



Original article

Quality of life and associated factors among children with cochlear implants in Vietnam: Results from parents' perception

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ABSTRACT

Objective: This study was to assess the quality of life (QoL) of Vietnamese children with cochlear implants (CI) according to the perception of their parents, and to determine associated factors on the perceived QoL.

Methods: A cross-sectional study were conducted among 68 children (20 children aged 3–6 years, and 48 children aged 7–10 years) who had cochlear implantation at the Vietnam National Children's Hospital, Hanoi, from June 2020 to November 2021. Kiddy-KINDL^R and KINDL^R questionnaires were used to gather information on QoL of their children. Scores were transformed to a 100-point scale with 100 representing the most positive response.

Results: Parents of the 7–10 year group rated generic QoL more positively than the 3–6 year group, overall average scores were 72.1, and 69.6, respectively. Parents of 7–10 years also rated QoL of their children slightly below average than that of the standard hearing population in both girls, and boys. A significant inverse correlation was detected between the overall QoL and age at first cochlear implant ($r = -0.284$, $p = 0.019$), and duration of cochlear implant experience was positively correlated with overall mean QoL score ($r = 0.268$, $p = 0.027$). Higher level of father's education level showed better QoL among their children ($p = 0.015$).

Conclusion: The QoL of Vietnamese children with CI were slight lower than average compared with normal hearing children. Age at cochlear implant, cochlear implant use duration, and education level of father were influencing factors of the QoL of children with CI in Vietnam.

1. Introduction

World Health Organization estimated that disabling hearing loss affects around 466 million people worldwide in 2018, considering hearing loss as the most frequent sensory impairment. It is also predicted that the number of people with disabling hearing loss will rise in the upcoming years.¹ In Vietnam, no universal newborn hearing screening program is available, therefore, data on hearing loss in newborns and children is limited in the country.² Several studies showed that prevalence of hearing among pre-school children were from 4.4%³ to 4.7%.⁴ Early intervention programs, and greater access to hearing technology in Vietnam are highly recommended to reduce the prevalence and adverse long-term effect of hearing impairment among children.^{2,5}

Previous studies, across different countries, have indicated that deaf children have significantly poorer reading comprehension, literacy skills, and overall depressed academic achievement in general when

compared to their hearing peers.⁶ In addition, studies suggested that specialized mental health services for deaf and hard of hearing children and adolescents should be installed in educational settings and could contribute to early identification and therapy of those at risk of mental disorders.⁷

In recent years, cochlear implants (CI) has become an increasingly common aid for children born with sensorineural deafness in the western world. A cochlear implant is a hearing device that, through a surgically inserted electrode array in the cochlea, provides the acoustic nerve with electronic stimulation that is perceived as sound by the auditory cortex.⁸ CIs has enabled many children, and adults, to take part in mainstream society and education to a greater extent than what was previously possible for deaf individuals, by providing them the ability to hear and acquire spoken language.⁹

Health-related QoL, which we refer to as QoL, encompasses the physical and psychosocial aspects of an individual's perception of their

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position in life.¹⁰ QoL is an important outcome measure that is widely used for clinical and research purposes to assess the impact of acute and chronic diseases, to compare affected individuals with healthy individuals, and to measure progress after treatment. It is known that QoL of children with hearing loss increases after receiving auditory rehabilitation alongside their hearing device such as a hearing aid or cochlear implant.^{11,12} However, there appears to be a lack of consistency within the literature regarding the comparison of QoL of children with and without hearing loss. In terms of associated factors, previous studies showed the factors influencing the QoL of the implanted children, including older age at the evaluation, mothers' level of schooling, and the family receptiveness.¹³ Additionally, research also reported that birth order, gender, and distance from the cochlear implant center had effect on the QoL dimensions.¹⁴

QoL can be measured using generic and condition specific instruments.¹⁵ The strength of generic instruments lies in their ability to enable comparisons among children with different medical conditions, as well as make comparisons with healthy populations.^{16,17} However, they lack precision and sensitivity, particularly when the assessor wants to target outcomes for a specific health condition.¹⁸ In contrast, condition-specific (or disease-specific) QoL instruments are designed for application with a particular medical condition or sensory impairment.

In Vietnam, CI has been performed for more than ten years. However, due to required complicated technical and facilities, this surgical has just been some national hospitals in Hanoi, Hue, and Ho Chi Minh City. In Hanoi, the National Children's Hospital is the main hospital to perform CI for children in the North of Vietnam. The purpose of this study was to assess the QoL of children were cochlear implanted according to the perception of their parents, and to determine associated factors on the perceived QoL.

2. Methods

2.1. Study design

This cross-sectional study was performed between July 2020 to November 2021.

2.2. Participants

Parents of sixty-eight children using cochlear implants between 3 and 10 years of age who had cochlear implant in the Vietnam National Hospital's Children, Hanoi, Vietnam from June 2012 to July 2019 were invited in the study.

2.3. Materials

2.3.1. Demographic questionnaire

This form collected socio-economic and demographic information to enable assessment of potential relationships between participant variables and QoL outcomes. This structured questionnaire contains socio-demographic variables (age, sex), educational variables (school system and school environment) of the children, auditory history variables (age of identification of hearing loss, age at activation of the cochlear implant, duration of cochlear implant experience, and chronologic age at time of testing), general information of parents of the children (education levels, occupations).

2.3.2. KINDL^R questionnaires

To measure the QoL among the children with CI, this study used the Kiddy-KINDL^R for 3-6-year-old children, and KINDL^R for 7-17 year-old children interview version for parents. The KINDL^R is an established generic health-related QoL measure designed for children between the ages of 3 and 17 years. The generic QoL instrument, Kiddy-KINDL^R, and KINDL^R, previously have been validated and translated into Vietnamese. They are available for free download [<http://www.kindl.org/>].

The questionnaires were tested and culturally adapted before using in this current study.

The Kiddy-KINDL^R and the KINDL^R contain 24 items in six multi-dimensional subscales: emotional well-being, family, friends, physical well-being, school, and social well-being. These six subscales sum to an overall index score. Each score is transformed to a 100-point scale, with 0 denoting minimal QoL and 100 denoting maximal QoL. In addition to the 24 items, the parents' version of Kiddy-KINDL^R plus 22 items designed to supplement the limited information provided by the child self-report questionnaire.¹⁹ In this study, only 24 items in six dimensions were analyzed.

Parents response categories included five points on a Likert scale: never, seldom, sometimes, often, and all of the time. We interviewed parents to response the questionnaire independently of the child to ensure the answers reflected the parent's assessment of the child's well-being.

2.4. Procedure

The parents of children who were cochlear implanted in the Vietnam National Children's Hospital were contacted and invited into study via telephone by investigator. In total, sixty-eight parents of children (20 children aged 3–6 years, 48 children aged 7–10 years) with CI agreed to participate phone interview. On average, the interview took less than 20 min to complete the questionnaires. Participants were free to ask for clarification for any of the questions, and were also informed that there was no right or wrong answer their honest opinion was all that was required. All completed questionnaires were verified by the investigator to ensure that the data was accurate, legible, and completed before the participants left.

2.5. Ethic

The research received approval of the Institutional Ethic Board of the Vietnam National Children's Hospital with approval number 514/BVNTW-VNCSKTE dated April 17, 2020. All participants were informed about the purpose of the study and verbal consent were obtained before interviewing. The study ensured that the participant's data will be confidential, private, and only used for research purposes.

2.6. Statistical analysis

For data analysis, we followed instructions of the KINDL questionnaire for measuring health-related quality of life in children and adolescents manual.¹⁹ Collected data of each dimension were transformed from the two KINDL^R questionnaires into 100. All aspects and the overall scores of QoL were subjected to statistical analysis. Sub-scale QoL scores among 7–10 years was compared to the reference values for corresponding age-groups and sexes.¹⁹

Non-parameter test were applied to compare the differences between the two groups. Spearman correlations were computed to investigate associations between the children's transformed scores for each dimension, and overall QoL and auditory history variables such as age of identification of hearing loss, age at cochlear implant, duration of cochlear implant experience, and chronologic age at time of testing. The significance level was set at 0.05, and SPSS 26.0 software was used for statistical analyses.

3. Results

Table 1 shows the general information of children with CI and their parents accordingly. Sixty-eight children with their parents participated in the study. The participants were divided into two groups 3–6 years (20 children), and 7–10 years (48 children). The average age of the participants were 8.2 years. They were diagnosed for hearing loss at 15 months. Age at first cochlear implant among the children is 2.9 years.

Table 1
General information of the participants.

| Characteristics | Both | 3–6 year group (n = 20) | 7–10 year group (n = 48) |
|--------------------------------------------------|------------|-------------------------|--------------------------|
| Current age (years): mean (SD) | 8.2 (2.2) | 5.08 (0.96) | 9.59 (0.62) |
| Gender: Boy n (%) | 45 (66.2) | 13 (65.0) | 32 (66.7) |
| Birth order in the family | | | |
| First-born | 31 (45.6) | 8 (40.0) | 23 (47.9) |
| Middle-born | 37 (54.4) | 7 (35.0) | 22 (45.8) |
| Last-born | 8 (11.8) | 5 (25.0) | 3 (6.3) |
| Age at diagnosis (in months): mean.(SD) | 15.4 (8.7) | 14.85 (8.65) | 15.69 (8.76) |
| Degree of hearing loss | | | |
| Severe | 4 (5.9) | 0 | 4 (8.3) |
| Deaf | 64 (94.1) | 20 (100) | 44 (91.7) |
| Bilateral/unilateral implantation | | | |
| Unilateral | 67 (98.5) | 20 (100) | 47 (97.9) |
| Bilateral | 1 (1.5) | 0 | 1 (2.1) |
| Age at first cochlear implant (years): mean (SD) | 2.9 (1.2) | 2.6 (0.5) | 3.1 (1.4) |
| Cochlear implant use duration (years): mean (SD) | 5.2 (2.3) | 2.4 (0.8) | 6.4 (1.6) |
| Cochlear implant use duration (year) | | | |
| ≤4 years | 22 (32.4) | 18 (90.0) | 4 (8.3) |
| >4 years | 46 (67.6) | 2 (10.0) | 44 (91.7) |
| Current school environment | | | |
| Mainstream public | 65 (95.6) | 20 (100) | 45 (93.8) |
| Mainstream private | 1 (1.5) | 0 | 1 (2.1) |
| Special needs | 2 (2.9) | 0 | 2 (4.2) |
| Level of education of father | | | |
| Less high school | 12 (17.6) | 2 (10) | 10 (20.8) |
| High school | 15 (22.1) | 7 (35.0) | 8 (16.7) |
| College/University | 39 (57.4) | 10 (50) | 29 (60.4) |
| Post-graduate | 2 (2.9) | 1 (5.0) | 1 (2.1) |
| Level of education of mother | | | |
| Less high school | 14 (20.6) | 3 (15.0) | 11 (22.9) |
| High school | 16 (23.5) | 8 (40.0) | 8 (16.7) |
| College/University | 38 (55.9) | 9 (45.0) | 29 (60.4) |
| Occupation of father | | | |
| Farmer | 14 (20.6) | 5 (25.0) | 9 (18.8) |
| Worker | 8 (11.8) | 2 (10.0) | 6 (12.5) |
| Public staff/clerk/teacher | 23 (33.8) | 2 (10.0) | 21 (43.8) |
| Businessmen | 21 (30.9) | 10 (50.0) | 11 (22.9) |
| Others | 2 (2.9) | 1 (5.0) | 1 (2.1) |
| Occupation of mother | | | |
| Farmer | 14 (20.6) | 5 (25.0) | 9 (18.8) |
| Worker | 6 (8.8) | 1 (5.0) | 5 (10.4) |
| Public staff/clerk/teacher | 27 (39.7) | 5 (25.0) | 22 (45.8) |
| Businesswomen | 15 (22.1) | 7 (35.0) | 8 (16.7) |
| Others | 6 (8.8) | 2 (10.0) | 4 (8.3) |

Majority of the children have used CI for more than 4 years. More than 95% of the implanted children study in public mainstream.

The QoL of each dimension and total is reported in Table 2. For both group, the QoL ranges from 60.1 in school to 74.5 in physical well-being. The QoL of 3–6 year group is less than their counterpart in the 7–10 year

Table 2
Quality of life with KINDL QoL subscales and total scores among children with CI.

| Dimensions | Both Mean (SD) | 3–6 year group Mean (SD) | 7–10 year group Mean (SD) | p ^a |
|---------------------------------|----------------|--------------------------|---------------------------|----------------|
| Physical well-being | 74.5 (3.7) | 73.4 (5.6) | 75.0 (2.5) | 0.315 |
| Emotional well-being | 74.0 (3.7) | 72.1 (5.1) | 74.8 (2.7) | 0.018 |
| Self-Esteem | 67.6 (9.2) | 62.5 (10.7) | 69.7 (7.6) | 0.007 |
| Family | 76.0 (5.9) | 74.3 (6.9) | 76.6 (5.4) | 0.238 |
| Friends | 76.2 (5.7) | 75.3 (8.2) | 76.6 (4.4) | 0.936 |
| School or Nursery School | 60.1 (11.3) | 60.3 (13.4) | 60.0 (10.5) | 0.785 |
| Total | 71.4 (4.5) | 69.6 (6.4) | 72.1 (3.2) | 0.383 |

^a Mann-Whitney test.

group in all of the dimensions and total as well, however, the differences were only statistically significant in Emotional well-being and Self-Esteem dimensions ($p < 0.05$).

In comparison to the preliminary reference healthy children, the large sample of Hamburg school children, QoL of children aged 7–10 years in the current study are slightly below than their counterpart in both girls and boys in all dimensions except the self-esteem in both girls and boys. Scores for self-esteem in the present study were higher than that in the reference healthy group in both girls (71.6 compared to 66.6), and boys (68.9 compared to 66.5) (Table 3).

Table 4 illustrates the association of the studied factors with KINDL QoL subscales and total scores among children with CI. No statically differences between QoL subscales and total scores, and gender, birth order in the family, level of mother’s education ($p > 0.05$). The father’s education showed to be a significant predictor of School QoL ($p = 0.006$) and overall QoL score ($p = 0.015$). Fathers with higher education levels demonstrated better QoL in school and total scores among their children. We did not find any association between remaining factors (as shown in Table 1) with the QoL scores of the children (data not show).

Spearman correlations were computed to investigate associations between the children’s transformed scores for overall QoL and auditory history variables such as age of identification of hearing loss, age at first cochlear implant, duration of cochlear implant experience, and chronologic age at time of testing (Table 5). A significant inverse correlation was detected between the overall QoL and age at first cochlear implant ($r = -0.284$, $p = 0.019$), suggesting that children were implanted earlier CI have better QoL. In addition, CI use duration (years) was positively correlated with overall mean QoL score ($r = 0.268$, $p = 0.027$). That is, children having longer time of CI have better QoL. No correlation between age of children and age of onset and overall mean QoL scores was found. We only found a significant positive correlation with current age of children and the QoL score in self-esteem ($r = 0.335$, $p = 0.005$).

Table 3
Quality of life with KINDL QoL subscales and total scores (mean, transformed to 100, standard deviation) among children with CI and standard hearing ones by gender population (mean, transformed to 100 and standard deviation).

| Dimensions | 7–10 year group Mean (SD) | Standard hearing Mean (SD) | 7–10 year group Mean (SD) | Standard hearing Mean (SD) |
|-----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|
| | Girls | Girls | Boys | Boys |
| Physical well-being | 75.3 (4.2) | 74.4 (14.1) | 74.8 (1.1) | 76.6 (13.0) |
| Emotional well-being | 74.6 (3.5) | 83.1 (11.3) | 75.0 (2.2) | 82.9 (10.6) |
| Self-Esteem | 71.4 (6.8) | 66.6 (17.8) | 68.9 (8.0) | 66.5 (18.9) |
| Family | 77.5 (4.9) | 84.4 (12.8) | 77.5 (4.9) | 83.5 (13.1) |
| Friends | 77.3 (3.1) | 78.1 (13.7) | 76.3 (4.9) | 78.2 (12.7) |
| School | 57.8 (10.3) | 74.1 (12.2) | 61.3 (10.6) | 72.3 (12.8) |
| Total | 71.9 (3.2) | 76.8 (8.6) | 72.2 (3.3) | 76.6 (8.6) |

Table 4

The association of the studied factors with KINDL QoL subscales and total scores among children with CI.

| Variables | Physical well-being Mean (SD) | p ^a | Emotional well-being Mean (SD) | p ^a | Self-Esteem Mean (SD) | p ^a | Family Mean (SD) | p ^a | Friends Mean (SD) | p ^a | School or Nursery School Mean (SD) | p ^a | Total Mean (SD) | p ^a |
|-------------------------------------|-------------------------------|----------------|--------------------------------|----------------|-----------------------|----------------|------------------|----------------|-------------------|----------------|------------------------------------|----------------|-----------------|----------------|
| Gender | | | | | | | | | | | | | | |
| Boys | 74.7 (1.3) | 0.705 | 74.3 (3.5) | 0.338 | 67.0 (9.0) | 0.393 | 76.8 (5.7) | 0.106 | 75.9 (6.3) | 0.504 | 60.0 (11.6) | 0.969 | 71.4 (4.3) | 0.984 |
| Girls | 74.1 (6.3) | | 73.6 (4.1) | | 68.7 (9.6) | | 74.4 (6.2) | | 76.9 (4.3) | | 60.3 (11.0) | | 71.3 (4.9) | |
| Birth order in the family | | | | | | | | | | | | | | |
| First-born | 75.0 (2.2) | 0.673 | 74.7 (2.5) | 0.335 | 69.1 (7.5) | 0.328 | 77.4 (5.9) | 0.065 | 75.6 (6.1) | 0.412 | 59.2 (12.1) | 0.702 | 71.8 (4.1) | 0.872 |
| Middle-born | 74.7 (2.6) | | 74.1 (3.2) | | 67.4 (9.6) | | 75.2 (5.9) | | 76.5 (5.7) | | 60.1 (10.6) | | 71.3 (4.3) | |
| Last-born | 71.8 (8.8) | | 71.0 (7.4) | | 62.5 (12.5) | | 73.4 (5.5) | | 78.1 (4.7) | | 63.2 (11.7) | | 70.0 (6.8) | |
| Level of education of father | | | | | | | | | | | | | | |
| Less high school | 75.0 (2.6) | 0.965 | 72.9 (6.1) | 0.614 | 68.7 (8.4) | 0.129 | 75.0 (4.6) | 0.055 | 76.0 (3.6) | 0.064 | 54.6 (10.0) | 0.006 | 70.3 (3.2) | 0.015 |
| High school | 73.3 (6.8) | | 73.3 (4.3) | | 62.9 (10.9) | | 72.9 (7.3) | | 72.9 (7.7) | | 53.7 (13.1) | | 68.1 (5.9) | |
| College/University | 74.8 (2.2) | | 74.6 (2.4) | | 68.9 (8.5) | | 77.2 (5.4) | | 77.7 (5.1) | | 64.2 (9.6) | | 72.9 (3.6) | |
| Post-graduate | 75.0 (3.7) | | 75.0 (0) | | 71.8 (4.4) | | 81.2 (0) | | 75.0 (0) | | 59.3 (4.4) | | 72.9 (1.4) | |
| Level of education of mother | | | | | | | | | | | | | | |
| Less high school | 75.0 (2.45) | 0.884 | 73.2 (5.7) | 0.829 | 68.3 (7.9) | 0.207 | 75.8 (4.8) | 0.372 | 74.5 (6.2) | 0.446 | 54.0 (11.9) | 0.067 | 70.1 (3.6) | 0.144 |
| High school | 73.4 (2.2) | | 73.8 (4.0) | | 64.0 (11.0) | | 74.2 (7.1) | | 75.7 (6.4) | | 58.9 (13.4) | | 70.0 (6.1) | |
| College/University | 74.8 (2.2) | | 74.5 (2.6) | | 68.9 (8.6) | | 76.8 (5.7) | | 77.1 (5.2) | | 62.8 (9.4) | | 72.5 (3.8) | |

^a Man-Whitney or Kruskal–Wallis test.

Table 5

The correlation of the studied factors with KINDL QoL subscales and total scores among children with CI.

| Variables | | Physical well-being | Emotional well-being | Self-Esteem | Family | Friends | School or Nursery School | Total |
|------------------------------------------------------|---|---------------------|----------------------|-------------|--------|---------|--------------------------|--------|
| Age (years) | r | 0.003 | 0.187 | 0.335 | 0.095 | 0.066 | −0.043 | 0.126 |
| | p | 0.979 | 0.126 | 0.005 | 0.439 | 0.591 | 0.725 | 0.305 |
| Age of identification of hearing loss (years) | r | −0.005 | 0.043 | −0.128 | −0.010 | −0.067 | −0.173 | −0.140 |
| | p | 0.965 | 0.730 | 0.299 | 0.934 | 0.589 | 0.158 | 0.255 |
| Age at cochlear implant (months) | r | −0.093 | −0.146 | −0.183 | −0.168 | −0.174 | −0.157 | −0.284 |
| | p | 0.450 | 0.234 | 0.134 | 0.171 | 0.156 | 0.201 | 0.019 |
| Cochlear implant use duration (years) | r | 0.078 | 0.229 | 0.424 | 0.197 | 0.137 | 0.021 | 0.268 |
| | p | 0.525 | 0.061 | <0.001 | 0.108 | 0.267 | 0.865 | 0.027 |

r: Spearman correlation.

p: p values.

4. Discussion

To the best of our knowledge, this is the first study assessing the QoL among children aged 3–10 years with CI in Vietnam from the perspective of their parents and examining some possible associated factors. The study found that parents rated QoL scores of children aged 3–6 years less positively than that among the 7–10 year group. In comparison to the standard hearing children,¹⁹ our study found that QoL scores of the 7–10 year group are slightly worse in almost all subscales and overall scores in boys, and girls. In the view of the parents the age at implantation, the length of time with CI have significant correlated with QoL in their children (p < 0.05).

Warner-Czyz et al. (2009)²⁰ showed that parents rated QoL among children with CI aged 4–6 years using the Kiddy KINDL questionnaire as 78.1 (9.6) in overall score, higher than that among the present study. For the 7–10 year group, our study found similar overall QoL score with previous study, 72.1 (SD = 3.2) in the present study compared to 75.4 (SD = 9.2) in study conducted in America²¹ but better QoL in comparison to the study conducted by Huber, M (2005)²² using the same KINDL

questionnaire. It is noted that the QoL scores among 7–10 year group in the current study are only slightly less than the overall scores of the standard hearing boys and girls¹⁹ in almost all of the dimensions, and overall, suggesting that the effectiveness of the CI among children. Previous studies, both original and systematic review assessing the long term results by using CI on children, showed that CI effectively contributed to develop the functional communication abilities, hearing performance, and an appropriate language acquisition, comparable to normal hearing children.^{12,23}

Regarding associated factors of QoL among children with CI, our finding is consistent with the previous studies in which age of CI is significantly correlated with QoL of children.^{14,21,22,24} It has been reported that children who had earlier exposure to sounds (especially those who underwent implantation by 3.5 years of age) have better opportunities for age-appropriate auditory development, normal development of central auditory pathways, resulting in they were more integrated and involved with the surroundings and less likely to feel isolated and left behind.²⁵ In addition, the present study also found that duration of CI use showed positive correlation with QoL of the children.

This is inconsistent with study conducted by Warner-Czyz (2011)²¹ founding that a negative correlation between duration of CI use and QoL among the CI children was reported by children self-reported. Studies demonstrated that there are significant differences in rating QoL between children-self-reported and parental proxy.¹⁴ Therefore, the results may be influenced by different point of views. Previous studies confirmed the effectiveness of CI in improving QoL among children, and the benefits appear to keep stable over the years.²³ Majority of children in the current study have implanted the device for more than 4 years, their parents could be happy with the stabilized device. Although relatively weak associations between the QoL and the several factors found ($r < 0.3$), it is acceptable in research on QoL.²¹

Previous studies found more factors that can influence the perceived QoL among CI, including birth order, gender,²⁶ and level of parent's education.¹³ However, in this study we only found the education level of father is the influencing factor of QoL among their CI children in addition to the age of CI and duration CI use. For birth order, although some might argue that first-born children might get more attention than their siblings, middle-born children were found to have a higher emotional, psychosocial, and total score compared to the first-born children. This might be explained by the fact that older siblings can enrich aspects of younger children's language development through "overheard" conversations.¹⁴ More research need to be conducted in the future to identify associated factors of QoL among children with CI.

The strengths of this study include use of a qualified generic QoL instrument, exploring CI-specific QoL in a large cohort of children aged 3–10 years using CI, and the impact of some social characteristics on the results. The generic QoL instruments, Kiddy-KINDL, and KINDL^R, previously have been validated and translated into Vietnamese. However, this study has some limitations. First, this is a cross sectional study design. Therefore, at this stage no causing variables can be specified and no information can be provided on changes of QoL of deaf children, caused by the medical treatment of cochlear implantation. Second, lack of data for QoL scores of a Vietnamese healthy matched age, sex group for comparison is another limitation of the current study. Although the study compared the obtained QoL scores of the Vietnamese 7–10 year children with the reference values, it may not well reflex the truth as Vietnamese children differ from European children in terms of characteristics and socio-economic status. Further follow-up studies are necessary to be conducted to measure the changes of QoL before and after CI.²⁷ Regardless of the limitation the study has yielded for the first time basic information on the level of health-related QoL of children with CI. This is obviously not only relevant for professionals, but also very important for other parents.

5. Conclusion

From the parents' perspective, QoL of their children with CI were slightly below average in comparison to hearing counterparts. Age at cochlear implant, cochlear implant use duration, and education level of father were influencing factors of the QoL of children with CI.

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Declaration of competing interest

The authors declare that they have no competing interests.

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