PARENTAL PERSPECTIVES ON THE QUALITY OF LIFE OF CHILDREN WITH COCHLEAR IMPLANTS: THE CASE OF NORTH MACEDONIA

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Received: 12.05.2025.
Accepted: 03.11.2025.

Original research article
UDK: 616.28-76-053.2:37-055.52
https://doi.org/10.31299/hrri.61.2.6

Abstract: *Cochlear implants are revolutionary devices that have improved various areas of the life of young children to a great extent. Cochlear implantation in North Macedonia began in 2007, but little information exists regarding the quality of life of the children who have received these devices. The current study was designed to measure and compare parents' perceptions of the quality of life in children with cochlear implants across seven core domains: communication, child support, general functioning, well-being, self-esteem, social relations, and education. To address this aim, a short and adapted version of the* Children with Cochlear Implants: Parental Perspectives *(CCIP) tool was utilised, with responses obtained from 51 parents of children with cochlear implants. The results showed that all seven domains were ranked within the expected average, with higher performance in the social relations and self-reliance domains. Statistical analyses showed statistically significant associations between parents' income and the well-being and communication domains ($p < 0.05$). Additionally, the mode of communication used by the children (verbal, signed, or simultaneous) was presented as a predictor variable, with a statistically significant difference in the communication domain ($p < 0.01$), as well as in the social relations, well-being and happiness, and education domains (at $p < 0.05$). Furthermore, the level of education of the parents affected the results, where parents who had a bachelor's degree performed higher in the social relations and education domains compared to parents who had only primary education (at $p < 0.05$). The findings underscore the need for further research involving larger participant groups to better understand these associations and inform future interventions.*

Keywords: *cochlear implants, hearing impairment, parental perspective, inclusive education*

INTRODUCTION

Hearing loss is among the most prevalent childhood sensory disorders, though the prevalence is variable, ranging from 1-3 per 1000 newborns globally (CDC, 2010). The implications of the condition are beyond the scope of auditory awareness, as the condition affects the development of language, communication, social inclusion, and even school inclusion (Lazarovskae, et al. 2023). In the absence of early identification or intervention, children with impaired hearing encounter the risk of notable speech deprivation, literacy difficulties, as well as social isolation. In the past twenty years, however, the developmental path for hearing-impaired children was revolutionised by the achievements of neonatal infant screening for deafness (Cuthbert, Grosse, & Howell, 2024) and auditory cure technologies. The implementation of the universal neonatal infant auditory screening enabled the detection of hearing loss during the first ninety days of infant life, allowing for management during the sensitive period for the development of language.

One of the most powerful technologies is cochlear implants (CIs) that circumvent impaired cochlear cells to activate the auditory nerve directly. Unlike hearing aids, which make sounds louder, cochlear implants allow individuals with severe to profound hearing loss to hear sounds with much better definition. The development has proven to be a lifeline for deafened children who benefited very little, or not at all, from the use of hearing aids. A wide body of cross-cultural research has proven the influence of cochlear implantation on the perception of speech, intelligibility, literacy, independence, and social behaviour (Markman, et al., 2011; Punch & Hyde, 2011; Silva, et al., 2019; Archbold, 2017,Group, 2020; Raine, 2013)). As

an example, Archbold (2017) noted that most kids with implants develop verbal communication as the preferred mode, learn to read and write functionally, and score above average in mainstream institutions. Similarly, Fortunato-Tavares et at. (2012) found that the development of implants promotes the development of vocabulary and supports the development of advanced language use, the usefulness of which is expressed particularly later in school.

Implantation timing is an important consideration. As research has repeatedly demonstrated, children receiving cochlear implantation before the age of 18 months show better outcomes with respect to speech perception, language development, and cognition compared to children who receive implants later (Edwards, 2007; Kovachevikj, et al., 2023; Silva, et al.,2019). The explanation is that there is a period of neuroplasticity during development when the auditory pathway centres are particularly open to input. Implantation before this period has been found to frustrate or limit speech delays, reinforce verbal communication, as well as overall developmental achievements (Fortunato-Tavares, et al., 2012; Edwards, 2007). Beyond the linguistic advantage, the CIs also help enhance the ability to remember, pay attention, as well as solve problems by improving the child's ability to process complex auditory-linguistic activities (Edwards, 2007; Geers, et al., 2011).

Beyond cognition and language, implants have deep psychosocial and educational benefits. Research shows that CI users are more independent, and are better integrated socially compared to their counterparts who have only hearing aids (Warner-Czyz, et al., 2022; Silva, et al., 2019). Parent questionnaires verify the same, reporting enhanced self-confidence and inclusion in mainstream environments (Archbold, et al., 2008). Zhumabayev et al. (2022) reviewed families from Kazakhstan and reported better quality-of-life scores on well-being, social relations, and independence domains during cochlear implantation, underscoring the widespread psychological advantage. Family aspects are very important: kids who were raised by active rehab-involved parents and those with a better socio-economic background reported continuous improvement in auditory proficiency coupled with enhanced psychosocial abilities (Silva, et al., 2019; Warner-Czyz et al., 2022). This evidence is consistent with the findings of long-term follow-up studies such as Geers et al. (2011) who reported that the reading skills of kids with CIs, around the ages 8-9 years, were comparable to their peers with typical hearing; some problem development is noticed during the teenage period, given the mounting linguistic demands faced during school. Generally speaking, global evidence depicts cochlear implantation as a multifaceted intervention with medical, school-based, cognition-based, as well as societal advantages (Archbold, 2017; Fortunato-Tavares, et al., 2012; Edwards, 2007; Geers, et al., 2011).

Macedonian context

In spite of such global achievements, the Macedonian reality has followed a slower trajectory. Until the mid-2000s, late diagnosis was the rule for most childhood deafness/hearing impairment cases from North Macedonia, the majority having been suspected by delayed speech onset or suspected deafness (Poposka, et al., 2009). During 2007-2008, 540 children with mixed hearing impairment were registered by the University Clinic for Ear, Nose, and Throat, Skopje, of which two-thirds presented with delayed speech onset (Lazarovska, et al., 2023). The first cochlear implantation in Macedonia was performed in April 2006 at the University Clinic, Skopje, by the academician Prof. Dr. Ilija Filipce; this resulted in the initiation of a surgical practice in the region (Lazarovska, et al., 2023). Prior to this historic landmark, the few children who had received these implants had undergone this procedure abroad. The neonatal screening for hearing loss was implemented much later compared to Western European countries, depriving an entire generation from the benefits of early detection/treatment concept (Jacova & Karovska, 2009). By 2023, 89 people had undergone cochlear implantation surgery at the university clinic in Skopje, of which 9 were adults and the rest were children under the age of 18 years with prelingual deafness (Lazarovska,

Jovanovska, Georgievska Jancheska, & Gjorgjeska, 2023). Special education for deaf children also drastically changed. Traditionally, deaf children were educated in special schools; most often at the Institute for Rehabilitation of Children with Hearing Impairment "Kočo Racin" based in Bitola, which was founded in 1949. The education at the above-mentioned Institute and in special classrooms in mainstream schools was mostly carried out through the use of sign language. According to Ramadani Rasimi (2023), this approach has changed since the implementation of the 2019 Primary Education Law (Закон за основно образование, 2019) that mandates the need for inclusive education and the transformation of special institutions into resource centres. "Kočo Racin," for example, was reestablished as a resource centre with a preschool department for children from 3 to 6 years - Department of Education and Educational-Functional Rehabilitation, Individual Therapy Department and Social Welfare Department (https://ourckocoracin.com.mk/internat/). Up until 2023, most deaf children and those with CIs went to mainstream school, whereas few went to segregated classrooms. Local scholarships have provided valuable, but sketchy accounts of these advances. Jacova and Karovska (2009) reported advances in speech perception and language development after cochlear implantation, especially when combined with auditory and speech therapy, and noted the faster linguistic development of young recipients. Integration into society also improved, with full participation by children in school activities and communal activities (Jacova & Karovska, 2009). Lazarovska et al. (2023) reported similar results, observing enhanced independence and confidence among children with CIs. Jacova and Kovacevic (2010) conducted research among the deaf youth from the Balkan region in the city of Skopje and provided an elaborate one-year case study of a 12-year-old boy possessing a CI, illustrating the way in which adaptive learning methods, such as visual supports, noise management, and assistive technologies, can augment participation. Nevertheless, the study also unveiled the extent to which participation played a role across subjects: better participation was witnessed across the language class and the science class, in comparison to the music class and the history class, where less adaptation took place (Jachova & Kovacevic, 2010). More recent studies, such as Arsovski & Zhivkovikj (2023), reinforce the significance of inclusive practices and teacher preparation when it comes to the inclusion of children with CIs in mainstream classes.

Objective of the research

Previous studies have addressed the ways in which the outcomes of cochlear implantation are perceived based on the case under study, but these outcomes depend significantly on the availability of systemic support alongside professional capability. In spite of this work, the body of Macedonian literature is narrow in scope. Current studies are usually case studies or small samples with a limited focus on educational outcomes and speech remediation. Although these studies are informative, they do not examine the general construct of quality of life, including communication, social interaction, independence, well-being, and overall function. Global research has increasingly valued parental reports as a principal source of information for this topic (Archbold, et al., 2008; Zhumabayev, et al., 2022; Warner-Czyz, et al., 2013), but no systematic attempt has been made so far to study the perceptions of parents in North Macedonia. The current study fills this gap by examining the quality of life among children with CIs from the parents' point of view. Parents witness the daily changes in their children's communication, confidence, independence, and participation, thus making their perceptions a key component to the evaluation of the influence of cochlear implantation. By contextualising these outcomes within the overall global body of work and national situation, this study adds to the overall picture regarding the importance of CIs to the lives of children, going beyond medical and school outcomes, all the way to their holistic well-being.

Hence, this paper aims to analyse parents' perceptions on the effect of cochlear implantation across seven subdomains - self-reliance, communication, well-being and happiness, social rela-

tions, education, support of the child, and general functioning – and to evaluate if socio-demographic variables affect their perceptions. Furthermore, intercorrelation among subdomains were assessed.

Research questions

Based on the objective of this research, we derived the following three research questions:

1. What is the level of intercorrelation among the subdomains?
2. What are parents' perceptions of the quality of life of their children with CIs across seven domains: self-reliance, communication, well-being and happiness, social relations, education, support, and general functioning?
3. Do parents' perceptions of the quality of life of their children with CIs differ across the seven domains (self-reliance, communication, well-being and happiness, social relations, education, support, and general functioning) with respect to parental education, income, employment, place of residence, and gender (mother vs. father)?

METHODS

Sample

This is a quantitative research study that has employed a purposive, non-probabilistic sampling method to recruit 51 participants, all parents of children with CIs. The majority of participants were mothers (66.7%), followed by fathers (31.4%) and guardians (2.0%). The respondents differed in terms of their level of education, with 19.6% having completed elementary education, 37.3% with a high school diploma, 37.3% with a bachelor's degree, and 5.9% with a Master's or PhD level education.

Regarding their employment status, 56.9% of the participants were employed, while 43.1% were unemployed. Income was classified into three categories based on the State Statistical office (https://www.stat.gov.mk/): 43.1% of the participants had a low income (minimal wage of 24.379 denars), 41.2% had a mean average income (43 050 denars), and 15.7% had a high income (above average income). 76.5% of the participants resided in urban areas, while 23.5% of the participants resided in rural areas.

Table 1. *Socio-demographic characteristics of the study participants (N = 51)*

Category	Subcategory	Percent (%)
Parent	Mother	66.7
	Father	31.4
	Guardian	2.0
Level of education	Elementary	19.6
	High school	37.3
	Bachelor's	37.3
	Master's/PhD	5.9
Employment	Employed	56.9
	Unemployed	43.1
Income	Low	43.1
	Average	41.2
	High	15.7
Place of residence	City	76.5
	Village	23.5

The age of the children ranged from 3 to 17 years, with a mean age of 11.45 years (SD = 4.02). The age at which the children received their CIs ranged from 1 to 13 years, with an average implantation age of 4.71 years (SD = 2.85). The modes of communication used by the children were a very valuable variable for our research: 64.7% primarily used verbal communication, 33.3% used simultaneous communication methods (a combination of verbal and gestures), and 2.0% relied on sign language. This classification was based on parents' ratings. This socio-demographic data provides an overview of the children's age distribution, age of cochlear implantation, and their preferred modes of communication.

Table 2. *Socio-demographic information of children with cochlear implants*

	Range	Minimum	Maximum	Mean	Standard deviation	Subcategory	Percentage
Age of child (years)	14.00	3.00	17.00	11.4510	4.01653		
Age of implantation (years)	12.00	1.00	13.00	4.7059	2.85162		
Mode of communication						Verbal	64.70
						Sign language	2.00
						Simultaneous	33.30

Procedure

Participants were recruited through the Association of Parents of Children with Cochlear Implants *Koklearno Srce* (https://www.facebook.com/kohlearno.srce/), which maintains a registry of parents whose children have received CIs, both in urban and rural areas. Parents were notified with an online notice posted on the official Facebook page of the association, and the survey was sent to them by email using a Google Form. In addition, a number of parents from the same Facebook group were contacted by phone to further expand the sample. They were informed that this was voluntary and anonymous, and they could participate only if their child does not have any additional developmental diagnoses such as intellectual disability, severe motor disability, severe visual disability, or nonfunctional autism. Only demographic information was collected, without gathering any identifying facts. Given the small sample size and score distribution, non-parametric tests were employed during data analysis. In order to address the research questions, the following statistical analyses were used: descriptive statistics to summarise the domains, correlation analysis to the explore the relationships between domains, and Mann-Whitney and Kruskal Wallis tests to explore differences across domains with respect to demographic variables.

Instruments

For this research, we administered the "Children with Cochlear Implants: Parental Perspectives" (CCIPP) questionnaire, which is a CI-specific closed-set tool that was developed by Archbold et al. (2008) and is intended to be completed by parents of children who had received a CI more than a year prior to completing the questionnaire. The CCIPP consists of 74 statements, 26 of which address the domain of decision-making, while 48 focus on outcomes of implantation. The statements regarding the outcomes of implantation are divided into eight subdomains: self-reliance (4 items), social relations (6), communication (7), support of the child (6), general functioning (6), well-being and happiness (5), education (7), and effect of implantation (7). The questions are scored on a Likert scale ranging from 1 to 5, with higher scores indicating a positive perception of the domain. The decision-making domain and the effect of implantation subdomain were excluded from further analysis in our study as they were not relevant to the aim of the present study.

Within the subdomains, items from self-reliance (1 item), social relations (1 item), well-being (2 items), and education (2 items) significantly reduced reliability in this study. To improve internal consistency, these items were excluded from the final version, ensuring that all subdomains reached at least an acceptable level of reliability. For exploratory studies, according to Hair et al. (2010), a Cronbach's alpha value of 0.60 is considered acceptable. Since the aim of the present study was to explore the perception of parents and to verify correlations between subdomains, we considered that a Cronbach's alpha value of 0.60 was acceptable.

The final subdomains, number of items, and reliability coefficients are as follows (Table 3): Self-reliance, consisting of 3 items reflecting confidence and independence, had acceptable reliability ($\alpha = 0.68$). Social relations is measured by 5 items assessing relationships and interactions with children and adults, both within and outside the family, and showed excellent reliability ($\alpha = 0.93$). Communication, measured using 7 items, captures parents' perceptions of their child's ability to com-

municate and converse effectively; this showed good reliability (α = 0.78). Child support, assessed using 6 items concerning the help required by the child before and after implantation, demonstrated acceptable reliability (α = 0.67). General functioning, with 6 items evaluating changes in attention, safety, and engagement, also showed acceptable reliability (α = 0.63). Well-being, measured with 3 items focused on parents' perceptions of the child's happiness and frustration, showed high reliability (α = 0.80). Finally, education, measured by 5 items evaluating the child's engagement and progress in educational settings, also demonstrated high reliability (α = 0.80). The factor analysis in Table 3 supports the final structure.

Table 3. *Reliability of the subdomains*

		Factor analysis			
		Initial version		Final version	
Subdomains	α	α	N of items	α	N of items
Self-reliance	0.68	0.49	4	0.68	3
Social relations	0.93	0.82	6	0.93	5
Communication	0.78	0.78	7	0.78	7
Child support	0.67	0.67	6	0.67	6
General functioning	0.63	0.63	6	0.63	6
Well-being	0.80	0.56	5	0.80	3
Education	0.80	0.74	7	0.80	5

RESULTS

For the purpose of this study, analysing the intercorrelations among subdomains was essential. The results revealed strong correlations across different domains of children's development as perceived by parents. The strongest positive correlation observed was between independence and social relations (ρ = 0.73, p < 0.01). This strong positive correlation indicates that the children perceived as more independent tend to exhibit good social relationships according to parents. This finding reveals that promoting autonomy in children will most likely expand their ability to participate and play well in social situations. Additionally, a significant positive association was observed between social relationships and communication (ρ = 0.63, p < 0.01). Parents who see their children as having better communication competencies believe they that they have stronger social networks, which highlights the importance of communication in the development of meaningful relationships. The findings also demonstrate positive correlations between education and happiness (ρ = 0.68, p < 0.01). The correlation between general functioning and well-being (ρ = 0.61, p < 0.01) further emphasises the interaction between functional capacities and psychological wellness. Communication also correlates strongly with general functioning (ρ = 0.61, p < 0.01), which shows its vast scope of influence on children's success when dealing with daily activities. Child support plays a multi-aspect role in affecting children's accomplishments. The positive correlation between social relations and child support (ρ = 0.50, p < 0.01) indicates that a supportive environment facilitates children to establish and maintain social relations. Additionally, the correlation between child support and well-being (ρ = 0.60, p < 0.01) indicates the role of a caring environment in the psychological well-being of children. Communication emerges as a cornerstone, underpinning (influencing) the education, general functioning, and social relations domains. Similarly, self-reliance and child support are foundational to fostering both social and functional growth according to parents' perspectives. According to these results, we can answer the first research question that the subdomains demonstrated strong positive intercorrelations, with the most significant being between independence and social relations (ρ = 0.73, p < 0.01), underscoring the interconnected nature of children's development as perceived by parents.

Table 4. *Spearman's correlation coefficients for the associations between health-related quality of life subdomains in North Macedonian children (N = 51)*

	Self-reliance	Social relations	Communication	Support of the child	General functioning	Well-being	Education
Self-reliance		0.734**	0.571**	0.460**	0.644**	0.673**	0.721**
Social relations			0.634**	0.504**	0.646**	0.739**	0.744**
Communication				0.472**	0.615**	0.659**	0.664**
Support of the child					0.501**	0.605**	0.446**
General functioning						0.618**	0.551**
Well-being and happiness							0.682**
Education							

** indicates that the correlation is significant at the 0.01 level (2-tailed);
* indicates that the correlation is significant at the 0.05 level (2-tailed).

To address the second research question, the overall mean ratings, based on a 5-point Likert scale, were mostly positive for all seven outcome domains of the children's performance, with mean values above 3.0. The social relations domain received the highest rating (M = 4.00, SD = 1.05, range = 1.20-5.00), corresponding to positive parents' perceptions of children's social competence. This was followed by well-being and happiness (M = 3.95, SD = 1.03, range = 1.00-5.00) and self-reliance (M = 3.84, SD = 0.91, range = 1.00-5.00), which were also highly rated, with positive ratings in these areas. The communication (M = 3.73, SD = 0.47, range = 2.71-4.57) and support of the child (M = 3.59, SD = 0.60, range = 2.14-4.57) areas also received positive ratings. These scores reveal that parents assess their children's ability to communicate and the support provided to them to be somewhat more than average. Education (M = 3.78, SD = 0.94, range = 1.20-5.00) and general functioning (M = 3.56, SD = 0.59, range = 2.33-5.00) were rated similarly, but the ratings for education varied more widely between parents, while the ratings for general functioning were more consistent. These findings indicate that parents see these domains as being part of general competence, but not all children perform the same - circumstances can make a difference.

On the basis of these findings, the second research question can be answered by noting that parents were more likely to provide positive assessments of children's quality of life across all seven domains, with mean scores for each always being above 3.0. The highest scores were recorded for social relations (M = 4.00), followed by well-being and happiness (M = 3.95) and independence (M = 3.84), reflecting a very positive parental identification of social competence, emotional stability, and independence. Communication, education, support of the child, and general functioning received positive ratings as well, though with somewhat greater variance per case.

Table 5. *Parental ratings of CCIP subdomains of their child with CI*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Self-reliance	51	4.00	1.00	5.00	**3.8431**	0.91251
Social relation	51	3.80	1.20	5.00	**4.0000**	1.04995
Communication	51	1.86	2.71	4.57	**3.7255**	0.47021
General functioning	51	2.67	2.33	5.00	**3.5588**	0.58862
Well-being and happiness	51	4.00	1.00	5.00	**3.9542**	1.03499
Education	51	3.80	1.20	5.00	**3.7843**	0.94220
Support of the child	51	2.43	2.14	4.57	**3.5882**	0.60248

With the third research question, we wanted to verify if socio-demographic variables would result in differences among the outcomes, (i.e.,) if parents' perceptions of the areas differ based on family income, employment, and child's communication mode. The Mann-Whitney U test (see Table 6) revealed significant differences in parents' views of children's quality of life based on three significant socio-demographic variables: income, employment, and communication mode. Income, also differed significantly in the communication domain (U = 133.00, Z = - 2.39, p = 0.016, r = - 0.36), which indicates a medium effect size. Similarly, well-being (U = 139.00, Z = - 2.27, p = 0.023, r = - 0.34) also reflected a medium effect size based on the participant's financial condition. Based on the employment status of the parents, there was a difference in the category of the child's general functioning (U = 213.00, Z = - 2.02, p = 0.043, r = - 0.28), which indicates a small effect size. Mode of communication, emerged as the most significant variable. Significant differences were observed in the domains of social relations (U = 52.50, Z = - 2.65, p = 0.008, r = - 0.37), communication (U = 163.50, Z = - 2.41, p = 0.016, r = - 0.34), education (U = 171.00, Z = - 2.23, p = 0.025, r = - 0.31), which indicates a medium effect size. Well-being and happiness (U = 184.50, Z = - 1.99, p = 0.046, r = - 0.28) also demonstrated a small effect size, when analysed in relation to mode of communication. No variation was found across the other socio-demographic factors, highlighting that income, employment, and particularly communication mode as the core determinants influencing certain aspects of parents' perceptions.

Mean rank analysis (see Table 7) provides additional information on differences in children's outcomes in relation to income, employment, and mode of communication. In the communication domain, children whose families had average incomes were perceived by parents as having greater communication skills (MR = 26.67), in contrast to children in low-income families, who were rated lower (MR = 17.55). This suggests that communication outcomes were rated higher among children from families with an average financial status. Moreover, parents in the families with average income perceived their children's well-being to be higher (MR = 26.38) compared to the perceptions of families with low incomes (MR = 17.82). When considering the domain of general functioning, parental employment status also appeared to have an impact in their perceptions. As opposed to unemployed (MR = 21.18), employed parents reported higher general functioning of their children (MR = 29.66). This suggests that children's overall functioning was perceived more positively by parents who were employed compared to those who were unemployed.

The mode of communication indicated enduring differences in a number of areas. In the social relations domain, mothers and fathers whose children were said to primarily use verbal communication perceived their children to have more contented social relationships (MR = 29.38), compared to parents who reported that their children relied on simultaneous communication (MR = 17.97). Similarly, in the domain of communication, parents perceived that children who used verbal communication had a higher level of communication development (MR = 29.05) compared to children who used simultaneous communication (MR = 18.62). This pattern was maintained in the well-being and happiness domain, where parents gave children who used verbal communication higher well-being and happiness ratings (MR = 28.41) than those who used simultaneous communication (MR = 19.85). Similarly, in the education domain, there were higher mean ranks for verbal communication (28.79) than for simultaneous communication (19.12). These results highlight that children's outcomes vary substantially between these variables, and that income, employment, and mode of communication are all consistently associated with higher scores in the vast of subdomains.

Table 6. *Differences of means based on the Mann-Whitney U Test*

	Parent (F/M)	Incomes	Place of living	Employment	Mode of communication
Self-reliance	0.585	0.251	0.867	0.357	0.081
Social relations	0.841	0.239	0.669	0.459	0.008**
Communication	0.209	0.016*	0.509	0.108	0.016*
Support of the child	0.917	0.317	0.332	0.043*	0.517
General functioning	0.704	0.054	0.274	0.070	0.136
Well-being and happiness	0.060	0.023*	0.832	0.146	0.046*
Education	0.587	0.299	0.251	0.560	0.025*

** Differences are significant at the 0.01 level (2-tailed).
*Differences are significant at the 0.05 level (2-tailed).

Table 7. *Mean ranks of variables that showed statistical differences.*

Variable	Domain	Subcategory	Mean rank
Incomes	Communication	Low	17.55
		Average	26.67
Employment	General functioning	Employed	29.66
		Unemployed	21.18
Mode of communication	Social relations	Verbal	29.38
		Simultaneous	17.97
	Communications	Verbal	29.05
		Simultaneous	18.62
	Well-being and happiness	Verbal	28.41
		Simultaneous	19.85
	Education	Verbal	28.79
		Simultaneous	19.12

In the case of non-dichotomic variables, the Kruskal-Wallis test was employed to investigate the differences between means. The analysis (see Table 8) explored relationships between the child's age, age at implantation, and parents' level of education and the varying aspects of children's development. The analysis revealed that parents' level of education significantly differentiated (influenced) their perceptions of certain aspects of their children's quality of life. Perceptions in the education domain differed across different levels of parental education ($H(3) = 7.926$, $p = 0.048$), showing a medium effect size ($\eta^2 = 0.08$) and social relations also varied significantly ($H(2) = 9.291$, $p = 0.026$), showing a large effect size ($\eta^2 = 0.11$). There was no significant difference in any of these domains with respect to parents' education, age of child, and age of implantation. These differences are also supported by the mean (See Table 9), as children of parents with higher educational qualifications had evaluated their child positively in these domains. In the social relations category, parents with a bachelor's degree provided the highest scores (MR = 33.89), while parents with an elementary school education provided the lowest scores (M = 19.20). Similarly, in the education category, the highest ratings were provided by parents who had a bachelor's degree (M = 32.92) and the lowest ratings were given by parents with an elementary school education (M = 17.50).

Based on descriptive statistics, mean differences were consistent with observed statistical significance, indicating that parents' education level is a discriminating factor that contributes to their perceptions regarding children's social relationships and educational outcomes. The other areas - support of the child, general functioning, and well-being and happiness, showed variations in mean values, but these variations were not statistically significant. Considering the third research question, we discovered that parents' perceptions of children's quality of life varied significantly with respect to employment status, income, and method of communication, and to a smaller extent due to education level. Children from families with working parents who earn an average income reported more positive outcomes in communication, well-being, and overall functioning, while children who used verbal communication were rated better in terms of social relationships, communication, well-being, and school. In addition, the Kruskal-Wallis test results confirmed that parental education influenced perceptions in the social relations ($p = 0.026$) and education ($p = 0.048$) domain (Table 8), where parents who had a bachelor's degree received higher scores compared to parents with an elementary education (Table 9). There were no significant differences in other variables such as child's age and age at implantation (Table 8).

Table 8. *Differences of means based on Kruskal-Wallis test (H)*

	Age of child	Age of implantation	Level of education of parents
Self-reliance	0.642	0.162	0.196
Social relations	0.592	0.510	**0.026***
Communication	0.225	0.206	0.175
Support of the child	0.974	0.987	0.811
General functioning	0.418	0.327	0.280
Well-being and happiness	0.929	0.408	0.126
Education	0.564	0.237	**0.048***

** Differences are significant at the 0.01 level (2-tailed).
*Differences are significant at the 0.05 level (2-tailed).

Table 9. *Mean ranks of variable that showed statistical differences – Level of education.*

Domain	Level of education	N	Mean Rank
Social relations	Elementary	10	19.20
	High school	19	22.89
	Bachelor's	19	33.89
	Master's/PhD	3	19.33
Communication	Elementary	10	16.90
	High school	19	27.18
	Bachelor's	19	29.82
	Master's/PhD	3	31.00
Support of the child	Elementary	10	26.05
	High school	19	27.45
	Bachelor's	19	25.71
	Master's/PhD	3	18.50
General functioning	Elementary	10	21.55
	High school	19	23.16
	Bachelor's	19	29.89
	Master's/PhD	3	34.17
Well-being and happiness	Elementary	10	19.45
	High school	19	25.37
	Bachelor's	19	31.45
	Master's/PhD	3	17.33
Education	Elementary	10	17.50
	High school	19	23.84
	Bachelor's	19	32.92
	Master's/PhD	3	24.17
Self-reliance	Elementary	10	21.55
	High school	19	22.58
	Bachelor's	19	31.61
	Master's/PhD	3	27.00

DISCUSSION

The current study examined parental perceptions of the quality of life of children with CIs in North Macedonia. These perceptions were examined within the framework of seven domains: social relationships, education, self-reliance, communication, general functioning, support, and well-being and happiness, and further analysed to determine similarities and distinctions.

With reference to RQ1, the intercorrelations between the subdomains were examined and strong connections were found between communication, education, and social relations. Communication, in turn, was found to be significantly associated with both academic engagement and integration with the peer group. This result is consistent with Geers et al. (2011), whose work highlighted the importance of verbal communication with respect to success in education and peer friendships. Independence was also significantly correlated with social relations, consistent with Warner-Czyz et al. (2013) and Archbold et al. (2008), suggesting that independence and participation in society grow together. The strong association between the domains point to the possibility that gains in one key area - communication - could influence parental perceptions of the quality of life by their offspring as a whole.

In RQ2, where the overall perceptions of parents on the quality of life of their children were examined across seven domains, the results indicate overall positive assessments, with well-being and happiness receiving particularly high scores. Parents also asserted that verbal communication led to enhanced emotional stability and psychological well-being, corroborating the work from Geers et al. (2011). Social relations and education also scored positively, particularly among the better-educated parents, who are more likely to offer superior intellectual support and exposure to sociability, as reported in Archbold et al. (2008), as well as the study from Kumar et al. (2015). Conversely, general functioning did not show strong differentiation, suggesting that activities of daily living may be viewed as stable despite background factors. These conclusions are supportive

of the contention that communication and sociability underpin parental perceptions of quality of life.

Lastly, RQ3 tested if the perceptions varied by socio-demographic factors such as level of parent's education, income, employment, residence, and parent's gender. Parental education maintained steady relationships across the social relations and education domains, supporting previous evidence (Archbold, et al., 2008; Warner-Czyz, et al., 2013) indicating that better-educated parents provide better opportunities to support their children in social and academic domains. Income had minimal influence on parental perceptions, although it predicted the perceptions on child support: affluent families reported wider access to resources/interventions, which is in alignment with Kumar et al. (2015). However, in contrast to Warner-Czyz et al. (2022), the outcomes for the education and communication domains did not show statistical significance. Likewise, socio-demographic background did not seem to affect general functioning, but these findings contradict those presented in Archbold et al. (2008) and Zhumabayev et al. (2022). Additionally, place of residence did not appear to have an influence on parental perceptions, contrary to Zhumabayev et al. (2022) whose study identified that rural settings had a negative influence on social/emotional domains. Finally, the gender of the parent had no significant effect on their perspectives, indicating relatively similar opinions from both parents across families.

CONCLUSION

Based on the findings and the discussion, the present research assessed parents' perceptions of the quality of life of children with CIs in North Macedonia. While the sample was small, it represented nearly half of North Macedonia's children with CIs, who received devices that were primarily financed by their parents. The findings point to the pivotal role of parental education and children's communication method in predicting the quality of life and development outcomes of children with CIs. Parental education was most strongly associated with social relations and education. Communication also emerged as a significant domain, with verbal communication being consistently associated with positive outcomes across domains, including well-being and happiness. Income played a role only in specific domains, such as support to the child, but it was not a universal predictor.

These findings also contribute to the broader field of cross-linguistic and cross-cultural research on children with CIs. The alignment of parental education with social and educational achievement is in alignment with international studies (Archbold, Sach, O'neill, Lutman, & Gregory, 2008; Warner-Czyz, Loy, Roland, & Tobey, 2013; Kumar, Warner-Czyz, Silver, Loy, & Tobey, 2015), while the less pronounced impact of income is contrary to observations made by Zhumabayev et al. (2022), noting that contextual and cultural circumstances can lead to varied outcomes. The strong effect of verbal communication echoes the research of Geers et al. (2011), indicating that this finding is generalisable across settings. One important finding that is contrary to investigations in other areas is the absence of geographical differences, suggesting that socio-linguistic environments moderate the extent to which location is associated with quality of life. Cumulatively, the results highlight the need to include underrepresented linguistic and cultural environments in global research on CIs in order to refine and expand international quality of life outcome frameworks. Future research should expand upon these results with larger, more diverse cohorts and pay close attention to cultural, economic, and systemic variables to inform more culturally sensitive interventions. The current study's conclusions present clear, applied implications for education, clinical, and policy arenas. In the education arena, school priorities must include the provision of sustained speech and language support services, as well as integrate socio-emotional learning into daily classroom practices. Peer-based initiatives establishing peer-to-peer interaction, independence, and classroom participation for children with CIs must be rigorously conceived. Teachers must receive focused training on how to track emotional

well-being, especially given its strong relationship with communication skills. In the policy arena, there is the need to provide sustained equal access to speech-language therapy across urban/rural environments, redressing service imbalances. Furthermore, formally implemented and structured parent education programmes need to be instituted, consisting of workshops coupled with counselling on communication, school support, and psychosocial development. Clinically, the plan of interventions must incorporate language habilitation with specially conceived modules focused on the enhancement of social skills (e.g., role playing, communication, turn-taking, inclusion in groups) and the development of psychological resilience by means of coping strategies and expressive play. Importantly, the need for interdisciplinary work must be formally established by means of frequent case conferences that bring speech therapists, psychologists, and teachers together in order to reach an agreement on how best to help and provide support to children with CIs. This degree of coordination guarantees that these children will receive sustained, coordinated assistance across the communication, emotional, social, and school domains by addressing the potential disconnect between clinical settings and the school environment.

Acknowledgements

Special gratitude is owed to the parents of the children with cochlear implants from the Republic of North Macedonia, whose collaboration in completing the questionnaire made this research possible.

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