

Comparison of health-related quality of life in children with normal hearing and those with cochlear implant at age of 4-6 years

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ABSTRACT

Background: Hearing impairment during early life years have profound negative consequences on linguistic output, educational, psychosocial and physical functioning. Auditory perception plays a key role in the development of child. Severely hearing-impaired children receiving cochlear implant (CI) before the age of speech and language acquisition may enjoy their quality of life similar to their normally hearing peers. Considering the beneficial effects of CI on quality of life of hearing-impaired child, it is evident to properly investigate the similarity in life quality of children with CI and their normal hearing mates of same age group.

Patients and Method: This comparative cross-sectional study was conducted on parents of 50 children, who were allocated in two equal groups by purposive sampling. The questionnaire was administered by interviewing the parent participants using a validated quality of life questionnaire of Children for Parents and findings were compared with the responses from parents of normal hearing children. Responses from both the groups were analyzed by independent sample t-test.

Results: Parents of Cochlear Implanted children rated their children's Health Related Quality of Life positively. All the sub domains showed the similar results except self-esteem. Findings suggest that normally hearing children had better self-esteem than CI children. No significant difference was found between overall Health Related Quality of Life of Cochlear Implanted children and their normally hearing peers.

Conclusion: Overall health related quality of life of children with cochlear implant is similar to that of normal hearing peers of same chronological age.

Keywords:

Normal hearing; Hearing loss; Quality of Life; Cochlear Implant

INTRODUCTION

Hearing plays a key role generally for safety, awareness and particularly for the development of speech, language and communication skills which is important for day to day conversations. Hearing impairment during infancy and early life years may have primary and secondary consequences. Primarily, decreased hearing acuity effects speech and language development because child is unable to receive or partially receive hearing stimulus, thus the linguistic output will be deteriorated. Secondary consequences include effected general, social, psychological and physical functioning and hence resulted in overall disrupted Quality of Life (QoL).¹

Hearing impairment can be classified as conductive, mixed, sensorineural and central type.² Hearing loss (HL) can also be classified in degrees depending on its severity, it may be slight to profound. From 16dB to 25dB it is considered as slight HL, 26dB -40 dB mild, 41dB to 55dB moderate, 56 dB -70 dB moderately severe, 71 dB -90 dB severe and 91dB to onwards it is termed as profound HL.³ For mild to moderately severe deficit, hearing aids can provide an effective management. But when HL reach at severe to profound level, the hearing aids become ineffective, these patients are poor candidates of hearing aids because via hearing aids they get only limited benefit in terms of sound awareness and are unable to perceive and comprehend speech sounds.⁴ Thus, Cochlear Implant (CI) is a treatment of choice for patients having severe to profound sensorineural HL.⁵

CI reaps a large number of benefits by providing opportunity to the congenitally deaf children who have spare VIII cranial nerve (vestibulocochlear nerve) and those who have severe to profound hearing

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impairment.⁶ These candidates can develop communication skills similar to hearing mates of same age specially when HL detected and treated in early life years i.e. before 2 years of age.⁷

The most widely confirmed treatment of choice for profound HL in infants is CI. Restoration of hearing ability before the age of speech and language acquisition, with the help of CIs significantly improve the communication skills but the results may vary based on certain factors i.e. chronological age at implantation, duration of HL, general developmental potential, environment for socialization and support to the child from the family and relatives.^{8,9} CI not only influences communication skills but also psychological and social well-being and hence improves QoL.⁸

QoL as the position of the hearing impaired child based on parental perception about life, related to the culture and value system of the society of child, including all domains of QoL i.e. physical, educational, functional social and emotional.¹⁰ Study of QoL in general can be estimated to be 'child centered' in terms of child's happiness, capacity to form friendships and independence of functions and 'family centered' i.e. parents' level of anxiety and disruption of family due to hearing impairment of their child.¹¹

Evaluating the Health Related Quality of Life (HRQoL) of hearing impaired candidates is a useful way to make evident all the positive outcomes obtained by CI including psychosocial and academic benefits furthermore the professional impact of CI on communication performance of CI bearers.¹² CI surgery was started in August 2000 in Pakistan but unfortunately no research on QoL of CI children has been done so far.¹³ This study is aimed to compare the performances and improvements in QoL of implanted children versus their normally hearing peers by interviewing the parents of the children of both groups to initiate an effort to fill the gap in the literature.

PATIENTS AND METHODS

This comparative cross-sectional study was conducted from 28th December 2018 till 28th September 2019 in the Audiology Centre and the Research Institute Lahore for recruiting the parents of implanted children, whereas data for children with Normal Hearing has been collected from Askari Public School Lahore Cantt.

Parent participants of 50 children based on their **child's profile**, either mother or father, where necessary both parents were included in the study to take their perceptions about health-related quality of life of their children with cochlear implant and those with normal

hearing by formally questioning the parents of both groups. Ethical approval was taken from ethical committee. A detailed consent was taken from all of the parent participants before including them in the study.

Parents of those cochlear implanted children were included in the group A **whom children's** ages were 4-6 years, their children had documented severe to profound sensorineural hearing loss, received their unilateral cochlear implants before three years of age, so that those children must have at least three years of experience with the implant and who did not have any additional disability except hearing impairment.

Group B consisted of Parents of children with normal hearing. They participated in this study by completing the questionnaire in annual parents-teachers meeting. Researcher personally went there to get the questionnaire filled. Normal hearing sensitivity of their children was reported by the parents themselves. The ages of the children of group B parents were also between 4-6 years.

Data was collected from parents using an **internationally validated Kiddy KINDL parents'** (Revised version) questionnaire. Kiddy KINDL^R questionnaire was consisted of 24 statements divided into six health related quality of life domains i.e. physical well-being, emotional well-being, self-esteem, family, friends and school performance and some important questions comprises of 22 statements.

Participants responded on 5-point Likert scale as never, seldom, sometimes, often and all the times. All the participants completed the questionnaire with 100% response rate. The scale was translated into Urdu so that target population can easily understand the questionnaire. For this purpose, permission from the KINDL organization was taken and the questionnaire **was translated into Urdu by following MAPI's** guidelines to check reliability and validity of the translated version of the questionnaire.

For measuring the HRQoL from both the groups of parents, the data was collected on questionnaire proformas and was analyzed using SPSS version 20 with relevant statistical tests. Frequency and percentages were calculated for quantitative data analysis, Independent sample t test was used to compare the outcomes between the two groups.

RESULTS

A total of 50 parent participants were enrolled in the study, divided into two groups, 25 in group A consisted of parents of congenitally hearing-impaired children who had Cochlear Implant (CI) in early life and 25 in

Table 1. Independent sample t test for total health-related quality of life

Total HRQoL	Mean \pm SD	t	p-value
Children with normal hearing	92.28 \pm 10.8	0.424	0.674
Children with cochlear implant	91.1 \pm 7.55		

Table 2. Independent sample t-test for health-related quality of life sub domains of Kiddy KIndl^R Parents' questionnaire

Total health related quality of life	Mean \pm SD	t	p-value
Physical well being	0.28 \pm 0.495	.565	0.575
Emotional well being	1.32 \pm 0.70	1.875	0.067
Self esteem	1.84 \pm 0.69	2.662	0.011
Family	0.40 \pm 0.45	.887	0.380
Social contacts	-0.44 \pm 0.69	-.631	0.531
School	0.56 \pm 0.645	.868	0.390
Important questions	-0.2 \pm 1.49	-.134	0.894

group B, parents of children who had normal hearing. The Minimum age of implantation of child was 1.2 years and maximum age was 3 years whereas mean age of implant was 2.1 years with the standard deviation of 0.57635. There were total 50 number of candidates included in the study comprising of 29 male (58%) and 21 females (42%).

According to the responses from the parents of both group of children the Mean health related quality of life (HRQoL) of children who had normal hearing and children having cochlear implants with standard deviations in the brackets were 92.20 (10.84) and 91.16 (7.55) respectively as shown in Table 1.

As appeared in the table 2 for measuring HRQoL of both the normal hearing and cochlear implant group at different sub domains independent sample t test was used. No significant difference was found between both the groups at physical well-being ($p > 0.05$), emotional well-being ($p > 0.05$), family ($p > 0.05$), social contacts ($p > 0.05$), school sub domains. Significant difference was found only at Self-esteem sub domain ($p < 0.05$).

As per the answers by the parents on total HRQoL of both the Normally Hearing (NH) and Cochlear Implanted groups on all sub domains showed no significant difference except self-esteem ($p < 0.05$) ($M = 1.84000$, $SD = .69109$). Parents of CI users perceived that their children have less self-esteem while the Parents of NH children responded better.

Table 3 also summarizes the findings for all sub domains of quality of life of children of both parents depicting approximately equal quality of life regarding physical and emotional wellbeing, family, school and social contacts of their children excluding self-esteem that is less in cochlear implanted children.

DISCUSSION

This study is based on effectiveness of cochlear implant (CI) in terms of Improvement of Quality of life (QoL)

of profoundly deaf children at least three years post implantation. A comprehensive, sensitive, reliable and internationally validated QoL generic Kiddy-KINDL^R (3-6 years) questionnaire was used for this purpose. The study population of this thorough investigation was too young to answer a questionnaire therefore based on observation, views and experiences of parents this typical health-related Quality of life (HRQoL) questionnaire was chosen.¹⁴ Parents positively rated overall HRQoL of their children who received CI in early life years i.e. before 3 years of age, because of their extreme involvement in health care of their children. CI children included in this study had three years of device experience and implanted at the age of (1-3 years). At the time of data collection, they reached to the age ranges between 4 and 6 years. Results suggested that children with CI enjoy health related QoL similar to that of normal hearing (NH) mates of same age because we found no significant difference between HRQoL of both groups of same chronological age except the domain of self-esteem where p value was less than 0.05.

In agreement with many international researchers this study finds out that Parents responded HRQoL of their CI children positively on school performance and physical and emotional well-being but self-esteem were less positively rated.¹⁵ Total QoL score were similar to that of NH group. On statistical analysis there was no significant difference were found in overall health related QoL of Children with CI or CI group ($M = 82.8$, $SD = 9.7$) and children with NH or NH group ($M = 80.8$, $SD = 10.3$) whereas ($t = 0.81$, $p = 0.42$).

Results shown from another study are in accordance with the findings of this study stating the mean age of Cochlear Implantation was 2.4 ± 2.25 years and mean duration of implant usage was 3.7 ± 1.4 years.¹⁶ QoL was measured on eight sub domains, out of which 5 were consistent with our measurements (social outcomes, general functioning, well-being, self-esteem and school performance). 75% of the parents reported that confidence of their children has been boosted up, 67.9% rated increased confidence than ever before, 96.5% responded that their children remained happy and 50% of the children were able to make new friends and got to interact with others easily after Cochlear Implantation as their normal age mates.

Results from another supporting study are consistent with our study on several domains of QoL in which 83.9% parents rated better general feelings of their children, 84.5% parents revealed that their children were able to do his/her work independently as his/her mates and 85.8% marked improved self-

Table 3. Health-related quality of life for both groups on all sub domains

Sub domains	Normal hearing [Mean \pm SD]	Cochlear Implant [Mean \pm SD]
Physical wellbeing	5.44 \pm 2.0	5.16 \pm 1.4
Emotional wellbeing	5.6 \pm 2.3	6 \pm 2.6
Self esteem	12.2 \pm 2.4	10.4 \pm 2.4
Family	8.4 \pm 1.5	8.08 \pm 1.6
Social contacts	9.8 \pm 2.5	10.32 \pm 2.3
School	9.3 \pm 2.6	8.76 \pm 1.7
Important questions	42.2 \pm 5.5	42.44 \pm 5.01

confidence of their children.¹⁷ According to 90.01% parents, their children were fully able to indulge in conversations and they were more talkative than before, 85.7% parents thought that their children have become more socialized. Overall QoL of children was improved after Cochlear Implantation comparable to their NH fellows.¹⁸

T. Razafimahefa-Raelina and coauthors reported in their research on 32 children with pre lingual HL, implanted at the mean age of 22 months, similar as the mean age of implantation (M=2.1years) of our sample population. The results of responses from 32 parents on all key domains of QoL at Kidscreen-27 questionnaire were differed from results from parents of NH peers, showing contradictory findings to our research.¹⁹

Rachel and coauthors conducted a research in 2013 on three groups. (a) Children with CI/CI group (b) Children with NH/NH1 group (c) Children with NH and higher financial status/NH2 group. In contrast to the findings of our research study, there were highly significant differences were found between CI-NH1 and CI-NH2 groups on the basis of parents' observations. Parents of CI children rated overall health related QoL of their children lower than NH1 group and higher than NH2 groups on various HRQoL sub domains.²⁰

Various explanations may account for this contrast in results. One reason is that parents of CI children may underestimated their children' QoL because the results of second hypothesis of both these studies suggested that children self-reported QoL was much better on all domains than their parents' perspectives. Moreover, NH1 group in study of Rachael and colleagues possess high financial status, better living environments and higher qualification of parents than parents of CI children, thus health related QoL scores of this group were higher from both other groups (NH2 and CI).²¹ Thus, it can be concluded that profoundly deaf children if implanted before the age of speech and language acquisition can enjoy QoL as NH mates of same chronological age.

This study had some limitations as well. This study provided parental perspectives about their CI children's health related QoL via a general QoL measuring questionnaire. Further studies may incorporate a CI specific QoL questionnaire consisting of open-ended questions from parents and their children as well to obtain more in-depth information regarding QoL of children with CIs.

CONCLUSION

This study revealed that there is no significant difference in the health-related quality of life of investigated groups, the cochlear implanted children and normal hearing children of same chronological age, as it is evident from the parental perception of both groups. It is concluded that profoundly hearing-impaired children, if implanted before the age of speech and language acquisition they can enjoy their life as their normal hearing peers.

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