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After the Implant-a Study on Post Cochlear Implant Rehabilitation of Congenitally Deaf Children

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ABSTRACT

Objectives: To assess the perceptions and compliance of parents/guardians of children with cochlear implant regarding post-cochlear implant rehabilitation of their children.

Study Design: Analytical, cross-sectional, quantitative study

Place and Duration of Study: ENT department, Combined Military Hospital, Rawalpindi Pakistan, from Nov 2021 to Apr 2022.

Methodology: The study was conducted on a sample size of 93 parents/guardians of congenitally deaf children (recipients of cochlear implant) who were recruited via purposive sampling. Parents/guardians of children having severe to profound hearing loss, who did not benefit from hearing aid were included in the study from which those having a hearing age of less than 9 months were excluded. A validated modified questionnaire was adopted and data was collected from the parents/guardians by interviewing them on calls. Data was analyzed by using SPSS 25.

Results: Amongst the study participants, 11(11.8%), 30(32.3%), 44(47.3%) and 8(8.6%) parents/guardians showed poor, fair, good and excellent compliance respectively. Better compliance was associated with positive parental (p-value=0.007) and child (p-value=0.004) attitude. Distance 68(73%) and finance 70(75%) were the hurdles faced; irrespective of compliance. However, financial difficulties (p-value=0.585), difficulties due to distance (p-value=0.210) and parental education level (p-value=0.175) were not significantly associated with compliance.

Conclusion: The study showed that most parents/guardians 82(88%) were compliant with the rehabilitation. Positive counselling of the parents and children can further improve compliance. Rehabilitation can be eased with financial assistance and improved accessibility.

Key Words: Cochlear implants, Congenital, Deafness, Hearing, Hearing loss, Rehabilitation.

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INTRODUCTION

All over the world, 1.5 billion,[1] people experience hearing loss to some extent. In other words, hearing loss impacts the daily lives, family and societal dealings of around 20% of the world's population.[1] Moreover, 5% of the global population is in need of rehabilitation for addressing their disabling hearing loss.[2] Hearing loss and the disabilities associated with it are rising day by day, so much so that by 2050, around 2.45 billion,[3] people are projected to be living with some degree of hearing loss. According to the Global burden of disease study,[3] in 2019, a total of 43.5 million years lived with disability (YLDs) globally were found to be associated with hearing loss; a number which was increased by 73% since 1990. It is alarming to note that by the year 2050, in every ten people, at least one is predicted to have disabling hearing loss.[2]

Hearing loss can negatively impact many aspects of day-to-day life. Congenital hearing loss not only influences the development of spoken language and cognitive skills but also risks different executive functions, concept formation and sequential processing.[4] In order to address hearing loss, early identification is the first and the most important step. Once a person has been diagnosed with hearing loss, the next important step is the provision of clinical and rehabilitative interventions.[1] The interventions to address hearing loss consist primarily of hearing amplification and cochlear implants, combined with speech therapy in a pertinent academic environment.[5]

According to a study conducted by Brodie A *et al*,[6] a cochlear implant has been defined as "an alternative electronic device that is used in profound hearing loss when a conventional amplification hearing aid had little or no benefit or cannot be used." Furthermore, successful auditory rehabilitation,[7] is defined as "the patient's (re) gaining of hearing and speech ability." So, in terms of cochlear implant, auditory rehabilitation is divided into three main stages: basic therapy (implantation of the device), follow-up therapy (out-patient care, speech therapy, schools) and

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aftercare (long-term hearing and speech intelligibility as well as and technical support.[8]

For the cochlear implantation process to reach its full potential in terms of auditory and speech rehabilitation, a combination of human and environmental factors, as well as appropriate facilities are required. A complete rehabilitation team comprising of an audiologist, speech therapist, psychologist and occupational therapist is needed along with the training of families.[9] Day by day the count and diversity of cochlear implant recipients is increasing, making it imperative for the post implant rehabilitation services to adapt in accordance with the needs of this diverse population.[10] Our study was therefore conducted not only to assess the degree of compliance of parents/guardians to post cochlear implant rehabilitation but also to analyze the parental perception regarding the post cochlear implant rehabilitation. It can, therefore, help to point towards the areas in which work can be done to improve compliance to rehabilitation.

METHODOLOGY

An analytical, cross-sectional, quantitative study was carried out at ENT department, Combined Military Hospital, Rawalpindi Pakistan, over a duration of five months from November 2021 to April 2022. Approval of institutional ethical review committee was taken before initiating the study (ERC/ID/218). Purposive sampling technique was used and a list of potential candidates, along with their contact numbers, was obtained from the cochlear implant recipient database at CMH, Rawalpindi Pakistan. Target population were the parents/guardians of the children who had received cochlear implants at CMH, Rawalpindi Pakistan.

Inclusion Criteria: Parents/guardians of congenitally deaf children of either gender, any age, who were recipients of cochlear implant, had severe to profound hearing loss and did not benefit from hearing aids.

Exclusion Criteria: Out of the potential candidates, the parents/guardians of children having a hearing age of less than 9 months (i.e having date of activation of the implant after April, 2021) and those who had their implants activated before January 2019 were excluded.

One hundred and seventy-five parents/guardians were then contacted via telephone and were asked for their consent. Some of the phone numbers were unreachable while some parents/guardians did not consent. Those who did not attend the call were contacted again after a few days and a final sample of 93 responses was obtained. Their participation in the research was voluntary and they were fully explained the purpose, benefits and risks of the study beforehand. Data was collected by using a validated questionnaire,[11] which was adopted after a few modifications i.e omission of some questions that were not under the scope of this study and tailoring of some questions according to the local conditions and norms. After taking informed consent, the questionnaire was filled by the researchers on Google Forms by interviewing the respondents on phone call. A few of the respondents were emailed the questionnaire via Google Forms. The questionnaire included three sections. The first section contained patient information and demographical data. The second section included questions about compliance to the post cochlear implant rehabilitation as well as the attitude of parents/guardians and the children towards the implant. The third section collected data about financial difficulties and difficulties due to distance faced by the parents/guardians during the process of rehabilitation of their children.

Data was analyzed using Statistical Package of Social Sciences SPSS version 25. Quantitative variables were expressed as Mean±SD. Qualitative variables were expressed as Frequency and percentages Chi-square tests was applied and a p-value <0.05 was considered to be statistically significant.

RESULTS

A total of 175 parents/guardians of the children who had received cochlear implants were contacted and 93(53.14%) parents/guardians participated in the research. The mean age of the participants was 35±6.7 years. The mean age of the children, who later received cochlear implants, at the time of diagnosis with hearing loss was 1.5±0.92 years. The average ages of children at the time of receiving hearing aids and cochlear implants were 2.27±1.26 years and 4.89±2.55 years, respectively. Further demographical characteristics of the parents/guardians as well as the children are given in Table-I.

Out of 93 participants, 11(11.8%) parents/ guardians showed poor compliance, 30(32.3%) showed fair compliance, 44(47.3%) showed good compliance whereas 8(8.6%) displayed excellent compliance; as shown in Figure-1.

Chi-square test was applied to check the significance of association of various factors with compliance. The results are summarized in Table-II.

Table-I: Demographical Details of Participants and Cochlear Implant Recipients

Variable	n(%)
Characteristics of Participants (parents/guardians)	
Gender	
Male	60(64.5)
Female	33(35.5)
Relation to the child	
Mother	30(32.3)
Father	55(59.1)
Sibling	2(2.2)
Grandparent	4(4.3)
Relative	2(2.2)
Marital Status	
Single	5(5.4)
Married	87(93.5)
Divorced/separated	1(1.1)
Number of Children in Household	
Single-child	6(6.5)
Multiple children	87(93.5)
Residence	
Rural	31(33.3)
Urban	62(66.7)
Characteristics of Cochlear Implant Recipients (children)	
Gender	
Male	54(58.1)
Female	39(41.9)
Family History of Congenital Hearing Loss	
Positive	31(33.3)
Negative	62(66.7)
Additional disabilities	
Present	6(6.5)
Absent	87(93.5)
Attending School or Not	
Attend school	50(53.8)
Do not attend school	31(33.3)
Are not old enough	12(12.9)
School Type	
Mainstream	35(37.6)
Deaf education	15(16.1)

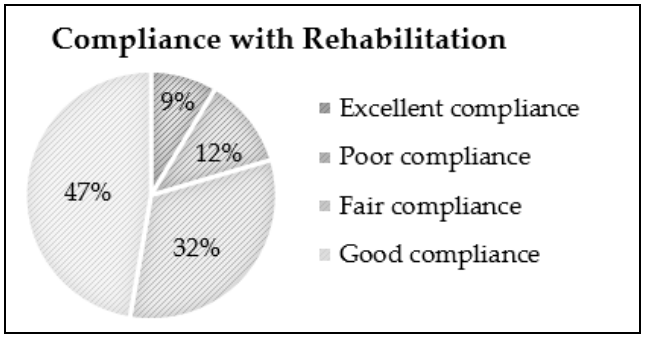

Figure-1: Level of parental compliance with post cochlear implant rehabilitation

Table-II: Association between various factors and compliance with rehabilitation

Variable	n (%)	*p*-value
Parent's attitude towards the implant		
Positive	87 (93.5)	0.007
Negative	6 (6.5)	
Child's attitude towards the implant		
Positive	88 (94.6)	0.004
Negative	5 (5.4)	
Financial difficulties		
Present	70 (75.3)	0.585
Not present	23 (24.7)	
Difficulties due to distance		
Present	68 (73)	0.210
Not present	25 (27)	
Education level of parents/guardians		
Matriculation or less	40 (43)	0.175
Beyond matriculation	53 (57)	

Positive attitude of the parent/guardian (*p*-value= 0.007) towards the implant and positive attitude of the child (*p*-value=0.004) towards the implant were found to have a significant association with complia-nce as depicted in Figure-2 & 3, respectively.

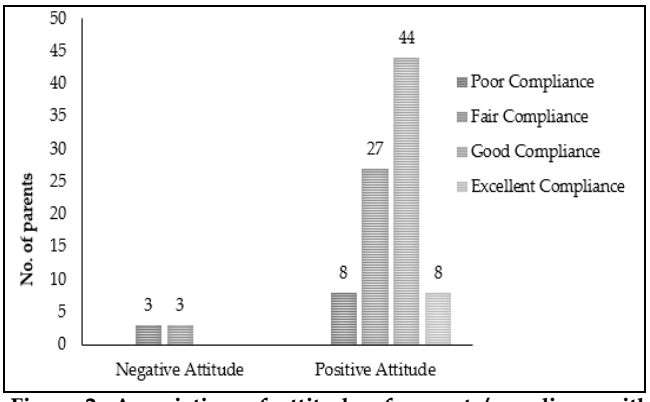

Figure-2: Association of attitude of parents/guardians with compliance to rehabilitation

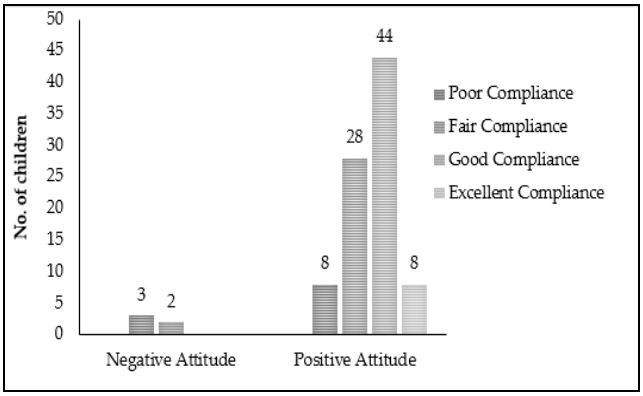

Figure-3: Association of attitude of children with compliance to rehabilitation

DISCUSSION

After cochlear implantation, better outcomes in the recipient children depend not only on the child's nonverbal intelligence and the implant characteristics but also on the educational rehabilitation after the implant.[12] Studies indicate that variance in outcomes after the implant is attributable to post implant rehabilitation, particularly concerning communication with the child (oral-aural mode).[12,13] Hence, analyzing the extent of compliance to rehabilitation and the factors which could further ease this compliance is important for improved cochlear implant outcomes in the recipients. A study on parental compliance to speech therapy of hearing impaired children using cochlear implant, revealed only 88 out of 217(40.55%) parents were compliant,[14] whereas our study showed 82 out of 93(88.2%) parents/guardians were compliant. Literature showed only a limited number of studies in this domain.

Our study showed a statistically significant association between positive parental attitude and compliance (p-value=0.007). In a study conducted by Vieira Sds *et al*,[15] family support has been declared a principal factor in the rehabilitation process of the child as after the implant the child requires family's help and mobilization in order to reach his/her optimal potential in personal, academic and social life. Similarly, another study showed that 67 out of 72 (93%) participants identified parental influence factors to be important contributors towards better speech and language outcomes in the children with the implants. Parental self-efficacy, adherence and habilitation carry-over were the prime parental influence factors identified in the mentioned study.[16] Additionally, a study carried out by Moeller MP,[17] stated that involvement of the parents is so far the strongest contributor for the achievement of enhanced language outcomes in cochlear implant recipients.

In our study, the association between positive child's attitude and compliance was statistically significant (p-value=0.004). Another study showed that the causative factors behind non usage of the cochlear implant in pediatric recipients included lack of closer cooperation of children, their families and their schools.[18] Our study also revealed that distance 68 (73%) was a hurdle in rehabilitation although its association with compliance was statistically insignificant (p-value=0.210). On the contrary, another research on cochlear implant recipients proves distance to be a significant hurdle in the provision of audiology service (p-value: 0.01).[11]

Furthermore, the current research showed finance 70(75.3%) to be a difficulty in the process of rehabilitation but its association with compliance was statistically insignificant (p-value=0.585). In a national electronic survey of pediatric cochlear implant audiologists, low socioeconomic status was identified as a factor causing poor speech therapy and language outcomes after the implant.[17] The association between level of education of parents/guardians and compliance was statistically insignificant (p-value= 0.175) in our study. The same thing was observed in another study regarding parental satisfaction with the cochlear implant outcome,[19] where the association of the level of education of parent with rehabilitation outcomes was also found to be statistically insignificant (p-value=0.13). However, a study by Yehudai *et al*,[20] claims that level of education of parents does affect their awareness and access to post implant rehabilitation.

LIMITATIONS OF STUDY

The results of this study have limited generalizability, firstly, due to its conduction in a single center, secondly, the sample size obtained was not large enough due to limited number of cochlear implant recipients in Pakistan. Furthermore, only congenitally deaf children were included, excluding those who underwent cochlear implant due to trauma or some other illness leading to deafness. Thirdly, there was a low response rate due to communication challenges and transient residence of some participants. Finally, inherent recall bias was also present leading to limitations in the outcome of the study.

RECOMMENDATIONS

Counselling of the parents or guardians as well as the children receiving the cochlear implants by the doctor, is recommended to achieve better compliance of parents to the rehabilitation. The doctor should educate regarding the importance and benefits of both the implant and post implant rehabilitation; thereby counselling them to adequately follow the schedule and maintain the quality of post implant rehabilitation.

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CONCLUSION

Our study showed that majority of the parents/guardians were compliant with the rehabilitation of their congenitally deaf child, showing their all-inclusive good acquiescence to the rehabilitation. The work done so far by the departments on developing a constructive attitude towards the implant is commendable as 87(93.5%) parents and 88(94.6%) children had a positive attitude towards the

cochlear implant. Continued positive counselling of the parents and children can further improve the compliance. Post cochlear implant rehabilitation of congenitally deaf children can be eased with financial assistance and improved accessibility. Despite the already initiated programs for financial assistance by the government, some time is yet to be taken to clinically see the full impact of these programs, in terms of rehabilitation.

Conflict of Intrest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

SFM: Conceptualization and design of the study, statistical analysis, technical support, reviewing the manuscript & final apporval of the version to be published.

NK: Conceptualization and design of the study, editing the manuscript & final apporval of the version to be published.

IAM: Literature review, data collection, statistical analysis, interpretation of results, writing introduction, reference writing, compiling and editing the manuscript & final apporval of the version to be published.

RA: Literature review, data collection, writing introduction, methodology and results, reference writing, reviewing the manuscript & final apporval of the version to be published.

HS: Data collection, writing discussion, reviewing the manuscript & final apporval of the version to be published.

RS: Literature review, writing conclusion, editing the manuscript & final apporval of the version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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