



## Original Article

## Parental Perspective on Impact of Hearing Assistive Devices on Children with Hearing Impairment

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## ABSTRACT

Being a common disability in Pakistan, hearing impairment causes problem in the language development of the child. This cause delay in their speech and language development and need of using hearing assistive devices to fulfill their communicational needs. Parental perceptions regarding their children's auditory behaviors by using these hearing assistive devices is essential. **Objective:** To evaluate the Parental perception of impact of hearing assistive devices of children with hearing impairment using PEACH questionnaire. **Methods:** This cross-sectional study was conducted from Nov-2018 to Oct-2019 at Isra Institute of Rehabilitation Sciences, Isra University, Islamabad. Sample recruited N=100 parents of children with mild to profound hearing loss using hearing aids and cochlear implants using convenience sampling. Sample included both genders and 1 to 15 years of age. Basic demographic sheet and PEACH (Parents' Evaluation of Aural/Oral Performance of Children) Questionnaire was used for data collection. The data were analyzed by SPSS version-22. **Results:** Results revealed a significant ( $p < 0.05$ ) association of Pechh Category with type of hearing assistive device use with higher number of children with typical performance noted in cochlear implant 38(62.3%) group compared to hearing aid users 17(43.6%) in quite environment. In noisy environment too, significantly ( $p = 0.001$ ) more cases 47(77.0%) revealed typical performance compared to hearing aid users. 18(46.2%). Children with higher hearing age and those who received speech therapy revealed better performance on PEACH questionnaire ( $p < 0.001$ ). **Conclusions:** Children using cochlear implants have better listening in everyday life conditions compared to hearing aid. It provides comprehension and understanding of language than hearing aid.

## INTRODUCTION

Hearing impairment causes the problem in the language development of the child thus hindering learning, attention and communication, which can further results in delay in their speech and language development [1] in addition to other problems being faced by HI children [2]. Young children especially with severe to profound sensorineural hearing loss face a lot of challenges in developing spoken language, psychological functioning, social relationships and academic achievements [3]. Language acquisition in such children represents a major challenge [4], however timely intervention with Hearing Assistive Devices (HAD) like cochlear implants (CI) and programmable digital

hearing aids (HA) can provide significant gain in auditory perception and speech production for them [5]. Since, hearing health is critical for a child's normal development. Due to late detection of HI in developing countries like Pakistan [6] and because of barriers in implementation of neonatal hearing screening [7], delayed identification and intervention may result in difficulties in social, cognitive, educational, linguistic, cultural and economic aspects of life of the HI [8]. Current advances in the treatment and rehabilitation of the children with hearing impairment enabled the access of speech sounds to the auditory system. HI children who can't be treated or cured by

medicines can use hearing assistive devices to prevent the communication and spoken language problem. Hearing assistive devices provide valuable input to Children with hearing impairment which improve their communicational ability and quality of life [9]. Studies have shown that cochlear implant provides hearing impaired population with a considerable gain in auditory perception and speech generation. With the proper and modified programming of the hearing assistive devices in noise and Quiet environment hearing impaired children using cochlear implant and hearing aids greatly improves the acquisition and use of spoken language which results in positive social and mental effects as well [10]. With recent technological advancements specifically in the digital hearing aids and cochlear implant technology [11], it has become necessary to evaluate the impact and the resultant benefits of these resources in the auditory abilities of HI children [12]. Young children are not able to respond by themselves regarding the auditory perception of their HAD in different listening environments, leaving parents as the best persons who observe the children's responses to the amplification, and give important information to the audiologist for adaption of hearing device of the child as well as the modifications which are required [13]. A study was also noted to indicate that children who use cochlear implants for more than three years are able to achieve language level close to their peers with normal hearing [14]. Keeping in view the lack of local literature on the subject, technological advancements in hearing amplification in the form of digital hearing aids and cochlear implants, and mothers being the prime caregivers who can report regarding benefit of HAD's, this study was conducted to evaluate the Parental perception of hearing assistive devices of children with hearing impairments. This study is important since it would be important part local literature, act as a base for future research and helpful for clinicians including audiologists and speech professionals in better management of their patients.

## METHODS

This was cross-sectional study conducted at Isra Institute of Rehabilitation sciences (IIRS) Isra University Islamabad, Pakistan, over a period of 12 months from 1st November, 2018 to 31st October, 2019. Study recruited N=100 parents of hearing impair children by convenience sampling technique from Audiology Centre and Alam Audiology clinic Lahore, and GMT Centre, Rawalpindi. Sample included parents of hearing impair children using either hearing aid or cochlear implant. Sample included of both genders aged 1 to 15 years, with mild to profound degree of hearing loss. Children with multiple disabilities and those using body worn hearing aid were excluded from the study. Data were collected by using Basic demographic sheet and

standardized Parents' Evaluation of Aural/Oral Performance of Children (PEACH) Questionnaire. PEACH questionnaire comprised of 13 questions regarding the auditory skills in different listening situations and it assesses the (i) Usage of telephone (ii) child response to voices in quiet and noise places (iii) child response to environmental sounds. Each response of the child was scored as per 5-point rating scale from 0 to 4. 0 means no response to sound and 4 means (76-100%) of response to auditory stimuli. The study was conducted following ethical approval of Institutional Research Board of Isra Institute of Rehabilitation sciences (IIRS) Isra University Islamabad, Pakistan vide registration Number 1702-Mphil.HS-001, dated 23 October 2018 and consent of the parents for inclusion in the study. Confidentiality of participants regarding data were maintained throughout the research. Data were directly collected by parents of hearing impaired children (HIC) using basic demographic sheet and Peach questionnaire. Questionnaire was filled as per participant's response by qualified audiologist. After data collection by PEACH questionnaire, data were analyzed by Statistical Software for Social Sciences (SPSS version-22.0). Descriptive statistics were utilized. Percentage and frequencies were calculated. Chi-square test was utilized to see any associations and  $p < 0.05$  was considered significant.

## RESULTS

Of the study sample of N=100, 39% were hearing aid (HA) users and 61% cochlear implant (CI) users. Study revealed significance association of most PEECH questionnaire questions with hearing assistive devices (HAD) with  $p < 0.05$  except the queries of child being upset by loud sound and child response in bus (Table 1).

**Table 1:** PEACH questionnaire: Responses to questions for different hearing assistive devices. Cross Tabulation

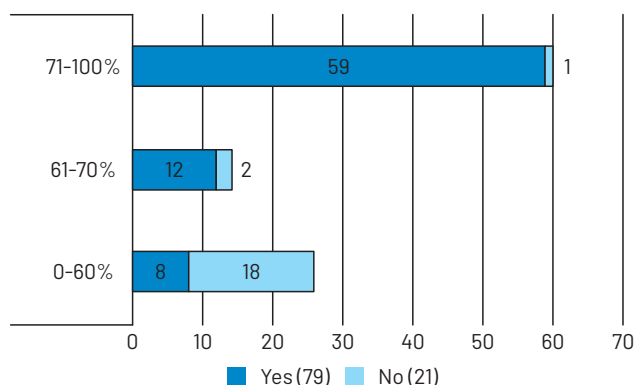
Question	Hearing assistive device	Response					Total	Chi-square
		Never	Seldom (1-25%)	Sometimes (26-50%)	Often (51-75%)	Always (76-100%)		p-value
How often has your child worn His/her complaint or been upset by Loud sound	HA	0	2	8	4	25	39	0.002*
	CI	0	1	0	9	51	61	
child respond his/her name in Quiet	HA	11	10	5	9	4	39	0.18
	CI	8	12	16	20	5	61	
child respond to his name in noise	HA	0	4	8	4	23	39	0.007*
	CI	1	4	1	17	38	61	
child follow instructions in Quiet	HA	0	11	7	11	8	39	0.009*
	CI	0	4	11	22	24	61	
child follow instructions in noise	HA	2	3	13	8	13	39	0.034*
	CI	2	0	11	25	23	61	
Attention to what other people are saying or playing on TV in Quiet	HA	4	9	12	5	9	39	0.002*
	CI	2	4	11	28	16	61	
initiate/participation conversation in Quiet	HA	8	3	13	6	9	39	0.02*
	CI	3	6	11	17	24	61	
Participation in conversation in noise	HA	6	4	8	10	11	39	0.02*
	CI	4	6	2	24	26	61	
child recognize people's voices without seeing who is talking	HA	8	4	11	12	4	39	0.01*
	CI	4	6	11	31	9	61	
Usage of phone	HA	6	8	12	6	7	39	0.001*
	CI	0	11	3	17	30	61	
Understanding of speech in bus	HA	5	8	6	6	14	39	0.02*
	CI	6	19	15	15	6	61	
Child Response to sounds other than voices	HA	3	6	7	11	12	39	0.12
	CI	2	7	8	9	35	61	
	HA	2	2	5	16	14	39	0.039*
	CI	0	3	5	24	29	61	

[Note: Hearing Aid=HA, Cochlear Implant (CI), \* = p<0.05]  
 Children with higher "hearing age" had significantly (p=0.001) better performance on PEACH score with their hearing assistive device as compared to lower age group 6-12 months and 13-19 months which revealed that only 25% and 39% had typical performance (Table 2).

**Table 2:** Hearing Age of Child with Overall PEACH Score (N=100)

Hearing age (Months)	Overall peach score			p-value
	0-60% (further review indicated)	61-70% (possible review)	71-100% (Typical performance)	
06 to 12	75	0	25	0.001*
13 to 19	22	39	39	
20 to 26	13	4	83	
> 26	9	12	79	
Total	26	14	60	

[Note\* = p<0.05]  
 Speech therapy plays significant role in the development of auditory behaviors which is evident from the results of the scores of the study, which revealed 59 % children having typical performance of their auditory behaviors with speech therapy sessions compared to just 1% without speech therapy (p=0.001) (Figure 1).



**Figure 1:** Speech Therapy status Vs Overall PEACH score (N=100)  
 Cochlear implant users showed significantly better typical performance than hearing aid users in Quiet as well as noisy environment with p=0.01 and p=0.001 respectively (Table 3).

**Table 3:** Environment with different Hearing Assistive Devices\* PEACH Score Cross Tabulation(N=100)

Environment	Type of Hearing Assistive Device (n/%)	PEACH Score Category			Chi-square
		Further review indicated	Possible review	Typical performance	p-value
Quiet	Hearing Aid (39)	13 (33.3)	9 (23.1)	17 (43.6)	0.01*
	Cochlear Implant (61)	16 (22.2)	7 (11.5)	38 (62.3)	
	Total(100)	29	16	55	
Noise	Hearing Aid (39)	13 (33.3)	8 (20.5)	18 (41.2)	0.001*
	Cochlear Implant (61)	13 (21.3)	1 (1.6)	47 (77.1)	
	Total(100)	26	9	65	
Overall	Hearing Aid (39)	12 (30.8)	9 (23.1)	18 (40.1)	0.04*
	Cochlear Implant (61)	14 (22.9)	5 (8.3)	42 (68.8)	
	Total(100)	26	14	60	

[Note: \* =  $p < 0.05$ ]

## DISCUSSION

Children with hearing loss face a lot of social and psychological problems even they are using HAD [15]. The present study revealed that children with higher "hearing age" had significantly ( $p=0.001$ ) better performance on PEACH score with their hearing assistive device as compared to lower age group 6-12 months and 13-19 months which revealed that only 25% and 39% had typical performance. Similarly, Said EAF also explained in his study that late hearing aid fitting brings poor outcome in child's life [16]. Further it is also seen that hearing age followed by cochlear implantation as compared to HA gives better performance in real life situations [17, 18]. Speech language therapy plays a significant role in the development of auditory behaviors which is evident from the results of the PEACH scores of the current study. 59 % children showed typical performance of their auditory behaviors who were taking the therapy sessions. According to Chatterjee *et al.*, significant speech language differences are observed in post implant cases with speech therapy [19]. In the current study, significantly better results were noted in children using cochlear implants with  $p=0.007$  and  $p=0.008$  as they always responded to their names in quiet and noisy environment respectively compared to those using hearing aids. This is in compliance with literature which depicts enhanced significance of CI in development of auditory milestones [20]. Dunn *et al.*, reported that for implantations before 4 years age can achieve good language as well as reading skills than those implanted later over time [21, 22]. In the current study only 30.6% children using the hearing aids always successfully participated in conversation in Quiet environment while significantly more ( $p=0.02$ ) children i.e., 69.4% using the cochlear implant showed participation, while 18.9% and 81.1% using hearing aid and cochlear implant respectively always showed participation in conversation in noisy environment ( $p=0.01$ ). Studies have investigated that children with CI have better language skills that include language comprehension, vocabulary and better linguistic

understanding. They have better understanding of auditory and non-auditory contextual cues [23]. In the current study it was also noted that that 72.7% and 27.3% children using CI and HA respectively, always paid close attention to TV and story books in Quiet environment, this difference was also significant with  $p=0.02$ . The benefit from cochlear implant is that it provides more social and financial opportunities, and as a result it will yield better quality of life [24]. Hearing aid provide the amplification of the sound which can add distortion to the sound which is perceived by the patients, hence people using the CI can communicate with other people more effectively than using the hearing aid [25], but CI directly stimulate the auditory nerve and it cover the complete spectrum of human auditory frequency range without giving any kind of distortions. As a result of better speech perception by CI child have less behavioral problems and better skills of gaining the auditory stimuli in the absence of any facial gestures resulting in better expressive language growth [26]. In the present study 81.1% and 18.9% children using cochlear implant and hearing aid respectively always recognized the people voices that who is talking.

## CONCLUSIONS

It is concluded that Cochlear implant provides enhanced comprehension and understanding of language than hearing aid. It is suggested that clinical application of such studies should be carried out in the field of audiology for measuring the functional outcomes of the device and in those children who are unable to express about their device's performance subjectively adversely affecting quality of life.

## Authors Contribution

Conceptualization: NM

Methodology: HS, GS

Formal analysis: HS

Writing-review and editing: NM, GS

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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