaction when hearing aid is working and improving their listening skills of the patient and ability to understand what is said, even in case of unilateral hearing aids [10, 11]. A longitudinal study by Holman et al., revealed that HA significantly reduce fatigue which is related to listening [12]. A person with profound degree of hearing loss has great difficulty in hearing and localizing sound even when it's in one ear [13]. Being a part of complex language system in Pakistan it is difficult to learn reading, writing in Urdu and English since it adds more challenges for a typical Pakistani student [14]. HI students face challenges in participating and interacting in classrooms [15]. In developing written expression skills children face many hurdles. Studies have showed that the slow up in the verbal and reading skills development and understanding are visible in the written document. However, identifying and intervening at an earlier stage improves expressive performance of HI students [16]. In achieving a common goal two or more people interact in representing a shared activity is communication with steps like to hear, to listen, to comprehend and eventually to communicate, hence it is a dynamic complex process. When a hearing-impaired student is listening properly then he/she will communicate properly [17]. Experience of HI children and their relation with HA's requires investigation in more depth which also gives a scope for further research in the field which is needed [5]. We need to determine the impact of use of hearing aids or no use of hearing aid on preschool children for speech perception intervention, vocabulary development and listening skills [18]. Available literature indicates that listening effort in case of HA users has shortcomings and needs further research [19].

Hence, current study was conceived to determine the impact of hearing aid on listening skills of school going hearing impaired students. The study is of immense importance due to gap in the literature and it would help act as a base for future studies and help audiologists and speech language pathologists in better managing their patients.

METHODS

This comparative study was conducted over a period of 5 months from 1st February, 2023 to 30th June, 2023 at Shifa International after obtaining ethical approval of research from Institutional Review Board and Ethics Committee,

Shifa International Hospital IRB # 0370-22 dated 04-Jan-2023. Using purposive sampling a sample of N=66 participant students were recruited from National Special Education Centre for Hearing Impaired Children, H-9 Islamabad and Government Special Education Centre Misrial Road, Rawalpindi. Sample size of 57 was calculated using G*Power 3.1.9.4 software with effect size 0.5, α error probability of 0.05, Power 0.95. To cater to any drop outs 70 participants were included in study, however four participants later refused consent and were excluded from the study leaving behind a sample of N=57. Sample included hearing impaired students aged 5 years and above, both genders who had moderate to profound hearing loss for more than three (03) years and were using hearing aids both analogue or digital. Cases with any comorbidities and disabilities like mental retardation were excluded from the study since they couldn't understand the instructions. Basic demographic sheet, Auditory Brain Response (ABR), Auditory Steady State Response (ASSR) or Pure Tone Audiometry (PTA) reports and list of 20 words were used for data collection. Researcher presented the list of words to students first without hearing aids and were asked to repeat the words, and then with hearing aids and responses were noted. Confidentiality of the students was mentioned. Data analysis was performed by Statistical Software for Social Sciences (SPSS version-23.0). Descriptive statistics were used. Percentage and frequencies were calculated for patient variables. Wilcoxon signed rank test was used to determine any associations and $p < 0.05$ was considered significant.

RESULTS

Study sample N=66 revealed a mean age of 15.09 ± 5.32 years with majority 45 (68.26) being males (Table 1). Majority 26 (39.4%) had severe HL while least 9 (13.6%) had moderately severe HL. Majority 63 (95.5%) were using digital hearing aids.

Table 1: Participant characteristics (n=66)

Variables	Group	Frequency (%)
Gender	Male	45 (68.2)
	Female	21 (31.8)
Degree of Hearing Loss	Moderate	10 (15.2)
	Moderately severe	9 (13.6)
	Severe	26 (39.4)
	Profound	21 (31.8)
Type of Hearing Aid	Digital	63 (95.5)
	Analogue	3 (4.5)

Since data were not equally distributed Wilcoxon signed rank test was used in table 2, which revealed that for unaided condition Median (IQR) score of 54, and the interquartile rank (IQR) of 35. The IQR represents the range between the 25th and 75th percentiles of the data. The

mean rank was 32 which suggests the average position of the responses in a ranked order. In aided condition Median (IQR) score was 80, and the IQR range was 20. This indicates that the scores are less spread out compared to the "UNAIDED" category. The mean rank was 0. $p=0.000$ which suggests that there's a significant difference between the two categories in terms of the measured variable. Hence, there are substantial differences between the "UNAIDED" and "AIDED" categories in terms of the measured variable, with statistical significance. The "UNAIDED" category tends to have lower scores, higher variability, and a higher mean rank compared to the "AIDED" category. The p-value indicates that these differences are unlikely to have occurred by chance.

Table 2: Descriptive Statistics Median (IQR) and Mean rank for different hearing aid status

Hearing status	Median (IQR)	Mean rank	p-value
Unaided	54 (35)	32	0.000
Aided	80 (20)	0	0.000

The biggest difference between aided and unaided scores was present in moderately severe category, children with moderately severe category of hearing loss benefitted the most from hearing aids (Table 3).

Table 3: Difference of degree of hearing loss among aided and unaided patients (n=66)

Test	Degree of hearing loss	Frequency	Mean ± Sd	p-value
Difference between aided and unaided scores	Moderate	10	19.60 ± 10.72	0.203
	Moderately severe	9	35.11 ± 12.56	
	Severe	26	23.19 ± 14.78	
	Profound	21	27.14 ± 22.61	
Percentage of scores repeated unaided	Moderate	10	64.40 ± 24.37	0.526
	Moderately severe	9	49.67 ± 10.69	
	Severe	26	55.42 ± 21.42	
	Profound	21	50.00 ± 36.95	
Percentage of scores repeated aided	Moderate	10	84.00 ± 23.60	0.777
	Moderately severe	9	84.78 ± 6.69	
	Severe	26	78.81 ± 17.85	
	Profound	21	77.14 ± 30.80	

DISCUSSION

Current study sample of N=66 revealed a mean age of 15.09 ± 5.32 years with majority (68.26%) being males with most (39.4%) having severe HL and 95.5% using digital hearing aids. There was a significant ($p=0.000$) differences between the "unaided" (Median IQR=54, IQR=35) and "aided" (Median IQR=80, IQR=20) categories, and "unaided" category had lower scores, higher variability, and a higher mean rank compared to the "aided" category. Similarly, an Egyptian study conducted by Ezzat et al., in 2022 revealed correlation between language skills and degree of hearing loss in preschool children. It showed that the longer time

the hearing aid was being worn by the subject the better his results were. The results of the study reinforce the results of current study which also shows the importance of using hearing aids on a daily basis [20]. This was also supported by a study performed by Cox et al., in 2017 which checked if hearing aids showed improved listening ability according to the patient's point of view. The listening ability was significantly improved which is in accordance with our study which also shows improvement in listening ability while using hearing aids [21]. In 2015 Woods et al., studied older HI population and found that older population revealed small improvement in sentence reception threshold i.e., 2.0 dB following HA fitting, however our study was directed towards students and older groups were excluded [22]. Secondly, current study shows that the difference between aided and unaided scores was more pronounced in the moderately severe category and hence, children with moderately severe category of hearing loss benefitted the most from hearing aids. Similarly, a study conducted by Harris and Terleksi which assessed listening skills of children, with one group of children using hearing aid and the other cochlear implanted children [23]. The Cochlear implanted children had profound hearing loss and hearing aid group had hearing losses less than profound degree. The results showed that best performance was shown in children with hearing aids. It showed even better performance than cochlear implant group. Which supports our results as our results showed best performance in children with moderately severe hearing loss. Another study conducted by Jarollahi et al., In Persian speaking children tested the listening skills of severe to profound hearing-impaired children and compared it with the listening skills of normal hearing individuals. The group with normal hearing children showed better results than the group with severe to profound hearing-impaired children [24]. This study shows how listening skills are affected by hearing loss which can also adversely affect academic performance, and thus shows the importance of getting hearing aids and wearing them. Similarly, Ohlenforst et al., in their review concluded that HI augment the listening efforts required to perceive speech and there were no evidences in literature which could prove that HA decrease the effort of listening [25]. This also supports our study, in which aided listening has been proved to be much better than unaided listening and is also supported by a study performed by Svirsky et al., which highlighted that HI patients may depend on better quality signal which in their study was provided by unilateral cochlear Implant, following which some patients may start neglecting the input derived from the other ear [26].

CONCLUSIONS

Study concluded that there was substantial improvement in the listening skills of participants with hearing aids on as compared to without hearing aid with children having moderately severe category of hearing loss benefitting the most from hearing aids.

Authors Contribution

Conceptualization: GS

Methodology: IA, MM

Formal analysis: IA, MM

Writing-review and editing: AM, MAS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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