

# An Analytical Study on Communication Abilities and Schooling in Children with Cochlear Implantation

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## Abstract

**Background:** As per the World Health Organization 2018, the new estimate of disabling of hearing loss is 466 million people. The State Initiative on Disabilities Survey (2015), Kerala, India, indicates that 2.32% of populations in Kerala, India, are affected by some form of disabilities. Among them, 60,925 are hearing disabled based on the definition of hearing impairment in the Persons with Disabilities Act 1995. A cochlear implant (CI) is a surgically implanted electronic device that provides a sense of sound to a person with severe to profound sensorineural hearing loss in both ears.

**Need for the Study:** Even though the Sruthitharangam scheme was started by the Government of Kerala, India, in 2012, no study was carried out to estimate the outcomes in terms of usage of CI, education placement, and mode of communication after CI surgery.

**Aims and Objectives:** The aim of the study was to investigate the usage of CI, communication abilities, and schooling in CI children who have undergone surgery under Kerala Government free CI program. The current study was to report the usage of cochlear implantation, the education status, and mode of communication of the children who had undergone, free of cost CI surgery from June 2012 to December 2015 in Kerala, India.

**Materials and Methods:** The demographical data were collected from the register maintained at Government Medical College, Kozhikode, Kerala, India. The study was a cross-sectional study and the data were collected through the telephonic interview of 114 parents or caregivers among 132 parents who had undergone free CI surgery from June 2012 to December 2015 at Government Medical College Kozhikode. Eighteen parents or caregivers could not be contacted due to unavailability or change of contact number and data collection was possible only for 114 parents among the 132 parents. All the children had attended a minimum of 2 years of post-implantation Auditory-Verbal Habilitation (AVH) from Sruthitharangam empanelled centers. Each subject was asked questions to understand the current usage of the device, the mode of communication, type of schooling, and associated issues that affect the prognosis of CI is also considered. The obtained responses were scored accordingly and tabulated for further statistical analysis.

**Observations and Results:** The result reveals that among the 114 CI recipients, 93.8% (107 recipients) were using CI and 6.14% (seven recipients) were non-users. These data found that all children were enrolled in school and attending in variety of educational settings. In that, 82.45% (94 children) were attending mainstream education and 17.54% (20 children) were going to special schools. On further analysis of the communication, abilities showed that the majority of the children (75.43%) communicated orally, 21.05% of them communicated through total communication and 3.5% of them used sign language.

**Conclusions:** Kerala government Sruthitharangam CI program aid the majority of the children with severe to profound sensorineural hearing loss in acquiring oral communication skills and also benefiting integration in normal schools. Steps should be taken to reduce the number of non- users and also plan new strategies for better normal school integration for CI children under the government scheme

**Key words:** Cochlear implant usage, Cochlear implantation, Communication abilities, Educational status

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## INTRODUCTION

As per the World Health Organization 2018 reports, the new estimate of disabling of hearing loss is 466 million people and 34 million of these are children. Disabling hearing loss refers to hearing loss >40 dB in the better hearing ear in adults and a hearing loss >30 dB in the better hearing ear

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in children.<sup>[1]</sup> The State Initiative on Disabilities Survey (2015) indicated that 2.32% of populations in Kerala, India, are affected by some form of disabilities. Among them, 60,925 are hearing disabled based on the definition of hearing impairment in Persons With Disabilities Act 1995.<sup>[2]</sup> According to the 2011 Census data, 7.01% of children in the age group of 0–6 years in India have a disability, inborn, or acquired.<sup>[3]</sup> Its incidence is estimated to be 4.8% in children aged 0–1 year and 6.4% in children aged 1–4 years.<sup>[4]</sup> Prevalence and severity of hearing loss vary with some factors, including socioeconomic status, exposure to infections, and consanguinity.<sup>[5]</sup> Lower-income and increasing age lead to increased incidence of hearing loss.<sup>[6]</sup> In this regard, early identification and intervention services can play a crucial role in prevention as well as remediation of the developmental delays that occur in young children. Early intervention broadly refers to the provision of services to infants, toddlers, and young children who are considered vulnerable for reasons of disability or risk of disability. Liberty (2000)<sup>[7]</sup> describes early intervention as, “...a philosophy of providing specialized services to children with special needs during their developmental years, with the aim of ameliorating the effects of biological and other factors that can affect the developmental outcome. Children with profound hearing loss who no longer benefit from hearing aids, cochlear implant (CI) may be the next best step. Cochlear implantation is a medical device that uses electricity to stimulate the spiral ganglion cells of the auditory nerve to restore sensorineural hearing loss. The purpose of this device is to convert sound to an electrical signal and deliver this to the hearing nerve, which by passes the damaged hearing apparatus.<sup>[8]</sup> It enhances good communication skills; auditory performance in these children. It is also benefiting the academic performance of the children. Modes of communication in CI children are classified into three: (1) Oral communication, (2) total communication, and (3) bilingual communication. Schooling consideration of CI children includes a public or private school with adequate facilities or inclusion in a public or private school adequate supports integrated within the school (special/normal). In Kerala, India, the government started first free cochlear implantation program in 2012 called “Sruthitharangam” which provides free cochlear implantation surgery and 2-year Auditory-Verbal Habilitation (AVH) for children with severe to profound hearing loss in the age group of 0–5 years. Two hundred and sixty-nine children under 5 years had undergone surgery under the scheme at Government Medical College, Kozhikode. Therefore, this study is significant as the first to report on the long-term outcomes of the Sruthitharangam CI programme at Government Medical College, Kozhikode. The outcomes measured were the relationship between

implanted children’s current status of CI usage, modes of communication, and their educational placement. Further this study also investigated the relationship of the variable age of implantation, additional disabilities, and the presence of abnormal radiological findings. In the present study consideration to the current status of CI usage, education status and mode of communication of the children who had undergone free of cost CI surgery from June 2012 to December 2015 in Kerala, India, were analyzed.

## MATERIALS AND METHODS

This was a prospective, cross-sectional, and analytical study conducted from September 2012 to December 2015 at Government Medical College Kozhikode, Kerala, India. Children received the CI under the “Sruthitharangam” scheme and they had attended 2-year AVH at the same place. The demographical data were collected from the register maintained at Government Medical College Kozhikode, Kerala. The study was a cross-sectional study, and the data were collected through the telephonic interview from 114 parents or caregivers among 132 parents who had undergone free CI surgery from June 2012 to December 2015 at Government Medical College, Kozhikode, Kerala. Eighteen parents/caregivers could not be contacted due to non-availability or change of contact number, and the data collection was possible only for 114 parents among 132 parents. A questionnaire was used to collect the data from parents through a telephonic interview. The questionnaire contained queries about the current status of CI usage (user/non-user), current communication mode (oral, bilingual, and total communication), and educational placement (Regular/normal vs. special school), and associated medical issues. All the data were computerized and analyzed using Fisher’s Exact test.

## OBSERVATIONS AND RESULTS

The authors contacted 114 parents out of 133 parents through telephone. All the reported data is tabulated in Figure 1 which shows that the majority of the implantees, i.e., 107 children (93.8%) were using the device continuously. The remaining seven children were non-users. From the non-users group, four children have their processor repair issues and they could not afford the cost of repair. The patients then learned total communication. The other one non-user implantee lost his external implant. There were no radiological abnormalities, associated disabilities, intraoperative or post-operative complications in these two categories of patients who were non-users in the study.

Figure 2 shows that the majority of 86 (75.43%) of the implantees have acquired oral communication and

used it as their mode of communication. Other modes of communication used was: Total communication in 24 (21.05%) and bilingual communication in four (03.5%).

Figure 3 shows that out of 114 implantees 92 (82.45%) were in mainstream education. Those who were not in mainstream education were studying in special education schools; 20 (17.54%).

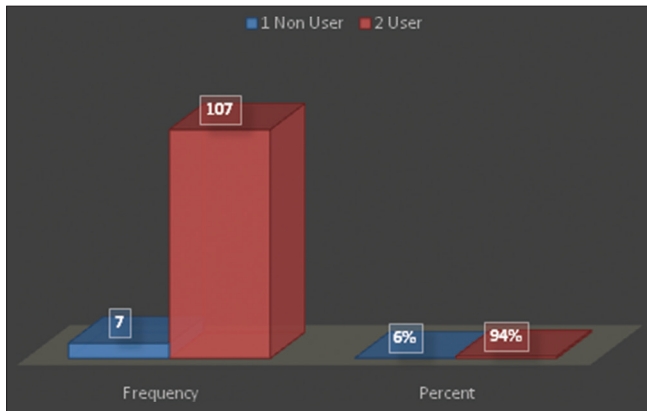


Figure 1: Showing the current status of CI Usage in children of the study (n=114)

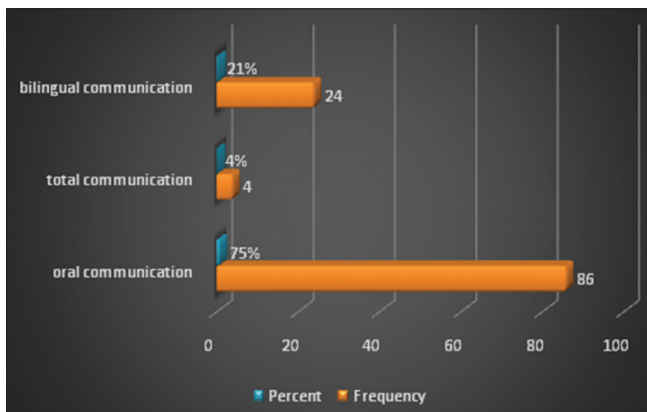


Figure 2: Shows the Modes of communication among the subjects in the study (n=114)

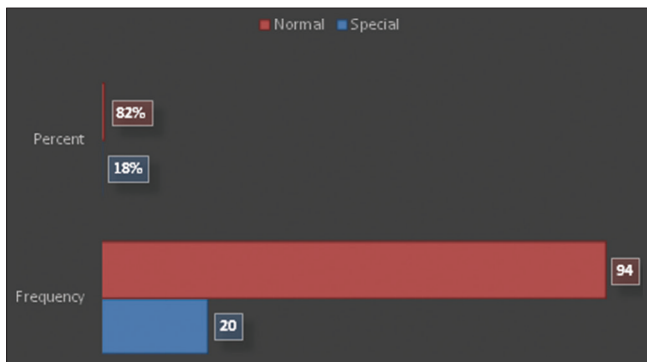


Figure 3: Showing the educational placement among the subjects in the study (n=114)

Fisher’s exact test was performed to observe the significant relationships between the current status of CI users and types of education placement and modes of communication. The result of the Fisher’s exact test between CI users and types of educational placement showed *P* value less than the significant level 5%, which implies that there was a significant relationship between these two variables. The result also showed that only 0.6% percentage of the CI non-users was attending the normal school. However, the results of the test between CI users and modes of communication were greater than the significant level, showing that the two variables were not related.

## DISCUSSION

This study showed that the majority of cochlear recipients of the Sruthitharangam CI program were using the device, suggesting that they have gained benefits from cochlear implantation and thus using it continuously. A very small proportion of the implantees become non-users.

The result reveals that among the 114 CI recipients, 107 children (93.8%) were using CI and seven children (6.14%) were non-users. Further analysis of the data showed that all children were enrolled in schools and attending in variety of educational settings. Among them, 94 (82.45%) children were attending mainstream education and 20 children (17.54%) were going to special schools. Analysis of the communication abilities showed that 86 (75.43%) children communicated orally 24 (21.05%) of them communicated through bilingual communication, and 4 (03.5%) of them used sign language. There are many studies in the literature that were identical to the present study. A Korean study was done by Hoon *et al.*<sup>[9]</sup> in 2019, which investigated the educational status in bilateral deaf children with a cochlear implantation, found that among 64 implantees 46 (71.87%) were attending mainstream educational institutes. Eight (12.5%) of them were enrolled in integrated school set up and the remaining ten (15.62%) were attending special schools. The study by Goh *et al.*<sup>[10]</sup> in 2017 which investigated the long-term outcomes of cochlear implantation, in terms of device usage, modes of communication, educational placements, and functional auditory/oral performances found that among the implantees, the proportion of non-users of CI was low 02.4% and a large majority were full-time CI users 97.6%. These results were similar to the results observed in the present study. Contrera *et al.*<sup>[11]</sup> have conducted a study which determined the rates of long-term CIs use in children. They found that 93.2% of the implantees were using CIs regularly. “Sruthitharangam” free CI program was a successful program in Kerala wherein the number of CI users was of international standard. The hearing impaired children

joining the social mainstream in respects to educational placements and improving their modes of communication has given rise to a sense of confidence among the parents and children. To discuss few solutions to reduce the number of non-users, to improve oral communication and better educational placement, the stakeholders should concentrate on early hearing detection and intervention which should be the foremost step. The government should provide free amplification device/economic support after the warranty period was over, to reduce the number of nonusers.

## CONCLUSIONS

Kerala government's "Sruthitharangam CI program" aided the majority of the children with severe to profound sensorineural hearing loss in acquiring oral communication skills and also benefiting integration in normal schools. Steps should also be taken to reduce the number of non-users and also plan new strategies for better normal school integration for CI children under government schemes.

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