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Comparison of Parental Expectations Regarding Effectiveness of Speech Therapy Among Cochlear Implant and Hearing Aid Users

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Abstract

Background: Parental expectations are the desires for their children's socialization, academic performance, and professional ambitions which are based on effective communication.

Objective: This study compared parental expectations regarding the effectiveness of speech therapy among children with Cochlear Implant and Hearing Aid.

Method: The study design was a comparative Cross-Sectional Study. The sample size consisted of parents of 100 hearing-impaired children. It was divided into two groups i.e., 50 parents of cochlear implant children and 50 hearing aid users' parents. The purposive Sampling Technique was used to conduct this study. The study was conducted at Mind Care Rehabilitation, Bol Rehabilitation Centre, and Rahman Rehabilitation Clinic. In this study, the parents of the children receiving speech therapy after amplification were included. The parents of the children with other

challenge disorders i.e., neurological disorders, organic disorders, syndromes, or learning disabilities were excluded from this study. (Questionnaire) The expectation of improvement in communication abilities was used to conduct this study**.** Demographics were explained using frequencies. Cross tabs were used to display the results

Results: This current study showed that in "child will be able to easily detect very quiet sound'' domain cochlear Implant 24% and hearing Aid 26% expectations. And in the other result is" Child usually treated like a hearing child by family and friends" with cochlear Implants at 27% and hearing aids at 27% expectations.

Conclusion: It was concluded from this study that parents with children having cochlear implants have higher expectations than those of hearing aid users. It is implicated by the study that parents of such children should provide counselling sessions.

Keywords: Hearing, Hearing Impairment, Cochlear Implant, Hearing Aid, Sensorineural Hearing Loss

INTRODUCTION

Hearing is the capability or ability to perceive sound through an organ-like ear, from surrounding medium pressure ear deduct vibration as a periodic fluctuation. The educational aspect is concerned with auditory science, the sound can be perceived from gaseous, liquid, and solid matters(1). An important role of hearing is the answer to human speech, the main way in which human beings connect through communication, expressively and intelligently. In the development of the human brain, language plays a very important role in hearing(2). There are significant findings about the academic achievement of children being higher among the children who learn to speak and read from their parents. While children with hearing impairment have to face issues related to their academic performance(3).

The term "Presbycusis" means hearing loss that is linked with the cochlear degenerative process of aging. By definition, Presbycusis is bilateral, symmetrical, and slowly progressive(4). Hearing loss is common in children by age 18 years and affects nearly 1 of every 5 children. Without hearing rehabilitation, hearing loss can cause detrimental effects on speech, language, developmental, educational, and cognitive outcomes in children(5).

The mechanical sense was used in hearing. In this mechanical process, the sounds were converted into electrical range and this electrical range is measured in Hz. The Hz ranged between 250 to 8,000 at 25 dB A person's ability to recognize speech can be assessed through a speech discrimination test(6). A speech from the background creates the noise signals that help to create language in the mind. These speeches are based on vibrations that we experience as the sound of the world. The diversity of sound can be measured in Hz/cycler per second and the sound tone can be measured in frequencies(7).

The ear can perceive or deduct the sound from our surrounding medium and this sound has periodic variations. Hearing ability plays an important role in our daily life, this helps us to

maintain relationships and connections with our family and friends. This ability helps us to enhance our quality of life like, listen, speak and laugh(8).

The ear has the ability to concentrate on one voice and suppress most of the other voices. From the blended sound of a symphony orchestra, our ears can distinguish the one instrument that is performing incorrectly(9).

There are three types of hearing impairment permanent hearing loss, (ii) conductive hearing loss, and (iii) mixed hearing loss, permanent impairment hearing loss happens when there are some sound waves or injury in the auditory nerve or inner ear and the conductive or fluctuating hearing loss happens when the injury or sound waves can't reach the auditory nerves, inner ear. Conductive hearing loss may be caused by a build-up of earwax, punctured eardrum or fluid, gaining, chronic exposure, and loud noises, these factors cause permanent or temporary hearing loss(10).

Most people lose their hearing gradually. Some symptoms include earache, hearing loudly, dizziness, etc(11). Assessment of Hearing loss differs as per age of the child. In newborns and infants, BERA (brainstem audio-evoked response) test is the method for early diagnosis of hearing loss. Audiometry works with older children, aged 4 to 5 and older, who can respond to sound stimuli according to instructions. Tympanograms and audiograms are of value in adults and children unfortunately they provide information regarding the mobility of the tympanic membrane only(12).

The foremost goal of amplification is to revive audibility without causing discomfort; for individual with severe-to-profound hearing loss, the reduced dynamic range poses unusual challenges in hearing-assistive device fitting(13).

The other two goals of amplification include providing language and environmental cues respectively. The use of hearing devices (hearing Aids and Cochlear Implants) in connecting young children to their environment, helps maximize auditory language development if it allows them to hear any speech sounds, and uses auditory pathways to the brain, which may prevent the brain from "ignoring" them (as it does in cortically blinded laboratory animals)(14).

Through technology we can modify the frequencies to provide assistive hearing ability; these frequencies can be modified through, telecommunication devices, alerting devices, sign language, and captioning services and provide education to individuals with hearing loss(15). The technological aids devices improve hearing ability and make sounds audible to individuals with hearing loss. In the majority of countries, all technological hearing devices are classified as medical devices and controlled by individual rules. Such devices include a hearing aid which is a small electronic device that you place in or behind your ear. Hearing aids make the sound loader to the person who wears it, which enables the person to communicate, listen, and participate fully in daily routine.A hearing aid device helps the individual to hear in both noisy and quiet places. A hearing aid device has three main parts, speaker, amplifier, and microphone(16). The function of a hearing aid device is to receive the audio/sound through a microphone and convert it into electronic singles for an amplifier; an amplifier receives the electronic singles from the microphone and increases the power of electronic signals and sends them to the speaker for hearable sound; the speaker sound helps the individual in communication.(17)

Cochlear implantation is a safe and reliable treatment for children with severe to profound hearing loss around the world. It is clear that pediatric cochlear implantation is required for children who have profound deafness to hear and to develop speech understanding(18). A systematic review of speech perception demonstrated that those children who were implanted experienced a steep improvement in early speech perception, from exhibiting few prelingual auditory behaviors before implantation to identifying sentences in noise after one year of implant use(19).

To restore the sensor neural hearing loss a medical device cochlear was implanted which stimulates the spiral ganglion cells of the auditory nerve(20). But this device is not appropriate for every patient, the selection of patients does matter in the cochlear implants, this is the latest technological advancement in the field of medicine, and this technology is now speeding rapidly all over the world.These devices are inserted by otolaryngologists through surgery who work with audiologists to capable this aid to efficiently working for patients. This aid is recognized as the most successful hearing device in the world(21).

METHODOLOGY

The study design was a comparative Cross-Sectional Study. The sample size consisted of parents of 100 hearing-impaired children. It was divided into two groups i.e., 50 parents of cochlear implant children and 50 hearing aid users' parents. The purposive Sampling Technique was used to conduct this study. The study was conducted at Mind Care Rehabilitation, Bol Rehabilitation Center, and Rahman Rehabilitation Clinic. In this study the parents of the children who are receiving speech therapy after amplification were included for this study. The parent of the children with the other challenge disorders i.e., neurological disorders, organic disorders, syndromes, and learning disabilities were excluded from this study. The expectation of improvement in communication abilities (Questioner) was used to conduct this study. Demographics were explained using frequencies. Chi-square was used to compare responses.

RESULTS

The purpose of this study was to compare parental expectations regarding the effectiveness of speech therapy among children with Cochlear Implant and Hearing Aid. The data of 100 participants were analyzed using SPSS software. Out of 100 participants, 14 participants (14%) were 2 to 4 years old. The highest frequencies with 45 participants (45%) were 4.1 to 7 years old. The other frequency with 41 participants (41%) was 7.1 to 10 years old. Out of 100 participants, 19 participants (19%) were 1 year hearing age. The highest frequencies with 35 participants (35%) were 2 years of hearing age. The other frequency with 26 participants (26%) was 3 years of hearing age. And the last frequency with 16 participants (16%) was 4-year hearing age. Out of 100 participants, 64 participants (64%) were unilateral. The other frequencies with 36 participants (36%) were bilateral. The result of this current study depicted that a "Child usually treated like a hearing child by family and friends'' domain cochlear Implants 27% and hearing Aids 27% expectations. The result of this current study depicted that in "Child will improve his/her communication skills tremendously" domain cochlear Implant 36% and hearing Aid 28% expectations. The result of this current study depicted that in "Child will easily make friends with

hearing peers" domain cochlear Implants 23% and hearing Aids 25% expectations. The result of this current study depicted that in the "Child will be able to function like a child with typical hearing" domain cochlear Implant 33% and hearing Aid 28% expectations.

Table 1: Demographics

Variables		**Frequency**	**Percent**
Age Ranges (years)	2 to 4	14	14%
	4.1 to 7	45	45%
	7.1 to 10	41	41%
	Total	100	100
Hearing Age (Years)	1 Year	19	19%
	2 Years	39	39%
	3 Years	26	26%
	4 Years	16	16%
	Total	100	100%
Device Ear	Unilateral	64	64%
	Bilateral	36	36%
	Total	100	100%

Table 2. Comparison of Parental Expectations Regarding Effectiveness of Speech Therapy Among Cochlear Implant and Hearing Aid Users

	Question			Strongly Disagree	Disagree	Neural	Agree	Strongly Agree
1	Family and friends treat Child as normal Child	Child is using Device	Cochlear Implants	0	8	13	27	2
			Hearing Aids	1	9	11	27	2
2	Communication skills are improving tremendously.	Child is using Device	Cochlear Implants	5	1	8	36	5
			Hearing Aids	14	1	7	28	14
3	Hearing peers enable Children to make friends easily.	Child is using Device	Cochlear Implants	0	7	8	23	12
			Hearing Aids	0	8	8	25	14
4	Device will be able Children to function like a normal child.	Child is using Device	Cochlear Implants	0	1	14	33	2
			Hearing Aids	0	8	14	28	0

DISCUSSION

The research included children with hearing ages ranging from 1 to 4 years old and a chronological age range of 2 to 10 years. A survey with 15 questions on communication was given out by the researcher. A study have illustrated the positive attitude of parents whose children received cochlear impants treatment(22). The results of the recent study showed that parents have high expectations for their kids who use hearing aids and a cochlear implant. When parents were questioned about communication skills, it became clear that they had high expectations. The majority of the parents answered yes to the statement "Will be able to easily detect very quiet sounds(23)." The same goes for the statement, "Will be able to follow a conversation; with a group of cochlear implants," which 36% and 29% of parents agreed to. Similar to the hearing aid group, 32% of parents with cochlear implants and 26% of those with hearing aids responded favorably to the question(24), "Will be able to easily understand others without having them repeat themselves. “The findings of the current study demonstrated that, in the context of Pakistan, parents have high expectations for C.I. children rather than hearing aids(25). However, in the current study, 21% of parents of hearing aid users and 14% of parents of cochlea implant recipients reported stress in the family as a result of the child's hearing impairment. Mothers of deaf children who undergone cochlear implantation were the subject of a study by Wiseman et al. that looked at stress, attitudes, and expectations. When comparing stress levels across moms of CI candidates, it was reported that mothers of modern age have experience less stress as compared to those mothers, whose children are using older technology(26). Another study conducted by Rathna et al in 2022 explicated that parents ahd shown their staisfcation upon suing cochlear implants as a useful device that imporved the academic, social, and communication skills, and abilities in children with cochlear implants. The average score related to all these abilities were reported as above 81%(27). Parents of children utilising CI were anxious while answering questions about stress in their home. Stress reduction among parents of children utilising CI should be accomplished by realistic therapy provided by professionals. When compared to parents of children with normal hearing, Abdelrahman et al found that parents of children with cochlear implants experience higher levels of stress and worse psychological adjustment(28). Similarly, to this, Sarant and Garrard looked at how CI-using parents responded to a stress questionnaire. Additionally, they stated that compared to the general population, these parents experienced more stress(29). A study had demosntarted that parents should be given information regarding assistive device and remoe microphone can be used in some challeneging situation(30).

In the article for parents, the research revealed that parents had high expectations for their kids' use of technology in terms of their ability to communicate, their ability to interact with others, their ability to succeed in school, and how their future will change. Additionally, it demonstrated an understanding of the need for the kids to utilise gadgets to receive comprehensive speech-language and listening instruction. The study also shows that parents who have children with hearing impairment experience stress. It is possible to infer from the current study that a rehabilitation

specialist has to be aware of what parents anticipate of their children who utilize electronics. At each step of implantation, including pre-implantation, post-implantation, and heating assistance, appropriate counselling on reasonable expectations should be provided.

CONCLUSION

It is concluded from this study that, in this question "child will be able to easily detect very quiet sound" Hearing Aid users' expectations will be higher than cochlear Implant. In the other question, 'Child usually treated like a hearing child by family and friends" Hearing Aid and Cochlear Implant Users expectations are the same. In the 'Child will be able to follow a conversation with a group of people" Cochlear Implant parental Expectations were higher than Hearing Aid.

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Appendix

Table 1: Chronological Age of Child

Age Ranges	Frequency	Percent
2 to 4 years	14	14%
4.1 to 7 years	45	45%
7.1 to 10 years	41	41%
Total	100	100%

Table 2: Hearing Age of Child

Hearing Age Ranges	Frequency	Percent
1 Year	19	19%
2 Years	39	39%
3 Years	26	26%
4 Years	16	16%
Total	100	100%
Device Ear	Frequency	Percent
Unilateral	64	64%
Bilateral	36	36%
Total	100	100%

Table 3: Device using Ear

Device Ear	Frequency	Percent
Unilateral	64	64%
Bilateral	36	36%
Total	100	100%

Table 4: Family and Friends Treat Child as Normal Child

Family and friends treat Child as normal Child.		Child is using Device	Total
	Cochlear implant	Hearing Aid	
Strongly Disagree	0	1	1
Disagree	8	9	17
Neural	13	11	24
Agree	27	27	54
Strongly Agree	2	2	4
Total	50	50	100

Table 5: Communication Skills are Improving Tremendously

Communication skills are improving tremendously.		Child is using Device	Total
	Cochlear implant	Hearing Aid	
Disagree	1	1	2
Neural	8	7	15

Agree	36	28	64
Strongly Agree	5	14	19
Total	50	50	100

Table 6: Hearing Peers Enable Children to Make Friends Easily

Hearing peers enable Children to make Friends easily.		Child is using Device	Total
	Cochlear implant	Hearing Aid	
Disagree	7	3	10
Neural	8	8	16
Agree	23	25	48
Strongly Agree	12	14	26
Total	50	50	100

Table 7: Device will be Able Children to Function Like a Normal Child

Device will be able Children to function like a normal child.		Child is using Device	Total
	Cochlear implant	Hearing Aid	
Disagree	1	8	9
Neural	14	14	28
Agree	33	28	61
Strongly Agree	2	0	2
Total	50	50	100