

Assessing the quality of life in children and adolescents after cochlear implants compared to controls with normal hearing pattern

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ABSTRACT

Background: Emotional and social challenges are higher in children with hearing loss especially during their transition from childhood to adolescence phase. Before the cochlear implant placement became a routine and widely accepted management modality for treating hearing loss in children, the children felt more psychosocial issues.

Aims: The present trial was conducted to assess if children with cochlear implants secondary to hearing loss have similar psychosocial challenges as their peers having normal hearing patterns by assessing the responses given by children or their parents concerning the child's health-related quality of life.

Materials and Methods: 62 subjects were divided into two categories of 8-11 years old and 12-16 years (n=31). Independent assessment of children and their parents was done. The comparison was done of children's responses with their parent's responses, and with responses of the control children with the normal hearing pattern. The quality of life was evaluated using the KINDL^R survey designed especially for children. The collected data were subjected to statistical evaluation and the results were formulated.

Results: In 8-11 years old compared to their peers with the normal hearing pattern, cochlear implants had a less positive quality of life concerning their family and physical well-being with $p < 0.0001$. In 12-16 years when compared to their peers with the normal hearing pattern, cochlear implants had a less positive quality of life concerning their friends, school, and self-esteem with respective p -values of 0.01, 0.04, and 0.07.

Conclusion: Children with cochlear implants report their quality of life as similar to the subjects with the normal hearing pattern. In comparison, responses by parents were reliable and comparable to the children. The quality of life was better in young children compared to the older children group.

Keywords:

Children Hearing Loss, Cochlear Implants, Deafness, Hearing Loss, Quality Of Life

INTRODUCTION

Emotional and social challenges are higher in children with hearing loss especially during their transition from childhood to adolescence phase. Before the cochlear implant placement became a routine and widely accepted management modality for treating hearing loss in children, the children felt more social, emotional, and family-related pressures along with low self-esteem as described previously in the literature.¹ The data reports that deaf children tend to be more impulsive have higher emotional problems than their normal counterparts, difficulty in making friends, feel less accepted socially, and adjustment issues in peers. These problems were largely reduced with the usage of multichannel cochlear implants, allowing better language, speech, social adjustment, and psychological benefits among implant users.² Previous literature work largely focused on proxies such as parents to record the responses of deaf children concerning their quality of life-based on mental, physical, and social domain. However, including parents as responders might be appropriate owing to their insight and interest in child development; parents do not directly report the insight of the children with deafness.³ Hence, the responses should be directly involved in assessing the quality of life. It was also seen that using cochlear implants improved quality of life (QoL) in children where QoL was higher with more length implant and lesser in subjects with higher age of implant placement as reported by both children and their parents.⁴

Although extensive research has been done on hearing impairment in children with large improvements in the areas of technological, medical, linguistic, and pedagogy related aspect with advancement in knowledge concerning hearing loss and hearing aids especially cochlear implants. Relatively scarce data in the literature focus on emotional, social, and physical aspects concerning quality of life in children with cochlear implants from the children's perspective and frequency of using these implants.⁵ Hence, the present trial was conducted to assess if children with cochlear implants secondary to hearing loss have similar psychosocial challenges as their peers having normal hearing patterns by assessing the responses given by children or their parents concerning the child's health-related quality of life.

MATERIALS AND METHODS

The present cross-sectional trial was carried out to compare and assess the quality of life in deaf children with cochlear implants and their peers with normal hearing patterns. The study included a total of 62 subjects included after obtaining clearance from the concerned Ethical committee. The subjects were recruited from the patients visiting the Outpatient Department, Department of Otolaryngology, Institute of Medical Sciences, Banaras Hindu University, Varanasi from June 2016 to May 2017 and had cochlear implants placed in them, after obtaining the informed consent.

The inclusion criteria for the study were subjects having severe hearing loss and were treated with at least one cochlear implant for the same and the subjects willing to participate in the study. The exclusion criteria were the subjects not willing to participate and not able to respond to the questionnaire. The questionnaire was given both in Hindi and English to all the participants. The children and their parents were divided into two categories based on their age. The two categories were 8-11 years old and 12-16 years old each having 31 subjects. Independent assessment of children and their parents was done. The comparison was done of children's responses with their parent's responses, and with responses of the control children with the normal hearing pattern.

The quality of life was evaluated using the KINDL^R survey designed especially for children. The survey assesses psychological well-being, functioning in school, physical well-being, friends, self-esteem, and family. The survey uses a scale of 0-100 where 0 represents the minimum score and 100 the maximum score. KINDL^R uses five-point scales with responses

as never, seldom, sometimes, often, and all the time. All the study participants completed and responded to the questionnaire independently.

The collected data were subjected to the statistical evaluation using SPSS software version 21.0, 2012, Armonk, NY, ANOVA, and t-test. The results were formulated keeping the level of significance at $p < 0.05$.

RESULTS

The present trial was conducted to assess if children with cochlear implants secondary to hearing loss have similar psychosocial challenges as their peers having normal hearing patterns by assessing the responses given by children or their parents concerning the child's health-related quality of life. The study included 62 subjects divided into two groups having 31 subjects each. The demographic characteristics of the study subjects are listed in Table 1.

Table 1: Demographic characteristics of the study subjects

Characteristics	Variable	Group I: 8-11 years		Group II: 12-16 years	
		%	N	%	N
Mean age (years)		9.7		14.1	
Gender	Females	54.83	17	67.74	21
	Males	45.16	14	32.25	10
Deafness Etiology	Cytomegalovirus (CMV)	3.22	1	3.22	1
	Ototoxicity	9.67	3	0	0
	Connexin 26	3.22	1	0	0
	Waardenburg	6.45	2	0	0
	Enlarged Vestibular aqueduct	6.45	2	6.45	2
	Meningitis	9.67	3	12.90	4
	Other causes	6.45	2	16.12	5
	Unknown	54.83	17	61.29	19
Mode of Communication	Cued Speech	3.22	1	0	0
	Oral	87.09	27	70.96	22
	Total Communication	9.67	3	29.03	9

It was seen that mean age for 8-11 years and 12-16 years subjects was 9.7 years and 14.1 years respectively. Group I had 54.83% (n=17) females and Group II had 67.74% (n=21) females. In Group I deafness etiology was attributed to CMV, ototoxicity, Connexin 26, Waardenburg, Enlarged Vestibular aqueduct, Meningitis, Other causes and unknown in respectively 3.22% (n=1), 9.67% (n=3), 3.22% (n=1), 6.45% (n=2), 6.45% (n=2), 9.67% (n=3), 6.45% (n=2), and 54.83% (n=17) subjects, whereas, in Group II, it was CMV (3.22%, n=1), Enlarged Vestibular aqueduct (6.45%, n=2), and meningitis (12.90%, n=4). Cued speech, oral communication, and total communication was seen in 3.22% (n=1), 87.09% (n=27), and 9.67% (n=3) subjects in Group I respectively, and in 0%, 70.96% (n=22), and 29.03% (n=9) subjects respectively.

The present study showed that in children with the age group of 8-11 years when compared to their peers with the normal hearing pattern, it was seen that the subjects with cochlear implants had a less positive quality of life concerning their family and physical well-being with $p < 0.0001$. The respective mean values concerning physical well-being and family functioning in the cochlear implant group were 94.79 ± 19.33 and 72.59 ± 15.50 compared to children with normal hearing where mean values were 75.61 ± 13.60 and 89.01 ± 13.01 . Concerning emotional well-being, functioning in school, friends, self-esteem, and total

survey the results were non-significant with respective p-values of 0.945, 0.459, 0.373, 0.013, and 0.538. On comparing children with cochlear implants to the responses of their parents, it was seen that the responses of parents were comparable to the children with cochlear implants concerning all sub-scales and total scales, the p-values for emotional well-being, physical well-being, self-esteem, and family was 0.845, and for functioning in school and friends the respective p-values were 0.212 and 0.241 (Table 2).

Table 2: Comparison of Quality of life in 8-11 years old children to their parents and children with a normal hearing pattern

Parameter	Children with Cochlear Implant (Mean±S.D)	Children with Normal Hearing Pattern (Mean±S.D)	P-value (one-way ANOVA)	Mean difference in children with implants and their parents(Mean±S.D)	P-value (paired t-test)
Physical well-being	94.79±19.33	75.61±13.60	< 0.0001	-0.86±14.75	0.845
Friends	74.79±16.36	78.18±13.27	0.373	5.11±18.09	0.241
Self-esteem	78.43±17.72	66.8±18.42	0.013	1.3±19.97	0.845
Family	72.59±15.50	89.01±13.01	< 0.0001	1.73±16.96	0.845
Total	75.37±9.20	76.77±8.63	0.538	0.25±9.70	

In children with the age group of 12-16 years when compared to their peers with the normal hearing pattern, it was seen that the subjects with cochlear implants had a less positive quality of life concerning their friends, school, and self-esteem with respective p-values of 0.01, 0.04, and 0.07. The respective mean values concerning friends, school, and self-esteem in the cochlear implant group was 68.37±23.01, 55.26±20.46, and 70.17±21.45 compared to children with normal hearing where mean values were 78.27±12.69, 68.38±13.62, and 60.81±19.19. Concerning emotional well-being, physical well-being, family, and total survey the results were non-significant with respective p-values of 0.376, 0.651, 0.788, and 0.349 (Table 3). On comparing children with cochlear implants to the responses of their parents, it was seen that the responses of parents were comparable to the children with cochlear implants concerning all sub-scales and total scales, the p-values for emotional well-being, physical well-being, self-esteem, friends, and family was 0.662, and for functioning in school the p-value was 0.002 which was overestimated by parents (Table 3).

Table 3: Comparison of Quality of life in 12-16 years old children to their parents and children with a normal hearing pattern

Parameter	Children with Cochlear Implant (Mean±S.D)	Children with Normal Hearing Pattern (Mean±S.D)	P-value (one-way ANOVA)	Children with implants and their parents (Mean±S.D)	P-value (paired t test)
Emotional well-being	76.23±16.07	79.47±12.32	0.376	2.38±14.45	0.662
Functioning in school	55.26±20.46	68.38±13.62	0.014*	-12.11±17.89	0.002*
Physical well-being	70.58±23.65	72.88±15.29	0.651	-1.27±18.28	0.662
Friends	68.37±23.01	78.27±12.69	0.040*	4.4±21.80	0.662
Self-esteem	70.17±21.45	60.81±19.19	0.075*	-2.01±18.27	0.662
Family	78.85±12.96	77.8±17.34	0.788	2.74±16.10	0.662
Total	69.74±12.60	72.4±9.40	0.349	-0.93±12.04	

It was also seen that in 8-11 years old children, the subjects with higher reported deafness age had a better quality of life. In the 12-16 years age group, subjects with cochlear implants for longer duration and at a younger age had a more positive quality of life. The overall quality of life was better in 8-11 years old children compared to 12-16 years old children.

DISCUSSION

The results of the study showed that overall quality in children of all ages with cochlear implants was similar to their controls with normal hearing pattern with 8-11-year-old children showing less positive QoL concerning family than normal hearing children. More positive QoL was reported in younger children compared to adolescents. The responses by children and parents were comparable except for school functioning which was overestimated by parents compared by themselves in the 12-16 years age group. These findings show that quality of life is not affected negatively in children with cochlear implants. These results were consistent with the previous studies of Sahli S et al⁶ in 2006 and Percy-Smith L et al⁷ in 2008 and were contrasted to Huber et al⁸ in 2005 where QoL was less positive than the normal hearing group.

In children with the age group of 8-11 years when compared to their peers with the normal hearing pattern, it was seen that the subjects with cochlear implants had a less positive quality of life concerning their family and physical well-being with $p < 0.0001$. This can be attributed to the children's awareness of the cost of the cochlear implant. Concerning emotional well-being, functioning in school, friends, self-esteem, and total survey the results were non-significant with respective p-values of 0.945, 0.459, 0.373, 0.013, and 0.538. On comparing children with cochlear implants to the responses of their parents, it was seen that the responses of parents were comparable to the children with cochlear implants concerning all sub-scales and total scales. The overall quality of life was better in 8-11 years old children compared to 12-16 years old children. This could be due to more pressure on adolescents compared to young age children. This was in contrast to Huber et al⁸ in 2005 which can be owing to different study parameters, chronologically older subjects, and sample size. These findings correlated to the studies of Schorr E et al⁹ in 2009 and Nicholas JG et al¹⁰ in 2003 where similar results were reported by the authors.

In 12-16 years children, when compared to their peers with the normal hearing pattern, it was seen that the subjects with cochlear implants had the less positive quality of life concerning their friends, school, and self-esteem with respective p-values of 0.01, 0.04, and 0.07. Concerning emotional well-being, physical well-being, family, and total survey the results were non-significant with respective p-values of 0.376, 0.651, 0.788, and 0.349. On comparing children with cochlear implants to the responses of their parents, it was seen that the responses of parents were comparable to the children with cochlear implants concerning all sub-scales and total scales, the p-values for emotional well-being, physical well-being, self-esteem, friends, and family was 0.662, and for functioning in school the p-value was 0.002 which was overestimated by parents. These findings were also contradictory to 13-16 years children studied by Huber et al⁸ in 2005. The difference in school functioning opinion by parents and children can be attributed to the difference in school environment exposure to parents and adolescents as also suggested by Boyd RC et al¹¹ in 2000 and Geers AE et al¹² in 2009 with similar findings.

CONCLUSION

Children with cochlear implants report their quality of life as similar to the subjects with the normal hearing pattern. In comparison, responses by parents were reliable and comparable to the children. The quality of life was better in young children compared to the older children

group. Hence, cochlear implants can have a positive psychosocial effect on children with severe deafness and hearing inability. However, the study had few limitations including smaller sample size, cross-sectional nature, and geographical area biases. Hence, further longitudinal studies with a larger sample size and monitoring period will help reach a definitive conclusion.

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