



WWJMRD 2020; 6(6): 55-57
www.wwjmr.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
Impact Factor MJIF: 4.25
E-ISSN: 2454-6615

C.Pachaiappan

Assistant Professor Madras
ENT Research Foundation (P)
Limited-Institute of Speech
and Hearing,
New no.1/1, South Canal Bank
Road, Mandavelipakkam,
Chennai, Tamil Nadu, India

Sivaranjani Balasubramanian

Undergraduate Intern Madras
ENT Research Foundation (P)
Limited-Institute of Speech
and Hearing, New no.1/1,
South Canal Bank Road,
Mandavelipakkam,
Chennai, Tamil Nadu, India

Ramya Sri CH

Clinical Supervisor Madras
ENT Research Foundation (P)
Limited-Institute of Speech
and Hearing, New no.1/1,
South Canal Bank Road,
Mandavelipakkam,
Chennai, Tamil Nadu, India

Correspondence:

C.Pachaiappan

Assistant Professor Madras
ENT Research Foundation (P)
Limited-Institute of Speech
and Hearing, New no.1/1,
South Canal Bank Road,
Mandavelipakkam,
Chennai, Tamil Nadu, India

Analysis of Phonology in Tamil speaking Cochlear Implantees

C.Pachaiappan, Sivaranjani Balasubramanian, Ramya Sri CH

Abstract

Phonology plays a vital role in construction of one's language and communication. Hence, it becomes necessary to study the benefit of an intervention facilitating language development with respect to phonology. The study focuses on analysis of phonetic inventory, phonological process and production of consonant/syllables at different word positions in 24 Tamil speaking cochlear implantees. Conversational discourse samples were collected pre and post cochlear implantation for analysis. Results show significant improvement in phonological development post cochlear implantation. The phonological processes such as initial vowel and consonant elongation and denasalization was common in pre and post cochlear implantation samples and phonological processes such deaffrication, fronting and cluster reduction were observed commonly among the participants post cochlear implantation. Good impact is observed in the phonological aspects of children post cochlear implantation and auditory training which is parallel to normally developing children.

Keywords: phonetic inventory, cochlear implantation, phonological process, discourse analysis, Tamil

Introduction:

Phonology is the systematic use of sound to encode meaning in any spoken human language (Clark et al, 2007).^[1] Phonological development plays a major role in communication. It acts as a base for expressive language. The first aspect of expressive language that develops in children are prosody and phonology. As a part of the development, children tend to make errors such as reduplication, vowel, consonant or syllable deletion, cluster reduction, etc which fade as they advance in age. When these persist beyond specific age limits, they are termed as phonological processing errors. The phonological development and processes are different for different languages. This study is interested in studying the phonological development and phonological processes in hearing impaired children and also to study the benefit of Cochlear Implantation with respect to phonological development. Cochlear Implantation is a surgical procedure where a neuroprosthetic device is implanted in the cochlea of the inner ear. Cochlear Implant has become a widely opted amplificatory option for profound sensorineural hearing loss patients who shall not benefit with hearing aids. Cochlear implantation in children is a very good step towards early intervention that aids with the child's hearing, speech and overall development, making the quality of their lives better as they grow. Dramatic impact has been observed with respect to linguistic competence in cochlear implantees.^[2] After cochlear implantation, as a regular process, implantees are subjected to auditory habilitation or rehabilitation along with regular follow-up aided audiometry and MAPing. Initially, pre-lingual patients are trained in ling 6 sounds, vowel combinations, consonant vowel combinations and the complexity is improved after the achievement of each goal. It is therefore, essential to measure the success obtained through cochlear implantation in terms of speech reception and production with respect to phonology. It also becomes necessary that phonological development of these children should be analysed in their native language. Hence, this study focuses on studying the phonological development and changes in Tamil, a classic Dravidian language spoken primarily in the state of Tamil Nadu, India, in cochlear implantees. The main aim of the study is to analyse the phonological characteristics through connected speech of children who underwent

cochlear implantation. The objectives of the study include,

1. To analyse and compare the phonetic inventory pre and post cochlear implantation
2. To compare the phonological processes in pre and post cochlear implantation
3. To analyse the differences in production of consonant or syllable with respect to position of the phoneme in a word (initial, medial and final)

Methodology

2.1 Participants

24 children who underwent unilateral cochlear implantation at Madras ENT Research Foundation, Chennai has been considered for the study. The inclusion criteria set was that the child should be implanted at an age below 5 years and post-operatively should be below 8 years. The children with other associated conditions or deformities such as Cerebral Palsy, Intellectual Deficit (ID), Autism Spectrum Disorders (ASD), Attention Deficit Hyperactive Disorder (ADHD), Cleft lip and/ or palate and tongue-tie were excluded from the study. The children should have attended auditory habilitation for at least 1 year and should have used the device throughout without any interruption (interruptions due to device failure, repairs or due to other subjective factors). The child should have aided audiometric threshold within the speech spectrum at the time of obtaining the sample post implantation. A consent was obtained from the parents of the children for involving them in the study. The speech of the participants was unintelligible and their speech production ranged from vowelization to two-word utterances before implantation.

2.2 Audiological tests and instruments

Pre-operative pure tone audiogram thresholds and post-operative aided audiogram thresholds have been recorded. The pure tone audiometry was done using Cello Inventis audiometer with TDH 39 supra-aural headphones and B71w bone vibrator. The aided audiometry was done using Piano Inventis in free-field with 2 speakers (FBT electronics speakers- serial number: 10P052P0068, 10P052P0049) placed at 45° azimuths at left and right side of the participant respectively. Speech was tested using live voice monitored by VU meter.

2.3 Speech testing and stimuli

Connected discourse sample of each child in the study was video recorded in Tamil before implantation, close to the date of implantation and after implantation for the purpose of this study. The sample duration was for 5 minutes and minimum of 50 utterances were transcribed for each individual. Each child was engaged in a conversation with the clinician and the caregiver and materials such as toys, family photographs, cartoon pictures and story cards were used in the session to enable the child to continue the conversation smoothly. The speech sample was transcribed and was analysed using PRAAT, a computer software that facilitates analysis of phonetics.

Results and discussion

The evidences from literature shows that phonology is one of the early developing domains of language. [3] Children usually begin expressing themselves with vocalization of vowel /a/ and slowly explores different sounds of the language exposed.

In Tamil, there 12 vowels which includes both short and long vowels and 18 consonants and the alphabets are

formed by combining these vowels and consonants which totals to 216. [4] Also, there are consonants that are very much relative and requires appropriate knowledge and training to produce them appropriately. There are two diphthongs /ai/ and /au/ and are usually infrequently used in spoken Tamil. [5] Also, Tamil has a unique consonant /k/ which is difficult to produce at times even for native Tamil speakers.

The samples analysed revealed that pre-operatively, short (kuril) and long (nedil) low central vowels such as /a/ and /aa/ and mid-back short and long vowels such as /o/ and /oo/ were present. Consonants such as bilabial voiceless stop (/p/) and bilabial nasal consonant /m/ were present in 66.7% of the participants.

Samples collected post-operatively were analysed and it showed that high and mid front vowels such as /i/, /ii/, /e/ and /ee/ and high back vowels such as /u/ and /oo/ were added in the children's phonetic inventory. The diphthongs /ai/ and /au/ were also present but were used infrequently. In consonants, dental stops such as /t/ and /d/, alveolar lateral /l/ and labiodental semi vowel /v/ were present in all the children. The alveolar fricative /s/ were present in almost half (45.8%) the participants. The voiceless phonemes were produced more frequently and appropriately than voiced phonemes. The nasalised alveolar /n/ were acquired by only 6 (25%) participants appropriately. The consonants that are specific to Tamil were relatively under represented and were substituted most often by its relative consonants. The consonant considered to be unique to Tamil language, palatal lateral /k/ was not attained by any of the cochlear implantees involved in the study except one. When compared between the pre-implantation and post-implantation speech samples statistically through 't' test, the result showed that percentage of correctly produced vowels, consonants and consonant-vowel combinations had significantly improved after implantation (p<0.001).

Phonological process persisting in Tamil is different from that of English. Cluster reduction is reported to be observed in Tamil speaking children even after 3 years of age as well as stopping of liquids. [6] The frequency of initial consonant deletion and medial syllable deletion has been reported to be reduced after 3 years of age in Tamil speaking children. [7-8] The final consonant deletion observed in English is not applicable in English and the initial consonant deletion observed in Tamil speaking children was not observed in children speaking English or Western languages. [6]

Phonological processes analysed in these children showed that initial vowel and consonant elongation were present in 83.3% of the participants, prior to and post implantation. Initial consonant deletion, medial consonant and/or syllable deletion, weak syllable deletion, fronting, deaffrication and cluster reduction were present commonly among participants in the sample obtained to post cochlear implantation. Addition of a consonant/syllable in the medial position were also observed in 2 children but was infrequent. Denasalization was observed in both pre and post discourse samples.

When compared the appropriateness of the consonant production at various positions in a word, the non-retroflex consonants in Tamil were produced more appropriately in the medial positions than its relative retroflex consonants. The difference in the accuracy of production of a phoneme

with respect to position in a word was not statistically significant ($p > 0.005$). However, the accuracy of phoneme production was observed to be reduced with increase in word complexity.

The results of our study correlated well with the evidence from the literature in terms of phonological developmental pattern and phonological processes in typically developing Tamil speaking children except that there was a delay in these participants especially in pre-implantation period due to the sensory (hearing) impairment. Post cochlear implantation these children with adequate training were able to cope well and both phonological and overall language development was observed to be boosted up especially in children who were implanted before 3 years of age showing the importance of critical period of development.

Conclusion

The phonological development analysed in these participants shows that the cochlear implantation is beneficial and aids in achieving linguistic competence. The phonetic inventory of the participants, the pattern of phonological development and the phonological processes were different from that of other Western language speaking children but significantly correlated with earlier studies done in Tamil speaking children with slight delay contributed by the hearing impairment and time taken for intervention. The improvement was observed to be faster in children implanted within the critical time period.

References

1. Yallop, C., & Fletcher, J. (2007). An introduction to phonetics and phonology.
2. Geers, A. E., Nicholas, J. G., & Sedey, A. L. (2003). Language skills of children with early cochlear implantation. *Ear and hearing*, 24(1), 46S-58S.
3. Vihman, M. M. (2010). Phonological Development: The Origins of Language in the Child (Applied Language Studies). *Center for Applied Linguistics. BA English Language and Language Development-English*.
4. Sridhar, R., Rajkiran, R., Kumar, N. N., & Giridhar, M. (2013). Recognition of kalippa class of tamil poetry. In *In 12th International Tamil Internet Conference* (pp. 22-27).
5. Malini, R. H. (1993). A sociolinguistic study of phonological variables in Tamil learning context at the primary school level.
6. Perumal, R. C. Consonant acquisition and phonological processes in typically developing Tamil speaking children.
7. Nisthar, N. R. (2005). Development of phonological processes in Tamil speaking children between 2.6 and 5 years: A cross sectional study. *Unpublished Master's dissertation*. Manipal University, Manipal.
8. Bharathy, R. (2001). Development of phonological processes of 3-4 years old normal Tamil speaking children. *Unpublished Masters Dissertation submitted to the University of Mysore, India*.