ORIGINAL ARTICLE

Child's Communicative Status and Associated Factors at Pre-cochlear Implant Assessment

RIMSHA SHAKEEL, MARYAM SHAKEEL, GHULAM SAQULAIN, SAHIBZADA NASIR MANSOOR, HAFIZA SHABNUM MALIK, SYED AFTAB HAIDER SHAH

Pak Pediatr J 2025; 49(3&4): **302 - 308**

Correspondence to:

Rimsha Shakeel
Speech and language pathologist.
Current address
Health Sciences Department, Kobe University, Japan.
E-mail:
rimshashakeel.slp@gmail.com

Received for publication: July 7th 2025;
Accepted for publication: 2nd Octo 2025

How to cite this: Shakeel R, Shakeel M, Saqulain G, Mansoor SN, Malik HS, Shah SAH. Child's Communicate Status and Associated Factors at Pre-cochlear Implant Assessment. Pak Pediatr J. 2025; 49(3&4): 302-308

ABSTRACT

Objective: Our study highlighted child's communicative status and associated factors at the time of pre-cochlear implant speech therapy assessment.

Study Design: It is was a cross-sectional study.

Place and Duration of Study: The data collection was done form June 2020 till January 2021 at a rehabilitation hospital in Pakistan.

Material and Methods: A questionnaire and informal speech therapy clinical assessment was administered to collect data from the parents and children coming for pre-cochlear implant communication fitness assessment. Data collection took almost 15-20 mins. SPSS was used for evaluation.

Results: 93% of the children did not undergo hearing aid and speech habilitation trail before proceeding to cochlear implant. Most of the children were using distinct expressive skills to communicate and had age-appropriate play skills. These skills can help design appropriate speech therapy goals post-cochlear implant speech therapy. 10% of the children had oro-motor deficits. The p-value was significant for socio-economic status, mother's education and linguistic background.

Conclusion: The children adapted communication skills even with hearing loss and it was augmented by strategies like lip reading and play patterns. Hence, strength and deficits of hearing-impaired children considering oro-motor deficit and prior adequate therapeutic trail should be considered during post and pre cochlear implant speech therapy.

Key Words: *Cochlear implant, speech therapy, Communication patterns.*

INTRODUCTION

The lack of access to natural language during the first five years of critical period of language acquisition can lead to a phenomenon known as language deprivation. This can negatively affect the development of first language (L1).[1] The development of language can be affected because of many disabilities and one of the leading causes is hearing deficit.[2] Pakistan has a high prevalence of hearing loss.[3] The most common cause of hearing is otitis media (76%) and 2.5:1 is the ratio

of conductive hearing loss (CL) to sensorineural hearing loss (SNHL).[4] Profound hearing loss has been reported in Pakistan with a prevalence of 1.6 per 1000 cases.[6]

If we consider how early lack of auditory exposure because of hearing loss effects cognition, language and emotions, it can be commented that sign language is usually a precondition for child's ability to use and understand spoken and written languages because sign language helps access first language. Mental health problems have been reported with a greater prevalence in the population of deaf, this finding supports the usefulness of development of effective and early communication with loved ones like family and friends. There is a further risk of adverse health side effects of having no language or way of communication at all. There is also a greater risk of physical and emotional neglect, sexual trauma, anxiety and depression because of abuse.[1] Receptive language ability and phonological awareness, that are the predictors of reading ability, has also been poorly affected because of hearing loss. [8]

Upon the diagnosis of hearing loss in infants, the major concern is their development of language and cognition and social skill that are highly dependent on normal language acquisition process. Often the importance of sign language is undermined when an intervention of medical and education type is planned, for example use of hearing aids or cochlear implant, focusing on only one mode of communication, i.e. spoken/verbal output can in fact encourage poor language acquisition process.[1]

Hence, our study was conducted to highlight child's communicative status and associated factors at the time of pre-cochlear implant speech therapy assessment. So that findings can help encourage the use of appropriate therapeutic techniques, understanding of individual strengths, deficits and potential for adequate support and management of the child.

MATERIAL AND METHODS

A questionnaire (designed by the authors) and informal speech therapy clinical assessment was administered to collect data from the parents and children coming for pre-cochlear implant communication assessment in speech therapy department, rehabilitation hospital in Pakistan. The data was collected after approval of (IRB) ethical review committee of the hospital. The data collection was done form June 2020 till January 2021.The questionnaire was reviewed by 2 speech therapists, 2 rehabilitation specialists for validity and reliability. (questionnaire attached in appendix) Purposive sampling technique was used; data was obtained from parents and children after getting consent. Interview and data collection took almost 15-20 minutes. The collected responses were then entered in SPSS for evaluation**.**

Inclusion criteria: Children coming to speech therapist for pre-cochlear implant fitness assessment having hearing impairment and were declared fit for cochlear implant.

Exclusion criteria: Children who were deemed unfit for cochlear implant after assessment by speech therapist or by any other multidisciplinary team member.

RESULTS

Most of the children (93%) did not undergo speech therapy with hearing aids at the time of assessment. Only 4% of children were exposed to special education setup. 7% of children had exposure to speech therapy with hearing aids and 10% had oral motor deficits like cleft palate, ankyloglossia etc. Most of the children (99%) had age-appropriate play skills and 90% of children were on lip reading for verbal input and output **(Table 1).**

During pre-cochlear implant Speech therapy assessment, it was noted that communication status of these children had following properties: 77% of children had good communication skills, that is persistence, turn taking, social reciprocity, appropriate eye contact and joint attention during the communication. 88.6% of the children could follow simple commands given non-verbally. 57% of children were using gestures and vocalizations like /a/, /o/, /e/ up to one second, to communicate effectively. 91% of children had intentional communication. However, speech production of only 5.7% was short simple phrases whereas most of the children were using vocalizations **(Table 2).**

TABLE 1: Demographics Factors (n=70)

Demographics Factors		Frequency	Percentage
Child underwent speech	No	65	(93.0)
Therapy with hearing aids	Yes	05	(7.0)
Special education exposure	No	67	(96.0)
	Yes	03	(4.0)
Lip reading	Absent	07	(10.0)
	Present	63	(90.0)
Oral-motor deficit	Absent	63	(90.0)
	Present	07	(10.0)
Play skills	Not age appropriate	01	(1.0)
	Age appropriate	69	(99.0)

TABLE -2: Pre-cochlear implant Child's Communication status (n=70)

Pre-cochlear implant Child's Communication status		Frequency	Percentage
Communication skill	Poor	2	2.9
	Average	14	20.0
	Good	54	77.1
Receptive skills	Unable to follow any command given non-verbally	3	4.3
	Able to follow simple commands given non-verbally	62	88.6
	Follow complex command given Verbally with gestural prompt Identify maximal pairs in close set	5	7.1
Expressive skills	No functional communication	5	7.1
	Gestures (gross)	5	7.1
	Gestures with vocalizations	40	57.1
	Sign language	7	10.0
	Fine gesture with few phonemes	7	10.0
	Fine gesture + short phrases 1-3	4	5.7
	Complex sentences with Articulatory errors	2	2.9
Communicative intent	Non-intentional	2	2.9
	Intentional	64	91.4
	Variable	4	5.7
Speech production	Nil	6	8.6
	Vocalization	40	57.1
	Babbling	18	25.7
	Short simple phrases	5	7.1
	Complex sentence	1	1.4

TABLE-3: Correlation of Demographic Factors

Correlation r , p-value	Socio-economic status	Mother's education	Father's education	Area	History of hearing loss in family
Spoken Language	r= -0.072 p= 0.007*	r= -0.034 p= 0.032*	r= -0.04 p= 0.79	r= -0.25 p= 0.14	r= -0.09 p= 0.15
Previous Hearing Trial	r= 0.063 p= 0.622	r= 0.059 p= 0.462	r= 0.207 p= 0.24	r= 0.18 p= 0.12	r= -0.01 p= 0.84

No linear correlation was found in area, father education, familial history of hearing loss and language spoken however P value was significant for socio-economic status and mother education($p<0.05$).

No linear correlation was found in previous hearing aid trail with socioeconomic, parent education, hearing loss and area **(Table 3).**

It was also noted that 39 children had prior experience with a hearing aid trial, whereas 31 had not. In our sample, the spoken language in the household was also distributed as Urdu (7), Punjabi (23), Sindhi (2), Pushto (22), and Others (16)

DISCUSSION

In our study, most (93%) of the children did not undergo speech therapy trail with hearing aids. Undergoing hearing aid or speech therapy rehabilitation is considered one of the protocols prior to cochlear implant activation and a study notified that infants undergoing hearing aid trial prior to cochlear implant had better auditory skills scores than infants who did not have any habilitation and hearing aid trial.[12, 15]

99% of the children in our study had age-appropriate play skills that can become a good prognostic factor for therapy progress after cochlear implant. Assessing play skills prior to therapy is important as highlighted that assessment of play pattern can be used therapeutically to determine how play would be an appropriate intervention strategy for children with clinical diagnoses, and can help to track their therapeutic progress.[11, 16]

In present study, oral motor deficits were reported in 10% of children during pre-cochlear communication assessment, oral motor deficit included ankyloglossia, dental caries, malocclusion, cleft palate etc. Such oro-motor deficit can become a hurdle in post implant speech therapy. Oral deficit is a common presentation in children with special needs as indicated in a study poor oral hygiene is a common presentation in children with sensory deficits which is enhanced by reduced access to proper dental care and their physical inability because of communication deficits, they are unable communicate with dental professionals, hence they have a higher risk of developing dental aliments. According to study lack of awareness of sign language and communication aids poses a major barrier for health professional to deliver their services to children with hearing impairment.[5, 17]

In our study, as a part adaptive strategy to understand their environment 90% of children were using lip reading. Auditory deprivation, such as in hearing loss or deafness, can promote neuroplasticity in auditory cortex in particular cross modal type in which support of non-auditory sensory functions is obtained when these auditory regions reorganize to vision. Many studies claimed that for cochlear implant (CI) users cross- modal plasticity can be harmful for speech outcomes as it interferes with sound processing, while others have highlighted that visual language related to plasticity may be beneficial for speech recovery.[13] Evidence of cross-modal reorganization was noted in cochlear implant users stating that this phenomenon does not significantly predict poor speech outcomes. However, speech outcomes and cross-modal activation during lip reading are dependent on differences or strategies adapted in audiovisual speech communication by CI users.[13,18]

In our study expressive skills of children in cochlear implant pre-assessment for communications was as follows. 10% of children were using sign language, 57% were using gestures accompanied with vocalizations, fine gesture with few phonemes (10%), 5.7% were using fine gestures in addition with short phrases like come, baba come (/AO/, /BABA AO/) and 2.7% were using complex sentences with articulatory errors. Such presentation is due to lack of adequate auditory experience at appropriate stages of life. However, these modified ways of expression can prove to be beneficial in post implant speech therapy period. A study highlighted mode of communication and role of sign language in children with cochlear implant. It was found that some form of signed communication was used by parents (15-20%) and teachers 30% respectively. Qualitative findings revealed that even though the main aim was to develop spoken language, many parents, teachers valued Australian Sign Language and English Signe Language because according to them sign language bolstered academic, social and personal

development It was also noted that young people who communicated through signs, efficiently switched the mode according to topic, settings and communication partner.[7]

Our study sample of 70 children belonged to a variety of linguistic background, Urdu=7, Punjabi=23, Sindhi=2, Phusto =22, Other (Shina, Balti, Potohari etc) =16. No correlation of previous hearing aid trail with socio-economic status (SES), parental education, hearing loss and area of residence. However, p value ($p<0.05$) was significant for SES, mother education and spoken language. A study indicated that mothers play a vital role in linguistic development of children with cochlear implant. It depends of mother sense of self-efficacy and involvement and interaction, considering this impact in order to support better outcomes in speech therapy post-cochlear implant, professional should effectively design goals that incorporate linguistic input, self-efficacy and involvement of caregivers.[10]

A systematic review highlighted notable impact of linguistic input of parents during initial stages of cochlear implant and later linguistic outcome. In intervention comparatively weaker and more heterogeneous data was found for parental education and effects of parental involvement in intervention.[14] Cochlear implants encourages hearing skills development in children and by providing early access to sound in both ears best outcomes can be achieved. However, limitation in social determinants of health and medical comorbidities can add complexity in outcome and care.[9] After cochlear implant child's linguistic development was affected by socioeconomic status (SES), proximal environment variables.[14]

CONCLUSION

Every child adapts to a unique set of communication patterns even with hearing loss. And there is also a chance of unnoticed oro-motor deficits in these children due to inability to effectively communicate. Most of the children with hearing loss used lip reading to understand the message and many children did not have adequate trail of hearing and speech habilitation before proceeding towards cochlear implant. Hence, the strength and deficits of child with hearing loss, adequate therapeutic trial, physical impairments should be considered to design effective therapeutic goals. In addition, further research can be done to find out impact of such approach in post-cochlear implant speech therapy.

Acknowledgments: We thank all people with hearing impairment for inspiring us to understand their condition.

Source of funding: None
Conflict of interest: None

Author's affiliation

Rimsha Shakeel,
Speech and language pathologist,
Department of Rehab, AFIRM, Rawalpindi

Dr. Maryam Shakeel,
Medical Officer
Mega Medical Complex, Rawalpindi

Dr. Ghulam Saqulain,
HOD of ENT Department
Department of Audiology, CDA Hospital, Rawalpindi

Lt Col. Dr. Sahibzada Nasir Mansoor,
Rehabilitation Specialist,
Department of Rehab, CMH Okara

Hafiza Shabnum Malik,
SLP
Department of Rehab, RIPHA

Syed Aftab Haider Shah
SLP
Department of Rehab, AFRIM

REFERENCE

1. Murray JJ, Hall WC, Snoddon K. Education and health of children with hearing loss: the necessity of signed languages. Bulletin of the World Health Organization. 2019 Oct 10;97(10):711.
2. Graydon K, Waterworth C, Miller H, Gunasekera H. Global burden of hearing impairment and ear disease. The Journal of Laryngology & Otology. 2019 Jan;133(1):18-25.
3. Raza SH, Waris R, Akhtar S, Riaz R. Precochlear Implant Assessment: Clinical Profile and Family History of Children with Severe Bilateral Prelingual Hearing Loss. International Archives of Otorhinolaryngology. 2020 Nov 16;24:457-61.
4. Musani MA, Rauf A, Ahsan M, Khan FA. Frequency and causes of hearing impairment in tertiary care center. JPMA-Journal of the Paki Medical Association. 2011 Feb 1;61(2):141.
5. Vishnu Prasad S, Kumar M, Ramakrishnan M, Ravikumar D. Report on oral health status and treatment needs of 5–15 years old children with

sensory deficits in Chennai, India. Special Care in Dentistry. 2018 Jan;38(1):58-9.

6. Ahmed J, Saqulain G, Khan MI, Kausar M. Complications of cochlear implant surgery: A public implant centre experience. Pakistan Journal of Medical Sciences. 2021 Sep;37(5):1519.
7. Hyde M, Punch R. The modes of communication used by children with cochlear implants and the role of sign in their lives. American annals of the deaf. 2011 Jan 1;155(5):535-49.
8. Camarata S, Werfel K, Davis T, Hornsby BW, Bess FH. Language abilities, phonological awareness, reading skills, and subjective fatigue in school-age children with mild to moderate hearing loss. Exceptional Children. 2018 Jul;84(4):420-36.
9. Sharma SD, Cushing SL, Papsin BC, Gordon KA. Hearing and speech benefits of cochlear implantation in children: A review of the literature. International journal of pediatric otorhinolaryngology. 2020 Jun 1;133:109984.
10. DesJardin JL, Eisenberg LS. Maternal contributions: Supporting language development in young children with cochlear implants. Ear and hearing. 2007 Aug 1;28(4):456-69.
11. Halfon S. Play profile constructions: An empirical assessment of children's play in psychodynamic play therapy. Journal of Infant, Child, and Adolescent Psychotherapy. 2017 Jul 3;16(3):219-33.
12. Chen X, Liu S, Liu B, Mo L, Kong Y, Liu H, Gong S, Han D, Zhang L. The effects of age at cochlear implantation and hearing aid trial on auditory performance of Chinese infants. Acta oto-laryngologica. 2010 Feb 1;130(2):263-70.
13. Paul BT, Bajin MD, Uzelac M, Chen J, Le T, Lin V, Dimitrijevic A. Evidence of visual crossmodal reorganization positively relates to speech outcomes in cochlear implant users. Scientific Reports. 2022 Oct 22;12(1):1-2.
14. Holzinger D, Dall M, Sanduvete-Chaves S, Saldaña D, Chacón-Moscoso S, Fellinger J. The impact of family environment on language development of children with cochlear implants: A systematic review and meta-analysis. Ear and hearing. 2020 Sep 1;41(5):1077-91.
15. Parker R, Muzaffar J, Ayas M, Brassington W. Early activation of cochlear implants: a systematic review and narrative synthesis. *Cochlear Implants Int*. 2024 Jan;25(1):81-92.
16. Mood D, Szarkowski A, Brice PJ, Wiley S. Relational factors in pragmatic skill development: deaf and hard of hearing infants and toddlers. *Pediatrics*. 2020 Nov;146(Suppl 3): S246–S261.
17. Rajendran V, Roy FG. An overview of motor skill performance and balance in hearing impaired children. *Ital J Pediatr*. 2011 Jul 14; 37:33.
18. Layer N, Abdel-Latif KHA, Radecke JO, Müller V, Weglage A, Lang-Roth R, Walger M, Sandmann P. Effects of noise and noise reduction on audiovisual speech perception in cochlear implant users: an ERP study. *Clin Neurophysiol*. 2023 Oct;154:141–156.

Authors' contribution

RS: Proposed topic, basic study design, material and methods and manuscript writing, literature review & referencing, data collection, statistical analysis and interpretation result.
MS: Data collection, statistical analysis and interpretation of result etc.
GS: Quality insure, interpretation of result etc.
LI. CoI. SNM: Quality insure, manuscript review
HSM: Manuscript review
SAHS: Manuscript review
All the authors have approved the final manuscript draft and accept the responsibility of research integrity

APPENDIX

(ORIGINALLY DESIGNED BY THE AUTHOR)

(R) SPEECH THERAPY- COCHLEAR IMPLANT FITNESS QUESTIONNAIRE

Name: _____Age: _____ Gender: _____Birth Order: ___/___Father's Name: _____ Mother Tongue: _____ Hearing Loss: (Post -Lingual /Pre-Lingual) Language Exposure: _____ Socio Economic Status: _____ Parental Education (Mother): _____(Father): _____ Previous Hearing Aid Trial: _____ (If Yes) Hearing Age: _____ Family History of Language Delays: __ _____Address: _____Contact: _____

(Part A) Child's Assessment:

We have assessed the child based on informal assessment tools, direct observation, case history and parental reporting to evaluate skills necessary for functional communication development and to also highlight factors that may affect post implant speech/ audition development and therapy.

- Receptive Skills: _____
- Expressive Skills: _____
- Play Skill: _____
- Oral Motor Skill: _____
- Speech Reading Skills/Lip Reading: _____
- Speech Production: _____
- Communicative Intent : (Intentional/ Non Intentional)
- Other Disabilities: _____
- **(Part B) Parental Assessment:**

Effects of Cochlear Implant on Audition	Aware / Not Aware
Effective Auditory Verbal Strategies	Aware / Not Aware
Auditory Sandwich	Aware / Not Aware
Developmental Markers of Speech and Audition	Aware / Not Aware
Expectations Regarding Development of Speech / Auditory Skills	Rational / Irrational
Parental Response to Communicative Intents	Encouraging / Variable / Discouraging

Comments: Child has **Good / Average / Poor** communicative skills.

_____

_____

SPEECH THERAPIST